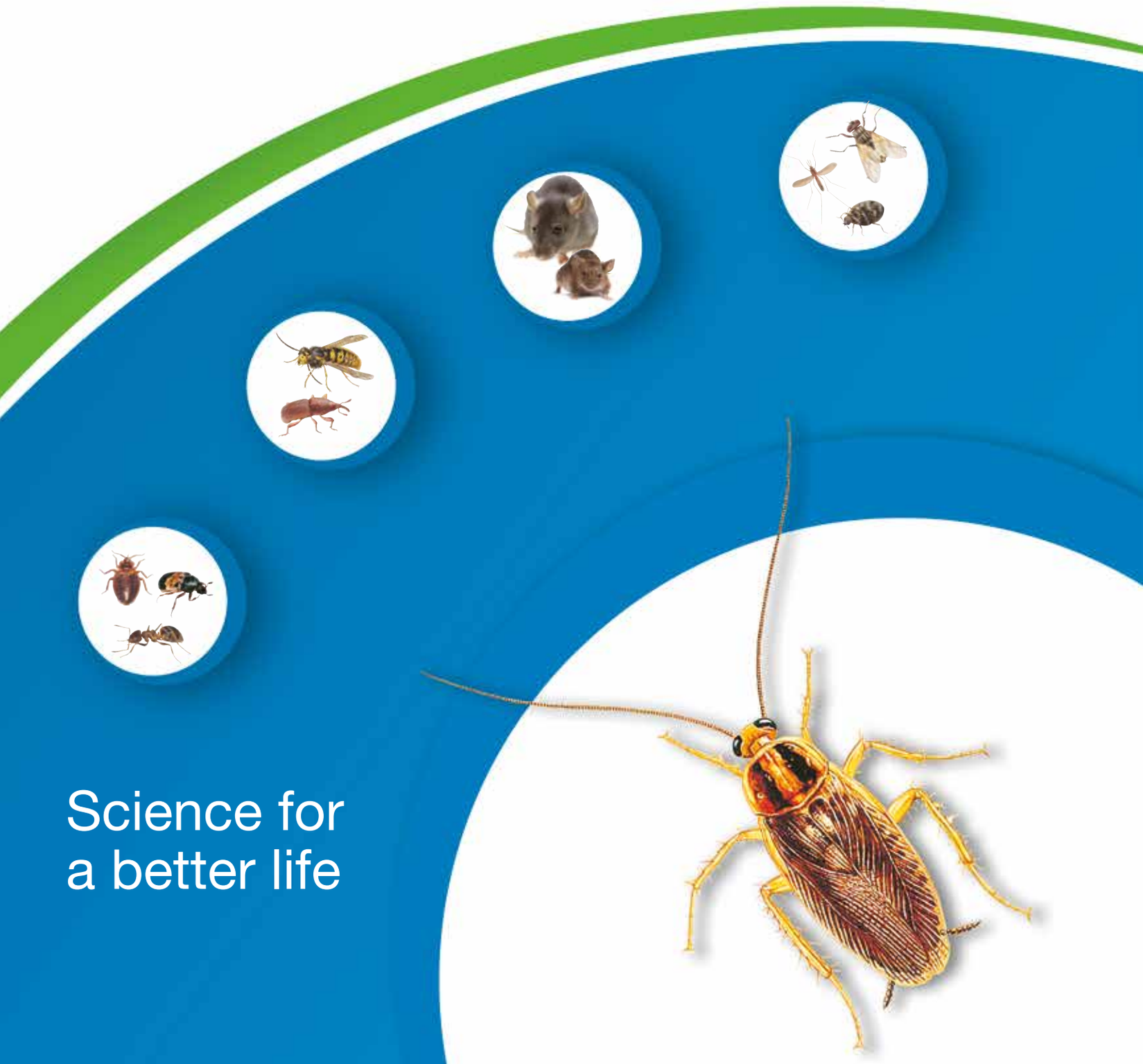
# Bayer

## Professional Pest Control Guide



Science for
a better life

# Bayer Contact

**Bayer CropScience**
230 Cambridge Science Park
Milton Road
Cambridge
CB4 0WB
**Customer Services: 00800 1214 9451**
**Email: pestsolutions@bayer.com**
**Web: www.environmentalscience.bayer.co.uk**

# Bayer Distributors

**Killgerm Chemicals Ltd**
113 Wakefield Road
Wakefield Road
Ossett
West Yorkshire
WF5 9AR
**Tel: 01924 268 400**
**Email: info@killgerm.com**
**Web: www.killgerm.com**

**Barrettine Environmental Health Ltd**
Barrettine Works
St Ivel Way
Warmley
Bristol
BS30 8TY
**Tel: 01179 672222**
**Email: beh@barrettine.co.uk**
**Web: www.barrettine.co.uk**

# Bayer - Science for a better life

Bayer is a multinational company with key skills in the fields of pharmaceuticals, nutrition and synthetic materials, the mission of which is to provide products and services which are useful to mankind, and improve quality of life.

Bayer is dedicated to the development of formulations which are destined for professionals in the hygiene and pest-control fields in urban and rural areas.

Bayer researches and promotes solutions, the priority objectives of which are the effectiveness of the product, the safety for the professional operators and for the environment. These solutions have often proved to be an example and a point of reference for the entire industry.

Bayer is present throughout the world, in Australia, the Americas, Europe, Asia and Africa, with the aim of maximising efficiency and flexibility, and creating new value in the professional field of environmental health. Its distinct innovative spirit, combined with decades of experience, has always positioned Bayer as a world leader in its field, with its well-known brands K-Othrine® WG 250, AquaPy®, Ficam® and Racumin® Foam.

Our products are used successfully every day and in every part of the world, by thousands of pest-control professionals. Throughout the world we sustain and promote pest control methods which are based on Integrated Pest Management, we co-operate with research institutes, health organisations and authorities to develop programmes which are aimed at controlling the most significant infestations.

In the UK and Ireland, we have a dedicated organisational and sales structure which operates in the sectors of Professional Pest Control, Rural Hygiene and the protection of stored cereals. Direct contact with the professionals in the field allows us to provide suitable technical assistance, logistics, and a commercial supply which meets the requirements of all the clients and end users.

We promote our products by means of targeted actions and meetings aimed at the experts in the field. We co-operate with the relevant associations, and support events which enhance the quality of service in the world of professional pest-control.

For 35 years the brand Ficam® has stood for excellence to the UK Pest Control Industry, and in recent years revolutionary high-tech solutions have become available, such as Maxforce Quantum® and K-Othrine® WG 250 formulation, which involves low dosages in use and increased safety in operation, without waste or dosage errors.

Bayer immediately distinguished itself in its defence of the active ingredients used because it intends to continue to sustain and invest in the pest-control industry. Bayer's priority is to develop products which are already in line with the Biocides Directive; our range of insecticides has been selected with the aim of meeting the needs of people who want to get the most out of their own services, with a view to satisfying the end user.

# Bayer as a global company

Bayer is an inventor company with over 150 years of expertise and social commitment. By applying science to the major global challenges, Bayer can deliver innovations that address unmet customer and market needs.
As a global enterprise, Bayer has key skills in the fields of health care and agriculture with the mission:

## Bayer: Science For A Better Life

**Bayer Leverkusen**
The Bay Arena stadium and training ground is home to the company's football team, which was founded in 1904.


**Aspirin™**
Discovered by Bayer in 1899.




# Bayer UK & Ireland

Bayer is a global leader in providing innovative solutions to pest, weed and plant disease problems in the professional non-crop markets. This encompasses the professional pest control product range, as well as our grain management portfolio of products.

Bayer campus in Monheim, Germany.

Bayer campus in Clayton, USA.

## Bayer UK offers;

### Extensive product portfolio

The UK and Irish product portfolio consists of our professional insect control range, traditional and contact rodent formulation rodenticides, and grain protection products.

### Direct contact with pest managers and pest control professionals

Bayer have formed Customer Advisory Councils, and our UK team regularly offer site support for our pest control customers. By working closely with pest control professionals and our key distributors , Bayer are constantly gaining a clear understanding of the problems encountered and experienced on a day to day basis in the field.

### Research and development to bring new products to market

Bayer invest up to 10 years and €300 million to bring each new active to market.

Bayer has a Pest Control Product research center in Monheim, Germany. Monheim has several in site breeding areas for pest insect species, meaning that Bayer formulations and active ingredients are subject to rigorous testing in a number of different environments before they are ever used by professional pest operators.

### Team of experts

The Bayer pest solutions team have a wide range of knowledge and practical experience in the pest control industry, and are available to answer technical questions and to give educational seminars in the use of professional pest control products.




# Pest Solutions Team

With the regulatory environment changing at a phenomenal rate for pest controllers, they need fast, accurate advice on pest matters, more than ever before. There are countless things to get right and, as a result of this, help is at hand from Bayer. The company has drawn together an experienced team of experts to make up their Pest Solutions team. The new Pest Solutions team is made up of five professionals, all with wide-ranging backgrounds in the sector, meaning they can offer a wide range of expertise. The team enhances the strong product portfolio available from Bayer and is further supported by the popular Bayer PestXpert app.

## Alan Morris

Having worked in the pest control sector for 18 years, Alan Morris has extensive experience in the industry, and has been privy to many changes over the years.

His first taste of the sector was in 1997, working in a sales administration role for AgrEvo, the environmental science company for professional pest control, and he hasn't looked back since.

In 2000 when the company merged to become Aventis Environmental Science, Alan took up the role of European product manager. "This was quite a step up from managing the sales, orders and deliveries in the UK. It was challenging, but the experience taught me a lot," says Alan.

"The role required me to travel around Europe, working on the ground with pest controllers from different countries, which gave me experience of the different pest control challenges.

"It was a really interesting time, we were ultimately preparing for what regulatory bodies would do and the future needs of the industry, and this strategic investment in the future of pest control and adapting accordingly, is what Bayer as a company still does," he says.

Now in the role of 'Head of Country UK and Ireland' at Bayer Environmental Science and heavily involved with the BPCA, NPTA and CRRU, Alan's contribution to the industry is far-reaching, and he maintains that looking after his customers is still top of the agenda. "The changing needs of the pest controller are paramount, and we're always innovating with new technologies, packaging presentations, new application equipment and are also keen to communicate key information and regulatory changes," he adds.

## Richard Moseley

Richard fell into the pest control industry quite by accident, but found it appealing from the off, because of the diversity of the job.

Starting as a pest controller in Wigan with 'National Britannia', a national pest control company, at the age of 22, he felt at home managing his own patch, and encountering a different challenge each day.

"I became fascinated straight away. I'd say something about the industry gets under your skin," he says.

Eventually Richard progressed to manage the pest control needs for some of the largest food manufacturers in Europe. "It was a huge learning curve for me. I was also training others in the industry.

"This experience and training paved the way for my next post, in 2008, when I became the technical manager for the BPCA. Here I was heavily involved with influencing government policy, for the benefit of our members and the wider industry," he says.

Having now been at Bayer for nearly two years, Richard is the technical manager for professional pest control and feels the most important aspect of the role is to give pest controllers a high level of support and industry knowledge.

"I'm here to inform on legislation, formulations, insect identification and guidance on what will and won't work," he adds.

## Ken Black

Ken Black is responsible for the agricultural side of the Bayer pest control business, primarily covering rodenticides and grain storage pests. Ken can be seen at many agricultural events across the UK, where he actively engages with farmers about their pest issues.

Ken studied agriculture at Lancashire and then Lincolnshire College of Agriculture, then went on to work for a company installing dairy equipment. But it was an interest in animal health that attracted him to a role managing the sales of rodenticides and animal health products into the agricultural merchant trade, for the company Sorex.

“I was recommended to make the move to Bayer because they were about to launch their product range Rodilon, which comprises of an exciting range of rodenticide formulations that contain difethialone, an active with no known resistance,” he says.

“I’ve been with Bayer for five years, and I’ve seen many industry changes and shifts. To me it’s clear that as a company, Bayer is trying to ensure that farmers and pest controllers working in the agricultural sector are armed with the right products, and the right advice for dealing with pest issues.” Ken is also BASIS qualified and holds an RSPH level two in pest management.

## Greg Collins

Greg Collins represents the Bayer Pest Control industry in Ireland. He sits on the board for CRRU in Ireland and is expert in policy, which can differ from England.

Greg actively engages with distributers and pest controllers in Ireland, and works on the ground to ensure that his customers have the support they need to do the job.

“Regulations in Ireland are often different than the rest of the UK, so I have to be up to speed, and ready to communicate these changes to the people that need to know them, and support this with product knowledge,” he says.

**The Pest Solutions team from Bayer can offer you:**

- Technical support
- Tailored advice
- Training & seminars

**Contact the Pest Solutions team with your questions at pestsolutions@bayer.com or on 00800 1214 9451.**

## Research & development

As a lifescience company Bayer puts huge resources into research and development activities, which are closely aligned to market needs and geared towards continuous improvement.

Bayer activities are supplemented by an international network of collaborations with leading universities, public-sector research institutes and partner companies that continue to expand in alignment with the company's main areas of research and development. This network allows the pooling of expertise, helping Bayer to rapidly translate new ideas into successful products. Even so, it can take up to 10 years, the analysis of 100,000 potential active substances and about €300 million to bring each new and innovative product that customers come to expect from Bayer, to market.

Bayer is committed to sustainable development, R&D and regularly invests in local R&D projects to help improve the future quality and management in the pest sector.

## Formulation vs. generics

With spending pressures across all business sectors there can be a temptation to opt for low cost generics containing the same active ingredient as a branded treatment.

This approach however, overlooks the added benefits of a branded formulation.

The efficacy of a treatment relies heavily on the correct formulation technology, to help the active ingredient be as effective as possible, such as by increasing palletability and longevity of a bait formulation. Formulation technology can reduce follow up frequencies for pest controllers, reducing cost in time and product application.

The rotation of active ingredients can be an essential aspect of Integrated Pest Management (IPM) to discourage resistance. Bayer insecticides provide access to a number of insecticide actives offering pest controllers the best control options.

## Latest innovations

### PestXpert app

PestXpert app contains photographs and information on a number of pest species. All current Bayer pest control products can be viewed via the app, and Bayer has provided a camera option allowing photographs to be uploaded and sent to their Technical Support for personal identification.

The app includes:

- Instant access to safety data sheets
- Support and 'how to' videos for pest control products
- The latest pest and product news from Bayer
- A pest treatment form and other support documentation.

The app is free and available to download now for iPhone and Android, to find out more visit www.environmentalscience.bayer.co.uk

**The Pest Classification incorporates:**

- Pest images
- Information on the pest's habitat, behaviour and biology
- Product Solutions

**The Bayer Product Guide incorporates:**

- Key features
- Use Areas
- Insects controlled

## Racumin® Foam

Racumin® Foam is a new, non-bait rodenticide from Bayer, offering an alternative method to control rat and mouse infestations.

This truly innovative formulation is Bayer's latest development in rodent control to be introduced to the UK and Ireland.

Unlike baits which are reliant on palatability for uptake, Racumin® Foam works with the rodent's natural grooming habits and is effective as a result.

When faced with situations where traditional bating methods are not possible (e.g. cavity walls), Racumin® Foam can be used as part of the rodent defence armoury. Racumin® Foam should be used in conjunction with baits as part of an Integrated Pest Management (IPM) approach.


# Protecting Tomorrow...Today

Science For A Better Life

Bayer carefully develops products and services which are designed for the well-being of people by improving their quality of life. Our efforts are in line with the Bayer Group's commitments to sustainable development.

### Protecting Tomorrow...Today

is Bayer's vision which declares our contribution to global sustainability. It is the guiding principle on which our operative and cultural strategy is based.

Bayer recognises that success is possible only by means of long-term commitment to protect sustainability. This concerns not only the products and services we supply, but also directly our way of behaving, and that of our suppliers and distributors and end customers. Sustainability is not new to us. Our history of innovation, training and management has always taken into account providing solutions which are aimed at improving quality of life, with minimal impact to the environment.

### What is Sustainable Development?

Sustainable development is a commitment to conduct economic development which meets the needs of present generations, without compromising those of future generations.

This globally accepted approach, which envisions economic growth whilst respecting the environment, and without damaging our planet or exhausting its resources.


### Our Vision of the Future

Bayer maintains the Bayer Group Sustainability guidelines, with particular attention to:

## The Environment

#### Attentiveness to our environment

For responsible support of our products throughout their entire life cycle. In order to guarantee safety for:

- The operator, by means of development of new molecules and innovative formulations
- The environment, by manufacturing in accordance with our Responsible Care principles, and developing products which are safer and more eco-friendly.

## Social

#### Partnership and development with operators in the field

To create a sense of sustainability in our daily activities. We co-operate with public and private organisations for the purpose of:

- Improving well-being and environmental health
- Providing modern technologies
- Promoting responsible use of our products by means of technical support and educational activities.

## Economic

#### Re-planning our future

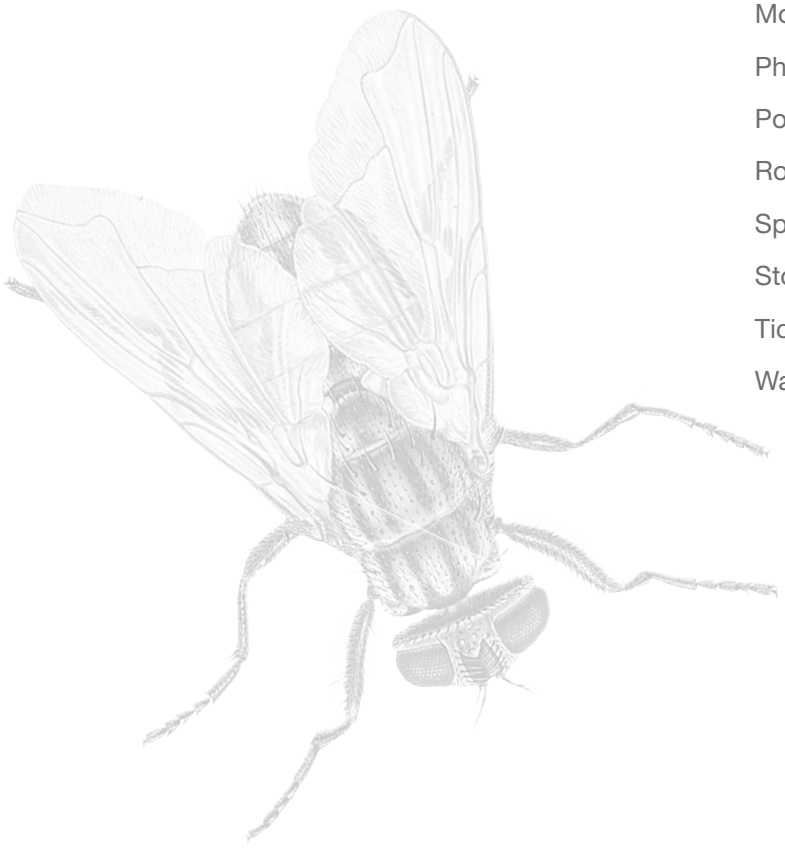
By means of continual investments in research and development, we are committed to providing new sustainable products, services and technologies which meet the needs and expectations of our clients. We encourage:

- Research and development at all levels
- Co-operation with our clients and partners in order to make improvements in terms of efficiency and productivity
- Work aimed at sustainable success.

# Contents


| Product Range | Page |
|---|---|
| AquaPy | 13 |
| Bayer Aerosols | 15 |
| Coopex Smokes | 17 |
| Ficam D | 19 |
| Ficam W | 21 |
| K-Obiol | 23 |
| K-Othrine WG 250 | 25 |
| Maxforce LN | 27 |
| Maxforce Prime | 29 |
| Maxforce Quantum | 31 |
| Maxforce White IC | 33 |
| Pybuthrin 33 | 35 |
| QuickBayt | 37 |
| Racumin Foam | 39 |
| Racumin Paste | 41 |
| Rodilon | 43 |

| Pest Guide | Page |
|---|---|
| Argentine Ants | 49 |
| Bed Bugs | 51 |
| Biscuit Beetles | 55 |
| Black Ants | 57 |
| Booklice | 59 |
| Carcinops | 62 |
| Carpet Beetles | 64 |
| Cockroaches | 67 |
| Fleas | 71 |
| Flour Beetles | 75 |
| Ghost Ants | 78 |
| Grain Beetles | 80 |
| Grain Weevils | 83 |
| Hide & Larder Beetles | 86 |
| Houseflies | 88 |
| Lesser Grain Borers | 91 |
| Lesser Mealworms | 93 |
| Mosquitoes | 96 |
| Pharaoh Ants | 99 |
| Poultry Red Mites | 102 |
| Rodents (Commensal) | 104 |
| Spider Beetles | 107 |
| Stored Product Moths | 110 |
| Ticks | 114 |
| Wasps | 118 |

# AquaPy®

## Knocks the spots off other insecticides

- Extremely versatile in use
- Pioneering FFAST™ technology
- Natural, water-based control
- Ultra low volume (100ml treats 3000m³)

### Versatile Application

AquaPy® is a virtually odourless non flammable water based insecticide which contains natural pyrethrum, synergised with piperonyl butoxide. This combination gives it the flexibility in where and how it can be used.

AquaPy® can be used in a variety of areas for the fast flushout, rapid knockdown and kill of an extensive range of flying and crawling insects. AquaPy® is accepted for use by the Soil Association for organic sites.

AquaPy® has the ability to be applied as a space spray (ULV aerosol, Mist/Thermal Fog) or as surface spray depending on the situation and target pest(s). (See label for full details).

**Controllable residual activity**

Space spray – no residual.

Surface spray – no residual or up to 2 weeks depending on dilution rate.

### Pioneering Technology - FFAST™

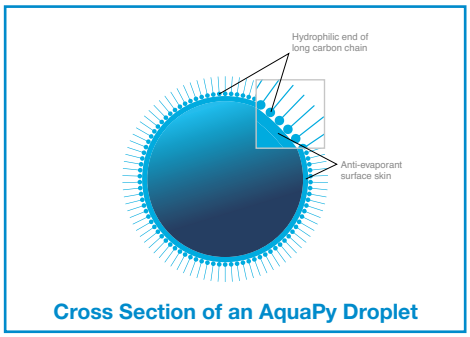
The FFAST™ technology is uniquely patented by Bayer which makes AquaPy® superior to any other water based space spray on the market.

AquaPy® utilises Film Forming Aqueous Spray Technology (FFAST™). Whether in ready-to-use form or diluted in water AquaPy® spray droplets are encased in a polymer coat of long-chain alcohols. This technology minimises evaporation ensuring the droplets stay in the air for longer, thus ensuring the insecticide penetrates its target.

**APPROVED**

**FOR USE IN EMPTY GRAIN SILOS, BARLEY STORAGE BINS AND GRAIN STORES INTENDED FOR STORAGE OF MALTING BARLEY**

Space Spray & Surface Spray




Cross Section of an AquaPy Droplet

# AquaPy

Knocks the spots of other insecticides

APPROVED
FOR USE IN AIRCRAFT

## Areas of Use

**Food Handling Processing:**

Food production, kitchens, slaughter houses, etc.

**Farm Buildings, Animal Husbandry Areas:**

In and around poultry houses, cattle sheds, milking parlours, piggeries etc.

**Outdoors:**

Refuse tips, indoors and outdoors in sewage works (excluding filter beds), empty grain silos, tobacco stores and empty grain transport vehicles etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Storage:**

Silos, food retailers, warehouses, raw material, tobacco stores etc.

**Public and Domestic Buildings:**

Private housing, hospitals, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Aircraft**: AMS1450A and Boeing D6-7127 compliant.

## Insects Controlled

Flies, mosquitoes, stored product moths, stored product beetles, wasps, fleas, bed bugs, cockroaches and many more (see label for more details).

## USE BIOCIDES SAFELY

AquaPy® contains pyrethrins 3% w/w synergised with piperonyl butoxide.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

AquaPy® is a registered trademark of Bayer.

HSE 5799. PCS 93571.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

## Health & Safety

Health and safety equipment.

## Application Rate

| Treatment | Pest Species | Dilution Rate with Water | Application. Rate |
|---|---|---|---|
| | | AquaPy Water | |
| **Space Spray Indoors** | | | |
| Ultra Low Volume Aerosol | **Flying Insects (not tobacco beetles)** | Undiluted – Ready to Use | 100ml/3000 $m^3$ |
| | Crawling insects cockroaches | Undiluted – Ready to Use | 200ml/3000 $m^3$ |
| | Fleas & bed bugs | Undiluted – Ready to Use | 300ml/3000 $m^3$ |
| | Stored product insects and tobacco | Undiluted – Ready to Use | 400ml/3000 $m^3$ |
| Misting/Thermal fogging | **Flying Insects (not tobacco beetles)** | 1 part (100ml) 9 parts (900ml) | 1Litre/3000 $m^3$ |
| Misting | **Crawling insects cockroaches** | 1 part (200ml) 4 parts (800ml) | 1Litre/3000 $m^3$ |
| | Fleas & bed bugs | 1 part (300ml) 2.3 parts (700ml) | 1Litre/3000 $m^3$ |
| | Stored product insects and tobacco | 1 part (400ml) 1.5 parts (600ml) | 1Litre/3000 $m^3$ |
| **Space Spray Outdoors** | | | |
| Ultra Low Volume Aerosol | Large Areas | Undiluted – Ready to Use | 500ml/Hectare |
| | Small Areas | Undiluted – Ready to Use | 100ml/500 $m^2$ |
| Thermal Fog | Large Areas | 1 part (100ml) 9 parts (900ml) | 5 Litres/Hectare |
| | Small Areas | 1 part (80ml) 11.5 parts (920ml) | 1Litre/500 $m^2$ |
| **Surface spray** | | | |
| No residuality: under 24 hours | Cockroaches fleas & bed bugs | 1 part (125ml) 39 parts (4.875L) | 5Litres/100 $m^2$ |
| Short residuality; 1 to 2 weeks | Cockroaches fleas & bed bugs | 1 part (500ml) 9 parts (4.500L) | 5Litres/100 $m^2$ |
| | Wasps (nests) | 1 part (100ml) 9 parts (900ml) | Spot Application |
| Solid waste management | Flies | 1 part (100ml) 9 parts (900ml) | 5Litres/100 $m^2$ |

# Bayer Aerosols

## Crawling and flying insect aerosols

- Rapid control - quick knockdown
- Wide area of use
- Controls an extensive range of crawling and flying insects
- Clean and easy to use

### The Aerosol Experts

The Bayer Flying Insect Killer and Crawling Insect Killer aerosols are specially formulated for the rapid control and quick knock-down of nuisance flying and crawling insects. Building on Bayer's long history of insecticide aerosols, the new Flying Insect Killer and Crawling Insect Killer aerosols are the best yet.

### Rapid Control

The Bayer Flying Insect Killer and Crawling Insect Killer aerosols can be used for the rapid control of an extensive range of crawling and flying insects*. (*See label for full details).

### Wide Area of Use

The Bayer Flying Insect Killer and Crawling Insect Killer aerosols can be used in a wide range of areas including domestic and industrial premises.


# Bayer Aerosols

Crawling and flying insect aerosols

## Areas of Use

**Bayer crawling insect killer**

Spray directly at insects exposed on surfaces for rapid knock-down and kill.

Spray onto surfaces on which insects walk; into cracks and crevices and other insect harbourages; on insect runs and points of access to buildings to give long lasting protection.

Suitable for use in domestic premises, hospitals (but not occupied wards areas) & industrial premises.

**Bayer flying insect killer**

Close all doors and windows.

Spray into the air in all directions; 5-10 seconds for an average size room of 30m$^2$.

Keep room closed for 10 minutes following treatment.

## USE BIOCIDES SAFELY

Bayer Crawling Insect Killer contains Cyphenothrin 0.28% w/w and imiprothrin 0.09% w/w. Bayer Flying Insect Killer contains d-tetramethrin (0.15% w/w) and d-phenothrin (0.15% w/w).

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

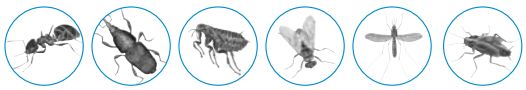
Bayer Crawling Insect Killer HSE 8756. Bayer Flying Insect Killer HSE 8771. PCS 96516.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

## Insects Controlled

Bayer insect aerosols targets flying and crawling insects to include, cockroaches, fleas, flies, mosquitoes, ants and bedbugs. Please see the label for full details.

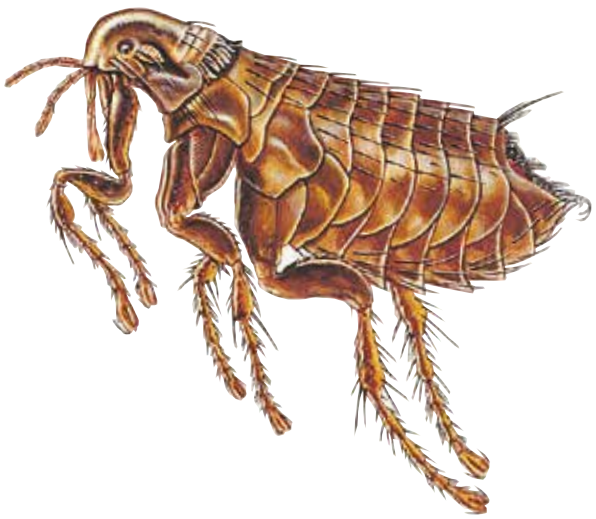


## Health & Safety

Health and safety equipment.

## Application Rate

Apply Bayer aerosols as directed on the container.



**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Coopex® Smokes

## Fast, easy and thorough

- Ready to use
- No equipment needed
- Easy, quick and simple

### Ready to Use

The Ready-to-use formulation involves no mixing or specialist equipment. Coopex® Smokes are biodegradable products which have highly penetrative smoke for fast, efficient control with low risk of environmental contamination. The clean smoke leaves no unsightly deposit, tainting or residual odour.

Coopex® Smokes contain permethrin, a synthetic pyrethroid which is well proven for use in pyrotechnic formulations. Permethrin exhibits low mammalian toxicity, minimising opportunity for operator contamination.

Coopex Smokes is available in 2 convenient pack sizes; Maxi and Mini.



# Coopex® Smokes

Fast, easy & thorough

## Areas of Use

Coopex® Smokes are ideal for awkward spaces where spraying equipment is difficult to use, for example, inside machinery, in lofts and in very tall structures. Coopex® Smokes are ready-to-use single treatments for use in domestic situations and public hygiene areas including hospitals (not occupied wards), industrial and municipal buildings plus food handling, storage and manufacturing premises.

May also be used in zoos, pet shops, kennels, veterinary practices and laboratory animal houses (excluding animal pens and cages).

## Insects Controlled

Coopex® Smokes are effective products offering rapid flushout, knockdown and kill, targeted for the control of a wide range of Public Hygiene insect pests to include:

Flies (including house and cluster), mosquitoes, moths, wasps, ants, fleas, bed bugs and cockroaches.

## Health & Safety

Health and safety equipment.

## Application Rate

| Insects | Volume treated m³ | |
|---|---|---|
| | Coopex Maxi | Coopex Mini |
| Flying Insects | Up to 1000m³ | Up to 120m³ |
| Fleas & Bed Bugs | 250 | 30 |
| Ants, stored product insects and cockroaches | 62.5 | 7.5 |

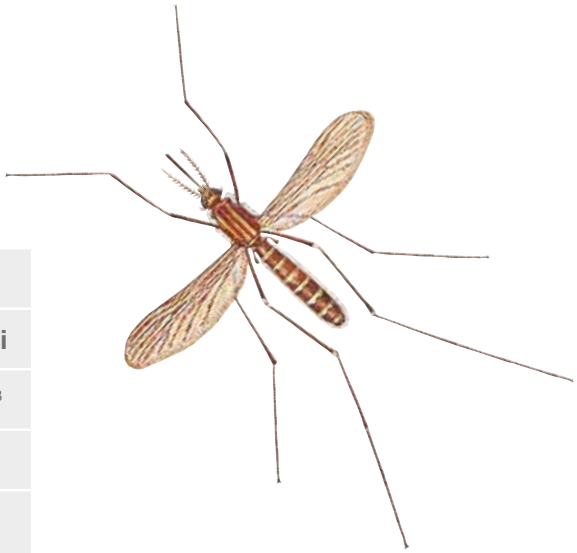
After preparing the area for treatment simply tear off the tag, remove the container cap, place on a fireproof base of approximately 300 x 300mm and light the igniter using a match.

## USE BIOCIDES SAFELY

Coopex® Mini and Maxi Smoke Generators contain permethrin (25:75 cis : trans isomeric ratio) 13.35 % w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.





**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Ficam® D

## Superior wasp control

- Superior against wasps and ants
- High penetration of voids (due to the talc used)
- Does not repel or excite the insects

### Superior

Ficam® D is the superior wasp and ant control product which has been tried and tested for over 35 years in the field.

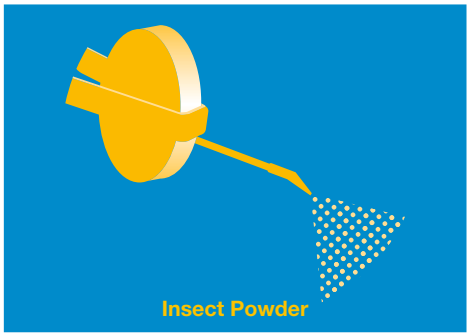
With its extensive label recommendations Ficam® D is easy and ready to use and comes in a resealable pack. It is a biodegradable product with low risk of environmental contamination. It is ideal to use where liquid-based formulations are unsuitable.

The particulate nature of Ficam® D means it will not be absorbed by porous surfaces and where deposits remain undisturbed, it will provide long term residual activity.

Ficam® D is odourless, non-tainting, non-staining and non-corrosive. Bendiocarb is photostable exerting prolonged residual insecticidal activity.

### Resistance Management

It is good practice to regularly rotate chemical groups to promote resistance management. In this instance K-Othrine® WG 250 is a perfect partner for Ficam® D.





# Ficam® D

Superior wasp control

## Areas of Use

**Ficam® D** can be used in and around wasp and ant nests and for the treatment of inaccessible areas such as roof voids and service ducts where spraying is impractical and around electrical installations where spraying is undesirable.

**Domestic premises:**
In and around buildings including houses, blocks of flats etc.

**Public Buildings:**
Hospitals (inc. occupied wards as band/spot or crack and crevice treatment only), factories etc.

**Storage:**
Warehouses.

**Outdoors:**
Refuse tips, sewage works (excluding filter beds) etc.

## USE BIOCIDES SAFELY

Ficam® D contains bendiocarb 1.25 % w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

Ficam® is a registered trade-mark of Bayer. HSE 4829.

PCS 93412.

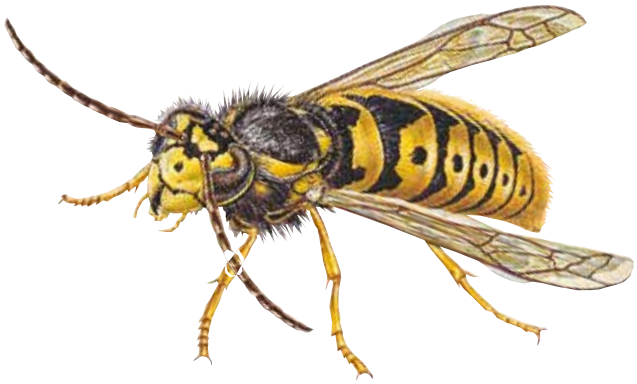


This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

## Insects Controlled

Ficam® D is suitable for the control of a wide range of flying and crawling insect pests to include:

Wasps, ants, silverfish, cockroaches, moths, flies, ticks, fleas, bed bugs, millipedes, spiders, beetles and woodlice (see label for more details).



## Health & Safety

Health and safety equipment.

## Application Rate

Apply Ficam® D by hand shaker or puffer, bellows or piston gun or rotary blower at a dose rate of 10-20g Ficam® D per $m^2$.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Ficam® W

## A predictable outcome

- Excellent against wasps, ants, fleas and bed bugs
- Does not repel or excite the insects
- Once added to water, no classification
- Odourless, non-staining, non-tainting and non-corrosive
- Provides prolonged, residual insecticidal activity
- Can be applied to mattresses

### Excellent Broad Control

Ficam® W is a recognised quality formulation with extensive label recommendations and is a non-repellent. As it is a non-pyrethroid, Ficam® W is an ideal tool for resistance management.

Ficam® W has long lasting activity as bendiocarb is photostable thus enhancing availability to insects.

Ficam® W is supplied in measured doses (15g water soluble sachet in 5L water). The pack being a water soluble sachet means less disposal of packaging and reduces operator exposure. Also available in 500g (for smaller quantities of mix).

Clean/minimal visual deposit after application.

Ficam® W is a biodegradable product with low risk of environmental contamination, it is water-based, no oil or solvent to damage surfaces. Ficam® W can also be applied to mattresses.

### Resistance Management

It is good practice to regularly rotate chemical groups to promote resistance management. In this instance K-Othrine® WG 250 is a perfect partner for Ficam® W.

Water Soluble Sachet | 15 Secs | 30 Secs | 45 Secs

APPROVED
FOR USE IN AIRCRAFT


# Ficam® W

A predictable outcome

## Areas of Use

**Domestic premises:**

Ficam® W can be sprayed in domestic premises, hotels, onto carpets, wall paper, furniture, bed frames and mattresses (but not clothing, sheets, pillow cases or in cots).

**Public Buildings:**

Continuously occupied areas (as band/spot or crack and crevice treatment only), hospitals, hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, slaughter houses etc.

**Storage:**

Food retailers, warehouses etc.

**Food Preparation:**

Restaurants etc.

**Outdoors:**

Refuse tips, sewage works (excluding filter beds) etc.

**Aircraft & Ship**

AMS1450A and Boeing D6-7127 compliant.

## USE BIOCIDES SAFELY

Ficam® W contains bendiocarb 80 % w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

Ficam® is a registered trade-mark of Bayer. HSE 5390.

PCS 93413.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

## Insects Controlled

Ficam® W is suitable for the control of a wide range of Public Hygiene insect pests to include:

Ants, wasps, fleas, flies, mosquitoes, bed bugs, cockroaches, moths, silverfish, earwigs, booklice & beetles.

It will also control spiders, woodlice, centipedes, millipedes, ticks and thrips.

## Health & Safety

Health and safety equipment.

## Application Rate

| |
|---|
| Crawling insect pests and adult mosquitoes in all situations; also cockroaches in most situations: |
| 1 sachet = 15g in 5L water |
| For control of cockroaches in special situations i.e. where heavy infestations are present, where an extended period of control is required, where conditions are particularly unhygienic: |
| 2 sachets = 30g in 5L water |
| Houseflies and blowflies |
| 1 sachet = 15g + 50g sugar in 5L water (0.3% + 1.0% sugar). 5L of spray covers approximately 125m$^2$ |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

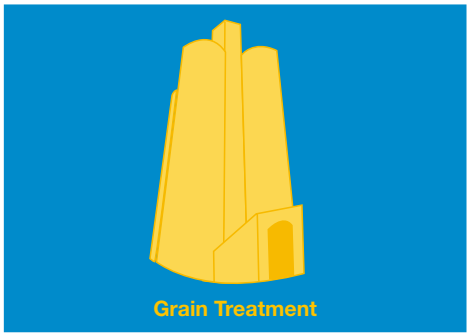
# K-Obiol®

## Assured protection

- Pyrethroid formulation
- No with-holding period
- Admixture and fabric of the building treatment
- Up to 12 months protection
- Control of a range of stored crop insects
- Approved for fabric of grain stores used for oilseed rape

**✓APPROVED**

**FOR FABRIC OF THE BUILDING TREATMENT AND FOR FABRIC OF GRAIN STORES USED FOR OIL SEED RAPE**




### Pyrethroid Formulation

K-Obiol® EC25 and K-Obiol® ULV6 are modern pyrethroid formulations containing Deltamethrin, synergised with piperonyl butoxide for the control of a range of stored product insects known to infest grain and pulses. This pyrethroid formulation is an ideal alternative to organo-phosphorus formulations.

### No with-holding Period

The Maximum Residue Limit (MRL) nominated for deltamethrin is 2mg/kg in grain. When K-Obiol® EC25 or K-Obiol® ULV6 are applied at their recommended rate, the residue level (0.25mg/kg) will be 8 times lower than the MRL. On finished, manufactured product, flour and bread: no residues over the MRL are found as deltamethrin does not significantly penetrate the grain but remains on the bran. Within hard wheat manufactured products, semolina and pasta: no residues over the MRL of deltamethrin were detected. In malting: no residues over the MRL of deltamethrin is found in wort or beer, and therefore has no effect on beer.

### Admixture and Building Fabric Treatment

K-Obiol® EC25 and K-Obiol® ULV6 are liquid grain protectant admixtures. K-Obiol® EC25 can be applied to the fabric of buildings.

K-Obiol® EC25 can be used in grain silos and stores that are subsequently used for oilseed rape storage as a fabric of the building and equipment treatment only. K-Obiol® EC25 does not have approval for use as an admixture treatment for oilseed rape.

K-Obiol® is accepted for use by the Brewing Research International (BRI), the National Association of British and Irish Millers (NABIM) and the Trade Assurance Scheme for Combinable Crops (TASCC).

# K-Obiol®

Assured protection

## Areas of Use

K-Obiol® EC25 and K-Obiol® ULV6 can be used during grain and pulse harvesting as admixtures. K-Obiol® EC25 can also be applied over the fabric of grain storage buildings and crop handling equipment (see application rates).

## Insects Controlled

K-Obiol® EC25 and K-Obiol® ULV6 control stored product pests including crawling insects such as grain weevils, flour beetles, grain borers, saw-toothed grain beetles, bean weevils, bruchid beetles and flying insects such as rice moths, indian meal moths and grain moths.

## Health & Safety

Health and safety equipment.

## Application Rate

| Treatment | K-Obiol EC25 | K-Obiol ULV6 | Period of Protection |
|---|---|---|---|
| **Admixture** per 100 tonnes of grain | 1L diluted in 99L water e.g. 10ml/ tonne | 4.2L undiluted Ready to Use* e.g. 42ml/tonne | Up to 12 months from 1 application |
| **Fabric of the Building** Porous (absorbent) (EC only) to treat 100m² | 40-60 ml diluted in 10L water | - | Up to 2 months |
| Non-porous (non-absorbent) (EC only) to treat 100m² | 40-60 ml diluted in 5L water | - | Up to 2 months |

*Specialist Ultra Low Volume (ULV) application equipment is required.

**USE PLANT PROTECTION PRODUCTS SAFELY**

K-Obiol® EC25 contains deltamethrin 25g/L and piper-onyl butoxide 225g/L. K-Obiol® ULV6 contains deltamethrin 6g/L and piperonyl butoxide 54g/L.

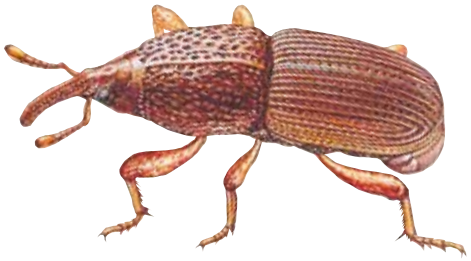
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

K-Obiol® is a registered trade-mark of Bayer. K-Obiol® EC25 MAPP 13573. PCS 03641.

K-Obiol® ULV6 MAPP 13572. PCS 03642.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.



**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# K-Othrine® WG 250

## As Ezi as 1, 2, 3...

- Minimal operator exposure
- Up to 12 weeks control
- Control of fleas, bed bugs, ants etc.
- Flexibility of mixing

### Minimal Operator Exposure

K-Othrine® WG 250 is a water dispersible broad spectrum insecticide with long term residual activity. This deltamethrin concentrated formulation is not classified in its toxicity by the European Community and has a low mammalian toxicity.

The 40g bottle must be used in conjunction with an Ezidose applicator:


With one pull of the trigger the Ezidoser simply dispenses exactly the right volume of K-Othrine® WG 250 granules (0.5g) to mix with 1L of water. This will treat 20m$^2$.

The Ezidoser is very flexible and easy to use allowing the operator to mix from 1L up to 5L in 1L increments. For example, if 2L of water is required, simply pull the trigger twice, 3L of water, pull the trigger three times. It's as easy as that!

The K-Othrine® WG 250 convenient granular formulation is quick and easy to use and due to the small pack size requires little space for storage. The 40g bottle used with the Ezidoser ensures accurate measurements and eliminates the risk of over-dosing while reducing disposal costs.

A 40g pack of K-Othrine® WG 250 provides 80 x 1L sprays which treats 1,600m$^2$!

### Up to 12 Weeks Control

K-Othrine® WG 250 has the recommendation to add 0.5g into 1L of water (or 2.5g into 5L water) for up to 12 weeks control on non-porous surfaces, which is essential in the treatment of bad infestations for fleas and bed bugs.

APPROVED
FOR USE IN AIRCRAFT


# K-Othrine® WG 250

As Ezi as 1, 2, 3...

## Areas of Use

**Domestic premises:**

K-Othrine® WG 250 can be sprayed in domestic premises, hotels, onto carpets, wall paper, furniture, bed frames (but not clothing, sheets, pillow cases or in cots).

**Public Buildings:**

Continuously occupied areas (as band/spot or crack and crevice treatment only), hospitals, hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, kitchens, slaughter houses etc.

**Storage:**

Food retailers, warehouses, raw material stores etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Aircraft & Ship:**

AMS1450A & Boeing D6-7127 compliant.

## USE BIOCIDES SAFELY

K-Othrine® WG 250 contains deltamethrin 250 g/kg.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

K-Othrine® WG 250 is a registered trademark of Bayer. HSE 8092. PCS 94096.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

## Insects Controlled

K-Othrine® WG 250 is suitable for the control, by surface spray and residual activity, of a wide range of Public Hygiene insect pests including: Crawling Insects including black ants, bed-bugs, fleas, earwigs, carpet beetles, cockroaches and booklice. It will also control spiders and woodlice. Flying insects when at rest including flies and mosquitoes.

## Health & Safety

Health and safety equipment.

## Application Rate

| INSECTS | CONDITIONS | DILUTION RATE K-Othrine WG250 | Water | APPLICATION RATE |
|---|---|---|---|---|
| CRAWLING INSECTS. **Public health insects eg:** Bed bugs, fleas, ants & cockroaches. Stored Product Insects | Chronic infestations where re-invasion is likely and long residual control is necessary | 5.0 g (10x Ezi-dose) | 5 Litres | 5 L / 100 $m^2$ |
| | | 1.0 g (2x Ezi-dose | 1 Litre | 1 L / 20 $m^2$ |
| | Clean up treatment of isolated infestations | 2.5 g (5x Ezi-dose) | 5 Litres | 5 L / 50 $m^2$ |
| | | 0.5g (1x Ezi-dose) | 1 Litre | 1 L / 10 $m^2$ |
| **Flying insects eg:** Flies, mosquitoes & moths | | 2.5 g (5x Ezi-dose) | 5 Litres | 5 L / 100 $m^2$ |
| | | 0.5g (1x Ezi-dose) | 1 Litre | 1 L / 20 $m^2$ |

Application: The granules disperse within one minute. Apply to just short of run-off on most surfaces, at a rate of 5L/100$m^2$ of surface. K-Othrine® WG 250 is non-staining, non-tainting, virtually odourless and biodegradable.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Maxforce® LN

## Simply fantastic control

- Controls black ants
- Formulated for nest eradication
- Convenient, discreet, long term control
- Indoor and outdoor use

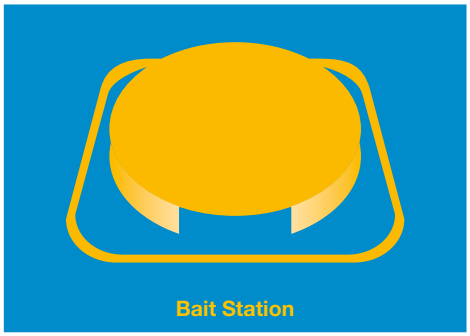
### Controls Black Ants

Maxforce® LN is a ready to use ant bait which has been specifically developed for the control of black ants. The Maxforce® LN ant bait consists of sugar and honey combined with the active ingredient imidacloprid forming part of the special bait matrix which encourages the ants to feed on it and take the bait back to the colony. Colony eradication can be expected within 7-14 days after treatment, depending on the size of the infestation.

### Indoor and Outdoor Use

Maxforce® LN can be used in and around domestic housing, commercial and industrial premises, public swimming pools, terraces, patios, pathways and on lawns. This professional and amateur approved product should be placed in a horizontal position where ants can be seen foraging for food. Indoors, trails are often seen emerging from underneath doors, windows or cracks and crevices. Maxforce® LN is presented in a tamper proof bait station and is ideal for sensitive areas.

APPROVED
FOR USE ON LAWNS





# Maxforce® LN

Simply fantastic control

## Areas of Use

**Domestic premises:**

In and around houses, blocks of flats etc. including kitchens.

**Public Buildings:**

Commercial and industrial premises, in areas surrounding public swimming pools, outdoor terraces, patios and pathways and on lawns.

## Insects Controlled

Black ants.

## Health & Safety

Health and safety equipment.

## Application Rate

Apply 1 to 4 bait stations per nest. Place bait stations next to nests where ants forage so that the bait can be taken back to the nest. If the nest cannot be found, apply 1 to 4 bait stations per 5m2.

**How to open the bait station:**

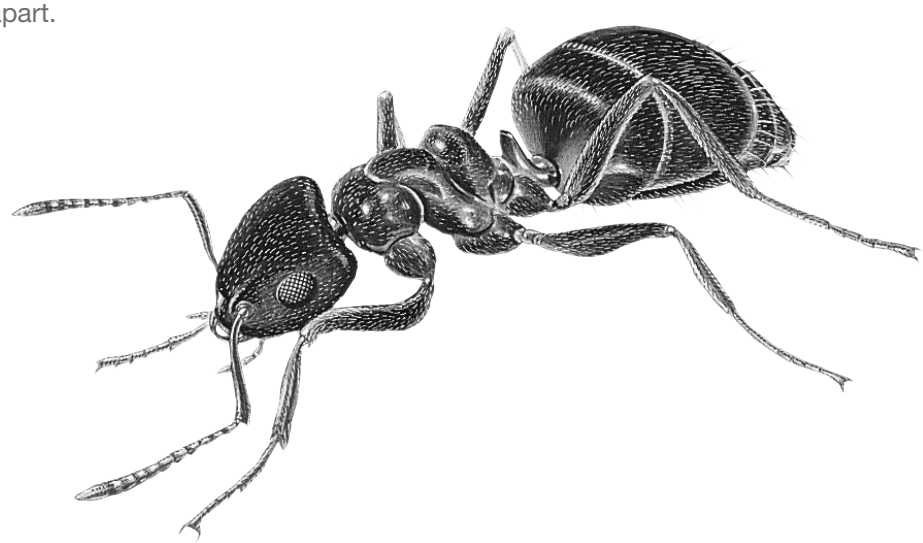
Snap off the 4 ‘hooks’ to open the ant entry holes into the bait station. Do not take the bait station apart.

## USE BIOCIDES SAFELY

Maxforce® LN contains imidacloprid 0.05%.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.





**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Maxforce® Prime

## Astounding attraction. Remarkable results.

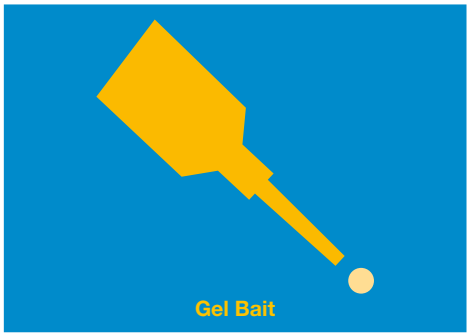
- Controls all major cockroach species
- Exceptionally palatable gel bait
- Consistent high performance

APPROVED
FOR USE IN AIRCRAFT

### Controls all Major Cockroach Species

Maxforce® Prime controls the following major cockroach species:

1. German cockroach (Blattella germanica)
2. Oriental cockroach (Blatta orientalis)
3. Brown banded cockroach (Supella longipalpa)
4. Australian cockroach (Periplaneta australasiae)
5. American cockroach (Periplaneta americana)

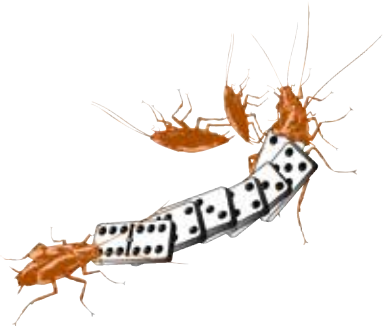



### Exceptionally Attractive Gel Bait

Maxforce® Prime has been formulated to offer the best consumption rates across cockroach species and more importantly cockroach development stages (nymphs), due to well balanced and highly attractive food ingredients in this premium bait matrix.

Maxforce® Prime was developed in the US to solve the bait aversion problems that the Americans experienced and focuses on delivering the most attractive Maxforce® bait to date. Based on the trusted active ingredient Imidacloprid which makes part of this superb formulation, an effect on the cockroach population can be expected within 24 hours of treatment.

The product can be transferred from one cockroach to another because survivors can eat the corpses or faeces of individuals that have previously fed on the gel. This is known as the 'Domino Effect™' and enables Maxforce® Prime to be passed on to and control even those cockroaches that remain hidden within harbourages.



### Consistent High Performance

Maxforce® Prime cartridges withstand a broad range of temperatures (00C to 300C) and are odourless. Unlike other fat based gels, the physical consistency of Maxforce® Prime remains unchanged within this range of temperature making it easier and more consistent to apply. Performance is also not affected when applying in temperatures up to 540C. The odourless gel bait is applied directly as small spots or thin strips to surfaces in the treatment area, ideally in discrete locations away from non target species.

# Maxforce® Prime

Astounding attraction. Remarkable results.

## Areas of Use

**Domestic premises:**

In and around houses, blocks of flats etc. including kitchens.

**Public Buildings:**

Continuously occupied areas including hospital wards, hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, kitchens, slaughter houses etc.

**Storage:**

Food retailers, warehouses, raw material stores, silos (except where grain is stored) etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Small scale animal housing:**

Zoos, pet shops, kennels, veterinary practices, laboratory animal houses etc. (excluding animal pens and cages).

**Aircraft & Ship:**

AMS1450A & Boeing D6-7127 compliant.

## USE BIOCIDES SAFELY

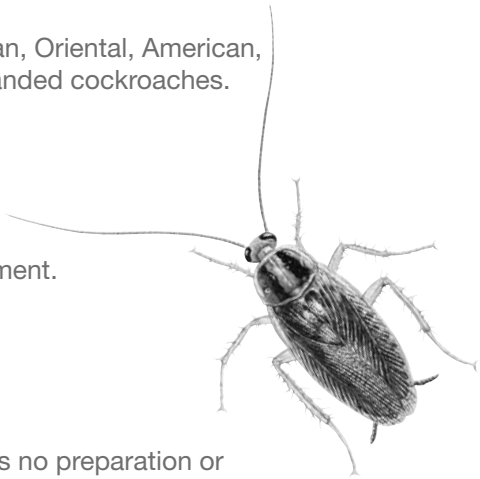
Maxforce® Prime contains imidacloprid 2.15 % w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.



## Insects Controlled

Cockroaches e.g. German, Oriental, American, Australian and Brown Banded cockroaches.



## Health & Safety

Health and safety equipment.

## Application Rate

Maxforce® Prime requires no preparation or spraying equipment, there is no risk of spillage and little opportunity for operator error. The gel readily adheres to clean surfaces.

Cockroach control should be evident within 48 hours of treatment. A discernible effect on the cockroach population can be expected within a week.

Maxforce® Prime contains 2.15 % w/w imidacloprid and is applied at 0.1 – 0.3g/m2 depending upon the cockroach species and level of infestation*.

| Species | Low Infestation | High Infestation |
|---|---|---|
| German and Brown Banded cockroaches | One spot x 0.1g | Two spots x 0.1g |
| Oriental, American and Australian cockroaches | Two spots x 0.1g | Three spots x 0.1g |

*Density of infestation:

Low infestation: Cockroaches rarely visible during the day
High infestation: Cockroaches commonly visible during the day

| Application Rate | Actual Droplet Size | Applicator Settings | |
|---|---|---|---|
| 0.1g/m² | ● 4mm | Piecemaker |  3 |
| | | Bait Gun 2000 |  3 |
| | | Walmur |  2 |
| | | B&G Multi-doser |  3 |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Maxforce® Quantum

## Now you're the expert on ant control

- Controls all major ant species
- Rapid control
- Quick and easy to apply
- Remains effective for up to 3 months

### Controls All Major Ant Species

Maxforce® Quantum controls sweet and protein loving ants including:

1. Pharaoh Ants (Monomorium pharaonis)
2. Black Ants (Lasius niger)
3. Ghost Ants (Tapinoma melanocephalum)
4. Argentine Ants (Linepithema humile)

### Rapid Control

A significant reduction in ant activity can be expected within days after treatment, followed by colony elimination within weeks (depending on ant species and size of nest e.g. Pharaoh Ants 1-2 weeks and Black Ants 2-3 weeks). An initial increase in ant activity might be seen (as they are attracted to the bait).

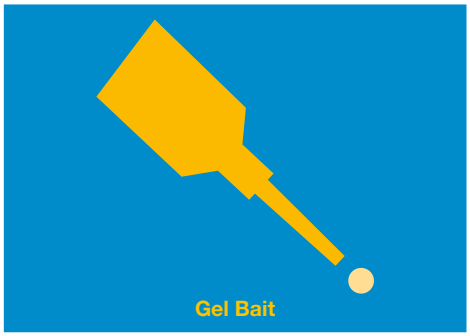
### Quick and Easy to Apply

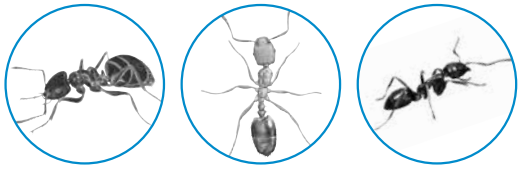
Using Maxforce® Quantum's transparent formulation will allow you to apply the product quicker than other conventional treatments (especially bait stations). The 30g cartridge contains 150 single doses (0.2g), which is enough to cover 150m$^2$ (this will treat approximately 15 apartments).

### Remains Attractive for up to 3 Months

Maxforce® Quantum's unique non-drying formulation is highly attractive to ants and remains active for up to 3 months due to Bayer's exclusive bait matrix technology. Ants feed readily before returning to their nest along with some of the bait and subsequently eradicate the colony.

**APPROVED**
**FOR USE ON LAWNS IN A BAIT STATION**



# Maxforce® Quantum

Now you're the expert on ant control

## Areas of Use

**Domestic premises:**

In and around houses, blocks of flats etc. including kitchens.

**Public Buildings:**

Continuously occupied areas including hospitals, hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, kitchens, slaughter houses etc.

**Storage:**

Food retailers, warehouses, raw material stores, silos (except where grain is stored) etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Outdoor:** Terraces, pavements, patios, entrance areas to sheds and garages etc. Can be applied on lawns in bait stations. Cannot be used directly on soil or in flowerbeds.

## USE BIOCIDES SAFELY

Maxforce® Quantum contains imidacloprid 0.03% w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.



## Insects Controlled

All major ant species including pharaoh ants, black ants, ghost ants and argentine ants.

## Health & Safety

Health and safety equipment.

## Application Rate

Maxforce® Quantum is a thick liquid (similar consistency to honey) containing imidacloprid (0.03%).

Maxforce® Quantum should be applied using a standard gel applicator onto horizontal surfaces or within an appropriate bait station. Small drops (1cm diameter) should be placed where there are ant trails, cracks and crevices, nest entrances, kitchen cupboards, in the vicinity of electrical and electronic equipment and any other areas where ant activity has been identified.

To treat a 10m² kitchen would require 10 droplets.

Maxforce® Quantum requires no preparation or spraying equipment, there is no risk of spillage and little opportunity for operator error.

| Application Rate | Actual Droplet Size | Applicator Settings | |
|---|---|---|---|
| 0.2g/m² |  10mm | Piecemaker |  4 |
| | | Bait Gun 2000 |  4 |
| | | Walmur |  3 |
| | | B&G Multi-doser |  4 |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Maxforce® White IC

## You have to blend in to stand out

- No visible deposit (non-staining)
- Reduces program visits and call-backs
- Rapid action and long term control
- Inconspicuous white colour

### No Visible Deposit

Maxforce® White IC contains imidacloprid, which is a white coloured gel formulation, is clean looking and inconspicuous in use. It does not contain any fat enabling it to be non-staining and leaves no visible deposits.

### Reduces Call-backs

Maxforce® White IC is ready-to-use, odourless and convenient to apply. It requires no preparation or spraying equipment, there is no risk of spillage and little opportunity for operator error. Maxforce® White IC offers minimal disruption to the client with no need to vacate the premises during/after treatment.

### How it Works

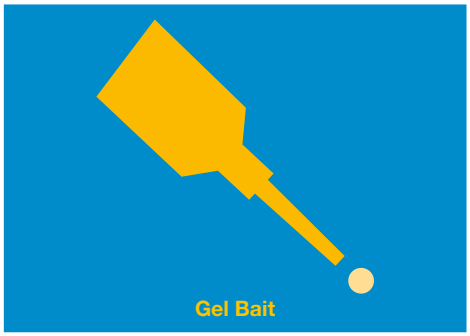
Cockroaches will feed on Maxforce® White IC immediately after application. A 30g cartridge provides 300 spots or 300m$^2$ (depending on level of infestation and species).

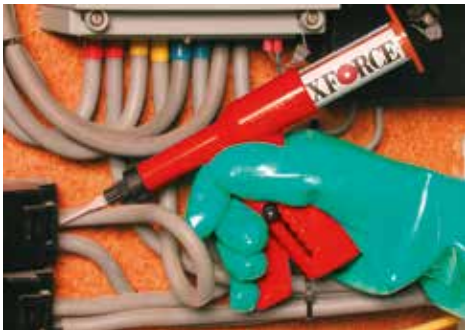
The first signs of intoxication with imidacloprid may be seen after ten minutes with knockdown of the cockroaches after one hour. Dead cockroaches should be evident within 24 hours of treatment. Maximum levels of control are achieved between 6 days and several months after treatment depending upon the level of infestation and as long as the gel is present. The bait is passed from one cockroach to another resulting in the 'Domino effect'™.

Maxforce® White IC readily adheres to clean surfaces. It stays where it is placed and does not run even at temperatures up to 54°C. Once applied the gel resists drying and remains soft and palatable to cockroaches over extended periods of time.

Maxforce® White IC is an attractive food bait proven in use in over 10 European countries.

APPROVED
FOR USE IN AIRCRAFT



# Maxforce® White IC

You have to blend in to stand out

## Areas of Use

**Domestic premises:**

In and around houses, blocks of flats etc, including kitchens.

**Public Buildings:**

Continuously occupied areas including hospitals, hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, kitchens, slaughter houses etc.

**Storage:**

Food retailers, warehouses, raw material stores, silos etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Small scale animal housing:**

Zoos, pet shops, kennels, veterinary practices, laboratory animal houses etc. (excluding animal pens and cages).

**Aircraft:**

AMS1450A compliant.

## USE BIOCIDES SAFELY

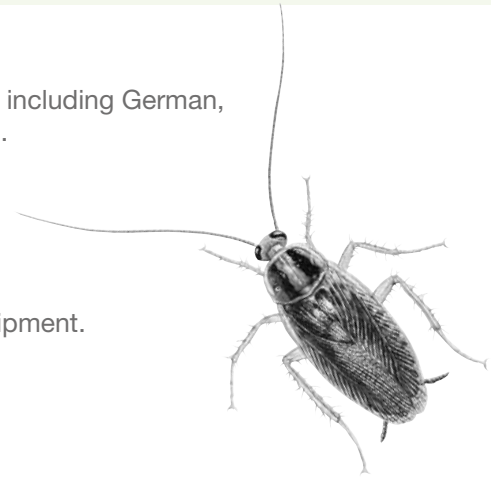
Maxforce® White IC contains imidacloprid 2.15 % w/w.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.



## Insects Controlled

All major cockroaches including German, Oriental and American.



## Health & Safety

Health and safety equipment.

## Application Rate

Maxforce® White IC contains 2.15% w/w active imidacloprid and is applied at application rates ranging from one to three 0.1g spots/$m^2$ or depending upon the cockroach species and level of infestation*.

Application of the gel is concentrated in and around identified cockroach harbourages, the quantity employed being based upon the total floor area of the infested building and the area to be treated.

The applied gel spots should be monitored regularly and further applications made as required.

| Species | Low Infestation | High Infestation |
|---|---|---|
| German cockroaches | One spot x 0.1g | Two spots x 0.1g |
| Oriental, American and Australian cockroaches | Two spots x 0.1g | Three spots x 0.1g |

*Density of infestation:

Low infestation: Cockroaches rarely visible during the day
High infestation: Cockroaches commonly visible during the day

| Application Rate | Actual Droplet Size | Applicator Settings | |
|---|---|---|---|
| 0.1g/$m^2$ | ● 4mm | Piecemaker |  |
| | | Bait Gun 2000 |  |
| | | Walmur |  |
| | | B&G Multi-doser |  |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Pybuthrin® 33

## Natural insect control

- Ideal for hot/thermal fogging (oil based)
- No residual
- Natural active ingredient
- Biodegradable

### Ideal for Hot/thermal Fogging

Pybuthrin® 33 is an oil-based ready-to-use insecticidal space spray for application by misting or fogging for the control of flying insects and as an aid to the control of crawling insects. It can repel, flushout, rapidly knockdown and control flying insects as well as flushout crawling insects from their harbourages resulting also in knockdown.

### No Residual

Pybuthrin® 33 is a classic space spray which can also be employed as a ready-to-use surface spray which can then be applied directly to insects on surfaces. It acts by direct contact action but exerts no significant residual activity.

### Natural Active Ingredient

Pybuthrin® 33 contains pyrethrins synergised with piperonyl butoxide. Pyrethrins are isolated from extracts of the flowers of Pyrethrum cinerariaefolium and related species. The synergist piperonyl butoxide, which enhances the biological performance of pyrethroids, is derived from oil of sassafras, an extract of the bark of the ochotea tree. Synergised pyrethrins are internationally recognised for their insecticidal activity against a wide range of insect pests.

### Biodegradable

Pybuthrin® 33 is biodegradable, virtually odourless, non-tainting and generally non-staining. The pyrethrins in Pybuthrin® 33 have low mammalian toxicity and are non-persistent (due to the pyrethrins breaking down rapidly in air and light), making the product ideal for use in food handling situations and public hygiene.


# Pybuthrin® 33

Natural insect control

## Areas of Use

A ready-to-use space and surface (contact spray) for use in the following situations:

**Domestic premises:**

In and around buildings including houses, blocks of flats etc.

**Public Buildings:**

Hospitals (excluding occupied wards), hotels, public baths, municipal buildings, churches, halls, community centres, cinemas etc.

**Food Handling:**

Processing, food manufacture, kitchens, slaughter houses etc.

**Storage:**

Food retailers, warehouses, raw material stores etc.

**Food Preparation:**

Restaurants, commercial kitchens etc.

**Outdoors:**

Refuse tips, sewage works (excluding filter beds), amenity areas etc.

## USE BIOCIDES SAFELY

Pybuthrin® 33 contains pyrethrins 0.38% w/w (3g/L), synergised with piperonyl butoxide.

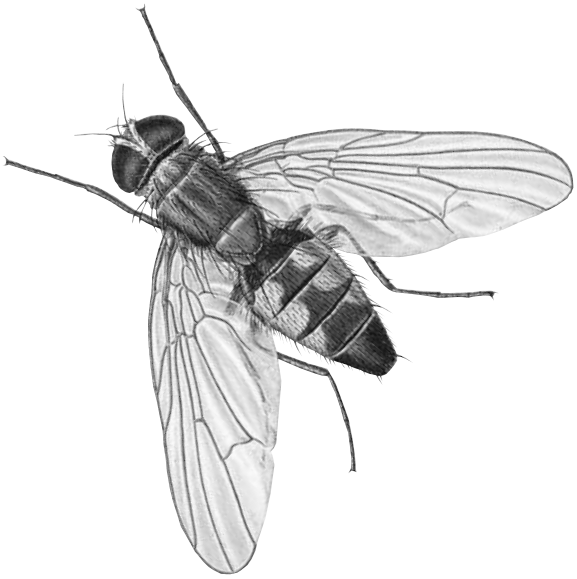
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.



## Insects Controlled

Pybuthrin® 33 is suitable for the control of a wide range of insect pests including:

Flies, mosquitoes, moths, wasps, beetles and cockroaches (see label for further details).



## Health & Safety

Health and safety equipment.

## Application Rate

Flying insects and as an aid to the control of crawling insects:

| Spray Type | Indoor | Outdoor |
|---|---|---|
| Space Spray | 1L per 3,000 $m^3$ | Up to 25L per ha |
| Surface (contact) Spray | Up to 5L per 100$m^2$ (i.e. sufficient to dampen the insects) | |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# QuickBayt®

## Dead flies dead quick

- Kills flies fast
- Up to 6 weeks control
- Easy and convenient to use
- Cost effective fly control

### Kills Flies Fast

Flies are controlled within minutes of contact. Paint on bait formulation for rapid results. Unique, highly visible red colour containing fly pheromone muscalure.

### Up to 6 Weeks Control

Up to 6 weeks efficacy in the field. The active ingredient Imidacloprid provides a unique mode of action for optimal fly control. QuickBayt® controls flies that exhibit resistance to other insecticides.

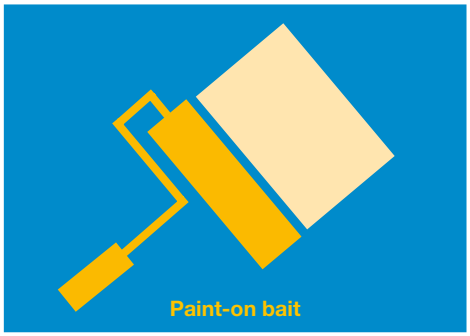
### Easy and Convenient to Use

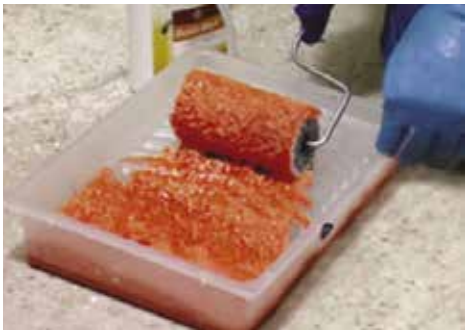
QuickBayt® can be applied in the presence of animals in areas inaccessible to them. Granules mixed with water form a thick paste that can easily be applied with a paint roller or brush.

### Rural Hygiene Usage

Fly nuisance will cost the farmer. Flies carry bacteria, diseases, viral infections and nematodes all of which can pose a risk to human and animal health. If animals are stressed, they lose weight. Untreated fly problems will cause nuisance to neighbours, farm workers and animals. This means fly infestations have a cost and the need for control is essential.

**APPROVED**
**FOR INDOOR USE**
**WHERE WASTE IS STORED**



# QuickBayt®

Dead flies dead quick

## Areas of Use

QuickBayt® is an insecticidal bait for the control of flies for use in animal units or agricultural buildings, e.g. broiler houses, livestock barns, caged layer houses and small husbandry e.g. kennels etc. It also approved for use in dairy/milking parlours and for indoor use where waste is stored.

Best results will be obtained when small amounts of the paste are applied in many locations, concentrating around the preferred resting sites of flies. Paint the bait in areas inaccessible to food producing animals, children and pets, and where food-stuffs will not become contaminated.

## USE BIOCIDES SAFELY

QuickBayt® contains imidacloprid 0.5%.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.



## Insects Controlled

QuickBayt® is suitable for the control of houseflies (Musca domestica).

## Health & Safety

Health and safety equipment.

## Application Rate

Apply at 2g per m². Mix the appropriate quantity of QuickBayt® with the required water volume as follows:

| Area to be treated | QuickBayt | Water |
|---|---|---|
| 1000 m²<br>Poultry - approx 2 units (30 x 15m²)<br>Pigs - approx 110 pens (3 x 3m²)<br>Cattle - approx 167 pens (2 x 3m²)<br>Equine - approx 33 stables (5m x 6m²) | 2kg  | 1L |


Mix QuickBayt® with required water volume to form a paste


Paint in strips on to areas where flies gather


Paint in strips


**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Racumin® Foam

## Unique, innovative foam formulation

- Quick and easy to apply: ready to use product
- Takes advantage of a rodent's grooming behaviour
- Can be used in locations where traditional baiting methods are not possible
- No bait-take required

### Why use Racumin® Foam

Racumin® Foam is a non-bait rodenticide from Bayer, offering an alternative method to control rat and mouse infestations. This truly innovative foam formulation is the latest development in rodent control to be introduced to the UK and Ireland from Bayer.

Unlike baits which are reliant on palatability for uptake, Racumin® Foam works with the rodent's natural grooming habits and is effective as a result.

When faced with situations where traditional baiting methods are not possible (e.g. cavity walls), Racumin® Foam can be used as part of the rodent defence armoury. Racumin® Foam should be used in conjunction with baits as part of an Integrated Pest Management (IPM) approach.

### How to use Racumin® Foam

Racumin® Foam is intended to be used as a complementary product during the course of a usual baiting programme.

1. For best results use Racumin® Foam at room temperature.
2. Shake the can vigorously until the mixing ball strikes audibly.
3. Attach the dispensing tube.
4. Remove safety cap and store in a safe place.
5. Do not apply to surfaces likely to stain; perform a patch test if necessary and wipe off excess foam with a dry paper towel.
6. Press the button to release the foam.
7. Apply the foam in known rat runways, passages, entrance points / holes, covered tracks and wall cavities.
8. To enable the rodents to continue using their entrance points do not totally seal the hole with the foam, keep the opening clearly visible
9. On runs create a foam hurdle that the rodent has to jump over to pass, this will ensure that some foam attaches to the underside of its body. The hurdle must not be too tall, the rodent must be able to see past it; otherwise it will turn around and take a different route.
10. Apply at least 2m from storage locations for food, animal feeding stuffs and food preparation surfaces.
11. Apply only in places inaccessible to livestock, children, and non-target species.
12. If applying the product overhead ensure that the aerosol can is held upright.
13. Replace the safety cap when you have finished applying Racumin® Foam.
14. The released foam usually lasts for 7-12 days, depending on disturbance and temperature/ humidity.
15. Racumin® Foam is ingested by the rat when it grooms itself.
16. For best results use in conjunction with a traditional bait.

# Racumin® Foam

Unique, innovative foam formulation

## Areas of Use

- Indoor use only; in agricultural, domestic, commercial, food factories, public services, municipal and industrial buildings.
- Rat runways, passages and covered tracks.
- Entrance points / holes.
- Suspended ceilings.
- Wall breakthroughs: waterpipes, electric cable.
- In rooms with high humidity (where durability of ready to use baits are limited).
- In locations where there is plentiful alternative food sources meaning take up of baits has been very low.
- When rats refuse baits - bait aversion.
- Cavity walls.
- Where neophobia issues are present.
- Cable trunking.
- Locations where traditional baiting methods are not possible.
- Use in conjunction with a bait treatment.

## USE BIOCIDES SAFELY

Racumin® Foam contains 0.4% w/w coumatetralyl.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL

Racumin® Foam BPR:UK-2014-0860, IE/BPA 70160.



## Pests Controlled

Norway rat (Rattus norvegicus), and house mice (Mus musculus)

## Health & Safety

Health and safety equipment

## Application Rate

This quantity can be applied as a single application or as a number of smaller applications along the track.

| | |
|---|---|
| **For Rats:** | Apply 20g-30g foam (foam the size of a half brick). (Press the aerosol button for approximately 4 seconds) |
| **For Mice:** | Apply 4g (foam the size of a tennis ball) to 30g (foam the size of a half brick). (Press the aerosol button for approximately 2 seconds) |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Racumin® Paste

## Access all areas

- Open areas use
- Low toxicity to non-target species
- Ready-to-use soft block formulation
- Highly palatable

### Wide Range of Application Areas

Racumin® Paste is registered for use 'Outdoors – In Open Areas'. This makes Racumin® Paste the perfect choice when treating external rat activity that does not fall within the 'In and Around Building' requirement found on most rodenticide labels.

### First generation anticoagulant

Racumin® Paste contains a first generation anticoagulant. With a better environmental profile and a lower toxicity than most second generation anticoagulants, Racumin® Paste is not as toxic to non-target species susceptible to secondary poisoning due to the fast degradation of the active ingredient, coumatetralyl, in the blood and liver of rodents. As part of the new rodenticide stewardship requirements in accordance with the CRRU code of best practice, users should consider first generation anticoagulants, where appropriate, before second generation anticoagulants as part of their integrated pest management approach.

### Highly Palatabe:

Racumin® Paste is very attractive to rats due to its high quality food ingredients. Racumin® Paste also contains the bittering agent Bitrex™ to prevent accidental ingestion. This ensures increased bait security without reducing effectiveness.

### Simple and easy to use

Racumin® Paste is a convenient, premeasured, 100g ready to use soft block formulation suitable for almost any environment when secured in a bait box.

APPROVED
FOR USE OUTDOORS
OPEN AREAS

# Racumin® Paste

First generation, first choice

## Areas of Use

- For the control of rats for the protection of public health, stored products and materials, in and around buildings, outdoors (open areas) & sewers

## Pests Controlled

Rats including Norway rats, Black rats

## Health & Safety

Health and safety equipment

## Application Rate

| | |
|---|---|
| **Baiting For Rats:** | Secure 100-200 g of bait in covered tamper resistant baiting stations or covered bait points spaced 5-20 metres apart (3-10 metres apart in areas of high infestation) in areas where rats are active. |
| **Baiting For Rats in Sewers:** | Place 100 g of bait per manhole or 200 g of bait per manhole if a high infestation is suspected. Where appropriate secure the bait block at its placement site to reduce the likelihood of its removal by surges of water. |

## USE BIOCIDES SAFELY

Racumin® Paste contains 0.0375% w/w Coumatetralyl.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

Racumin® Paste is a registered trade-mark of Bayer. BPR: UK-2016-0953



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Rodilon®

## Resistance is futile

- No known resistance in rats or mice
- Pioneering new active ingredient for the UK
- For indoor use only with four baiting options
- Highly palatable and effective single feeds
- Turbo impregnated

### No Known Resistance in Rats or Mice

Rodilon's® pioneering new active ingredient Difethialone works like no other anticoagulant because of its molecular configuration. When genetic mutation occurs, Rodilon® is still able to bind to the rodent's liver enzyme, unlike other well known anticoagulants. This allows all the Rodilon® formulations to continuously maintain their anti-clotting effects.


### Pioneering New Active Ingredient for the UK

The four formulations in the Rodilon® range are highly potent single feed anticoagulant rodenticide for indoor use. They contain a pioneering new active ingredient called Difethialone (0.0025%w/w) which is the first new active ingredient to be introduced to the UK market in over 20 years.

### Four Convenient Baiting Options

Rodilon® is available in four convenient baiting options to suit every indoor situation; Rodilon® Wheat Tech (available in 800g, 2.5Kg and 10Kg packs), Rodilon® Blocks (available in 2Kg and 4Kg packs), Rodilon® Soft Blocks (available in 2.5Kg and 5Kg packs), and Rodilon® Trio (available in 800g and 2.5Kg packs).

### Highly Palatable and Effective Single Feed Solutions

Rodilon® Blocks and Soft Blocks are formulated with high-food grade ingredients for ultimate palatability. Rodilon® Wheat Tech only uses the highest grade wheat while Rodilon® Trio offers a mix of oat, sunflower and maize specifically designed to appeal to mice. Both Rodilon® Wheat Tech and Rodilon® Trio benefit from 'Turbo impregnation' technology which impregnates and coats every grain with the active ingredient for maximum control.

# Rodilon®

Resistance is futile

## Areas of Use

Indoor use only for the control of rats and mice in agricultural, domestic, commercial, food factories, industrial, sewers, public service and municipal situations.

## Pests Controlled

Rats and mice including Norway rats, Black rats and House Mice.

## Health & Safety

Health and safety equipment.

## Application Rate

**Baiting for rats:**

Place several baiting points (see application rates below) in a dry place throughout infested area 4 to 10 meters apart (e.g. in nests, on rodent runs, along walls and where evidence of droppings have been found).

**Baiting for mice:**

Place many baiting points (see application rates below) through-out the infested area 1 to 3 meters apart (e.g. wherever damage, droppings or evidence of mice activity has been found). Pay particular attention for mouse activity at different heights.

## USE BIOCIDES SAFELY

Rodilon® contains 0.0025%w/w difethialone.

ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL.

Rodilon® is a registered trade-mark of Bayer. BPR: UK-2011-0043, BPR: UK-2011-0048, BPR: UK-2001-0050, BPR: UK-2011-0051. IE/BPA 70181, IE/BPA 70182, IE/BPA 70184, IE/BPA 70183.



This product guide is not to be construed a legally binding document. Specifications of the products and representations and warranties shall be exclusively dealt with in the distribution and/or sales contracts.

| | Rats<br>High Infestation | Rats<br>Low Infestation | Mice<br>High Infestation | Mice<br>Low Infestation |
|---|---|---|---|---|
| Rodilon® Wheat Tech | 200g per baiting point every 4-5 meters | 200g per baiting point every 8-10 meters | 50g per baiting point every 1-1.5 meters | 50g per baiting point every 2-3 meters |
| Rodilon® Trio | 200g per baiting point every 4-5 meters | 200g per baiting point every 8-10 meters | 50g per baiting point every 1-1.5 meters | 50g per baiting point every 2-3 meters |
| Rodilon® Soft Blocks | Up to 20 sachets per baiting point every 4-5 meters | Up to 20 sachets per baiting point every 8-10 meters | Up to 5 sachets per baiting point every 1-1.5 meters | Up to 5 sachets per baiting point every 2-3 meters |
| Rodilon® Blocks | Up to 13 blocks per baiting point every 4-5 meters | Up to 13 blocks per baiting point every 8-10 meters | Up to 3 blocks per baiting point every 1-1.5 meters | Up to 3 blocks per baiting point every 2-3 meters |

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Pest Guide Contents


| Pest Guide | Page |
|---|---|
| Argentine Ants | 49 |
| Bed Bugs | 51 |
| Biscuit Beetles | 55 |
| Black Ants | 57 |
| Booklice | 59 |
| Carcinops | 62 |
| Carpet Beetles | 64 |
| Cockroaches | 67 |
| Fleas | 71 |
| Flour Beetles | 75 |
| Ghost Ants | 78 |
| Grain Beetles | 80 |
| Grain Weevils | 83 |
| Hide & Larder Beetles | 86 |
| Houseflies | 88 |
| Lesser Grain Borers | 91 |
| Lesser Mealworms | 93 |
| Mosquitoes | 96 |
| Pharaoh Ants | 99 |
| Poultry Red Mites | 102 |
| Rodents (Commensal) | 104 |
| Spider Beetles | 107 |
| Stored Product Moths | 110 |
| Ticks | 114 |
| Wasps | 118 |


# Pest Guide Introduction

## Phylum Arthropoda: Joint footed animals.

### CLASS INSECTA

**Characteristics:**

Over 800,000 different species of insects have been described, some 80% of all animals. Although these vary greatly in size and structure they all possess certain fundamental characters which distinguish them from other animals.

Insects are invertebrates so do not possess backbones and, being jointed in limbs and body, they qualify for the phylum Arthropoda. This includes animals such as the shrimps, centipedes and spiders but the insects themselves belong to the Class Insecta.

The earliest known fossil insects date back to the Middle Devonian period some 300 million years ago, whilst winged insects appeared quite suddenly in Carboniferous rocks which are about 250 million years old.

The fundamental characters displayed by all insects to a greater or lesser extent are:-

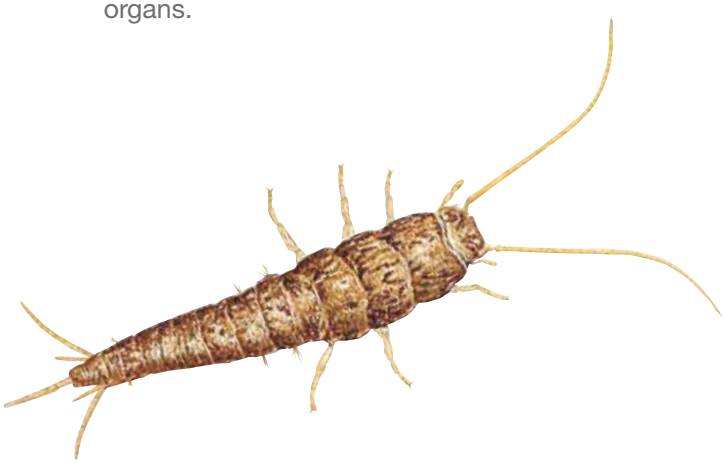
**Exoskeleton:**

A hard chitinous exoskeleton provides support and protection. It is arranged as a series of segments which may total 20 but are usually grouped together and specialised in some way so there appear to be far less.

**Three part body:**

The insect's body is divided into three distinct parts: the head, the thorax and the abdomen.

1. The head is composed of six segments fused together and bears mouthparts and some sensory organs.
2. The thorax is composed of three segments each bearing a pair of legs and the second and third often bearing a pair of wings. This is the basic pattern but may be modified in some way eg, flies possess only one pair of wings whilst beetles have one pair of functional wings (the hind wings) and have modified forewings which usually cover both the thorax and abdomen and provide protection.
3. The abdomen typically consists of 11 segments but these are often telescoped.



The immature forms of insects, the larvae and pupae, exhibit the same basic characteristics although often in a much simplified form. Thus the eyes and limbs are very simple structures and the wings only exist as buds.

**Classification:**

The existence of an exoskeleton imposes a restriction to growth necessitating moulting if the insect is to grow any bigger. Moulting is therefore a major process in the development of the adult insect. It also enables the insects to be classified according to their life cycle and this can be important when considering control measures. This classification is:-

Sub-class Apterygota - wingless with no metamorphosis. Moulting will still occur when the adult stage is reached.

**Orders containing insects of public hygiene significance:**

Thysanura - Silverfish and Bristletails. Collembola - Springtails.

Sub-class Pterygota - 'winged' insects with adults distinct from young and not subject to moulting. There are two types:

Division Exopterygota, Wings develop externally; they exhibit incomplete metamorphosis with nymphs resembling adults.

**Orders containing insects of public hygiene significance:**

Orthoptera - Crickets etc.
Dermaptera - Earwigs
Dictyoptera - Cockroaches
Isoptera - Termites
Psocoptera - Booklice
Mallophaga - Biting lice
Anoplura - Sucking lice
Hemiptera - True Bugs
Thysanoptera - Thrips

Division Endopterygota, Wings develop internally; they exhibit complete metamorphosis ie. there is a dramatic change from egg to adult involving distinct larval and pupal stages.

**Orders containing insects of public hygiene significance:**

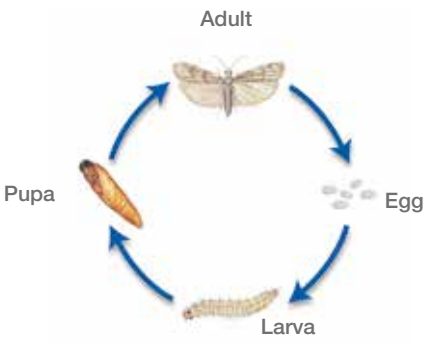
Diptera - True flies
Siphonaptera - Fleas
Lepidoptera - Moths
Coleoptera - Beetles
Hymenoptera - Wasps and ants

**Acquisition of pest status:**

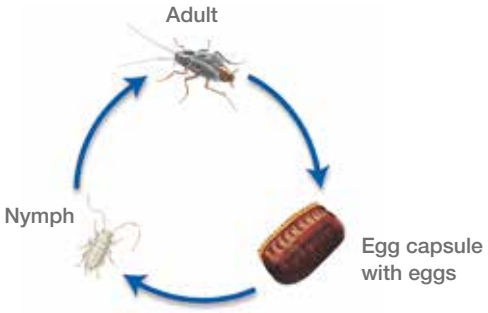
Insects are the most abundant of all land animals and have inhabited every environment except the sea. Their success can be attributed to:

- Exoskeleton, for protection and efficient water conservation.
- Mobility through crawling and especially which helps in the efficient location of food, shelter, breeding sites etc.
- Complete metamorphosis with larvae specialised for feeding and growing and adults for mating and dispersal.

**The life cycle of complete metamorphosis:**




**The life cycle of incomplete metamorphosis:**




This also enables the forms to occupy different environments which provides greater scope for survival and development.

- Rapid reproduction enabling rapid exploitation of resources when conditions are favourable.
- Small size - typically between 0.5-40 mm - facilitating ready exploitation of food and shelter.
- Adaptable, exhibiting a wide variety of forms suited to the environments in which they live.

Pests can be defined as troublesome or destructive animals. Only about 0.5% of insect species are pests and most of these infest plants and plant materials. Suitable conditions for insect pests are provided wherever crops have been concentrated in the field or store. Man and his environment, including domesticated animals, can also be infested when conditions are right. Insects in the non-agricultural sector are pests because they cause:

- **Loss of commodities in store.**
- **Reduction in the quality of stored commodities through:**
  Direct feeding damage.
  Tainting.
  Physical contamination.
  Secondary effects eg. heating of grain.
- **Nuisance.**
- **Health hazard eg:**
  Non-specific vectors of disease.
  Specific vectors of disease.

In addition insects may be responsible for allergic reactions, bites or stings whilst an imagined infestation with ectoparasites may lead to the psychological disorder, 'delusory parasitosis.'

# Argentine Ants

## Order: Hymenoptera ('membrane-winged')

**Argentine Ant**
2.5mm Long

**Intergrated Pest Management**

Recommended products for: **ARGENTINE ANTS**

✓ Maxforce Quantum
Go to Page 31

### Description

**Characteristics:**

Argentine ants are polygyne (multiple queens in a single colony), as they are not territorial towards each other the workers interact between nests, which enables them to form super colonies. Mated queens and a few workers may also leave an established nest to form a new colony (satellite).

**Family:** Formicidae

**Species Characteristics:**

**Argentine Ant** (Linepithema humile)

Argentine ants prefer a sweet food source such as honeydew, fruit juices and plant secretions, but will also forage on proteins such as meat, insects, eggs and fat. They may even attack small, vulner-able animals. In detail they are characterised as follows:

- Brown; some light brown
- Uneven thorax
- 12-segmented antennae, no club
- Sparse body hairs
- No stinger
- Monomorphic workers, 3-3.5 mm long

### Areas where found

Argentine ants are native to Latin America but have now spread on a world wide basis. They are to be considered a perfect "tramp ant". Argentine ants are an invasive species favouring warm climates. In the Mediterranean, Argentine ants are firmly established and widespread.

In Northern Europe, Argentine ants may survive outdoors in modest winters but are not generally frost hardy. Alternatively, they may be found in greenhouses or other heated environments. Colony numbers fluctuate seasonally, ranging from one hundred to several hundred thousand workers and many queens.

### Importance as a Pest

Argentine ants are an invasive exotic species. In areas inhabited by Argentine ants, endemic species will be driven out. Colonies may become very large and foraging ants represent a nuisance.

# Argentine Ants

## Order: Hymenoptera ('membrane-winged')

### Life-Cycle

Argentine ants are social insects and live in colonies which are large to very large consisting of: workers (sterile females), fertile males and queens (fertile females). There are usually many queens in a colony (multiqueen colonies) and they co-exist amicably. The queens can be replaced so colonies will survive indefinitely. New colonies are typically formed by budding and may be encouraged by disturbing nests. Adult ants are responsible for this process which may include queens. Worker ants carry larval stages to a new nest site from which they can rear queens and males. Temporary nests may be established whilst the workers search for new sites. If established in mobile equipment infestations can be widely distributed. The workers provide food for the colony and maintain the nest. Only 5-10% of workers are actually engaged in foraging. Fertile males and females develop from well fed larvae. Flying swarms are never seen, mating taking place in the nests and small spaces in buildings. The queen lays eggs which hatch after about two to four weeks depending on temperature. Larvae are legless and fed and tended by the other colony members.

Larval development takes approximately three to four weeks. The pupal stage lasts about two weeks. The whole cycle from egg laying to adult takes about ten weeks depending upon temperature.

### Control

Maxforce® Quantum should be applied to foraging trails. Frequent follow up is needed because colonies may be large or there may be more then one nest due to multiple queens and therefore bait spots may be taken up rapidly. Replenish bait as needed.

# Recommended Products


**Insecticide**

**Maxforce Quantum**
A ready to use insecticidal gel bait for the control of Black, Pharaoh, Ghost and Argentine ants.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Bed Bugs

## Order: Hemiptera ('half-winged' true bugs)

**Bed Bug**
5mm Long

**Intergrated Pest Management**

Recommended products for: **BED BUGS**

- ✓ K-Othrine WG 250 Go to Page 25
- ✓ Ficam D Go to Page 19
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Mouth parts piercing and sucking, forming a beak, or rostrum, normally held under the body. Metamorphosis usually incomplete, with egg and nymphal stages.

**Family:** Cimicidae.

Flat, oval insects, with very short, functionless forewings; hindwings absent; rostrum lies in a ventral groove; tarsi 3-segmented; exclusively bloodsucking.

**Species characteristics and host/habitat:**

**Common bed bug** (Cimex lectularius). Adults, 5mm long; reddish-brown in colour, becoming purple after feeding; well-developed antennae; prominent, simple eyes; feet clawed so can climb rough but not smooth surfaces; ratio of head width (including eyes) to length of third antennal segment usually greater than 1.7.

**Host/habitat:**

The principal host is man, though other warm-blooded animals can be parasitised. Found in human habitations throughout the world.

**Other blood-feeding bugs**

Blood-feeding bugs, very similar in appearance to the Common bed bug, can often be found infesting birds' nests and bat roosts. In certain circumstances, these bugs may invade houses and attack humans. They include:

**Pigeon Bug** (Cimex columbarius)

Very similar in size and appearance to the Common bed bug; can be distinguished by the ratio of head width to length of third antennal segment, which is less than 1.6 in most specimens.

**Host/habitat:**

Principal hosts are birds; mainly found in starlings' nests, pigeon lofts and poultry houses, but can attack man.

**Martin Bug** (Oeciacus hirundinis)

Similar in appearance to the Common bed bug, but smaller and more hairy. Can be further distinguished by the following characteristics: when viewed from above, the front margin of the prothorax is far less concave than in the other species; the head width is also more than twice the length of the third antennal segment.

**Host/habitat:**

Principal hosts are birds; often found in martins' nests, but can attack man.

# Bed Bugs

## Order: Hemiptera ('half-winged' true bugs)

### Area Where Found

As bed bugs cannot fly, they must either crawl or be passively transported in clothing, or more probably in luggage, furniture, books and other objects used as harbourages. Their ability to with-stand many months without feeding increases their chances of surviving such transportation and the insects' very wide distribution throughout the world demonstrates their success.

Household's, hotel's etc. can be invaded by bed bugs, but it is likely that infestations will only become established in premises with low standards of hygiene. Bed bugs are often associated with poor, crowded and unhygienic conditions.

Most bed bug infestations are to be found in domestic premises, usually in the bedrooms. Both juveniles and adults live similar lives, hiding away in cracks and crevices for most of the time and coming out at night, usually just before dawn, to feed on the blood of their sleeping hosts. Their hiding-places will be close to where their hosts sleep: in the bed frame or the mattress, in furniture, behind the skirting, behind the wallpaper -anywhere that affords a dark harbourage during the daylight hours for these nocturnal creatures.

The insect infestations occur particularly in areas of high population density including hotels, hostels and holiday camps.

In temperate climates bed bugs reach their peak numbers towards early autumn. At this time all stages in the lifecycle will be present. With the onset of colder weather their activity decreases, egg-laying ceases and development of the juvenile forms slows down.

Bed bugs overwinter mainly as adults, since the eggs and nymphs are more susceptible to low temperatures and die out with the onset of winter, unless in adequately heated premises.

The bird-feeding bugs, such as the Martin bug, will be found in the nests of their hosts and follow a similar lifestyle to the Common bed bug. The occasional problems of these species attacking humans are likely to stem from abandoned nests built near to or inside houses. Nests in lofts or under eaves would be a likely source if such an infestation were suspected.

### Importance as a Pest

Bed bugs are not regarded as disease carriers, but their blood feeding can cause severe irritation in some people, resulting in loss of sleep, lack of energy and listlessness, particularly in children. Iron deficiency in infants has resulted from excessive feeding by bed bugs. The bite often gives rise to a hard, whitish swelling which distinguishes it from the flea bite which leaves a dark red spot surrounded by a reddened area. Different individuals react differently to bites, some gaining immunity.

Probably more important, however, is the distaste with which these insects are regarded. Bed bug excrement gives a characteristic speckled appearance to their harbourages, whilst their 'stink glands' confer a distinctive and unpleasant almond-like smell on infested rooms. In addition, the very thought of being preyed upon by such creatures is quite sufficient to make most people take immediate action to control them. The bed bug may even help to reduce living standards by driving away householders with reasonable standards of hygiene, leaving behind only those who are less concerned with such matters.

It is interesting to note that many factors are helping to sustain existing bed bug populations: modern building techniques, which allow easy access between adjoining properties; the increased use of central heating, which allows continued feeding and proliferation during winter; the movement of furniture in the second-hand market, which aids their distribution; all these serve to maintain population levels.

# Bed Bugs

## Order: Hemiptera ('half-winged' true bugs)

### Life-Cycle

Bed bug eggs, which are slightly curved, measuring 0.8-1.3mm long by 0.4-0.6mm broad, are cemented to the surfaces of the harbourages, often in large numbers. Unhatched eggs are an opaque, pearly white colour, whilst hatched eggs, which remain in position long after hatching, are opalescent and translucent. While temperature and the availability of food have a profound effect on egg production, under optimal conditions egg-laying is almost continuous, at a rate of about three per day. The number of eggs laid by a female in the course of her adult life has been variously quoted as between 150 and 345.

The first-stage nymphs which hatch from the eggs are just over 1mm long and, like all the nymphal stages, appear very similar to the adults, except in size and colour.

Early instars tend to be more amber than the darker brown of the adult. Each nymph requires one full blood meal before moulting to the next stage. Though there are variations in size, due mainly to the effects of feeding, which may increase the bug's weight by up to 6 times, the approximate lengths of each of the five nymphal stages are: stage I 1.3mm, II 2.0mm, III 3.0mm, IV 3.7mm and V 5.0mm. The rudimentary wings appear in the last moult.

The speed of development from egg to adult and the duration of adult life vary according to temperature and availability of food. With frequent feeding, at normal room temperatures (ca. 18-20°C) adults live for 9-18 months, with egg incubation taking 10-20 days and the complete cycle 9-18 weeks. Under these conditions nymphs feed at about 10-day intervals and the adults weekly. If necessary, both can survive long periods without food. Under cool conditions (13°C) starved adults could survive for as long as one year. In unheated rooms where the temperature drops below 13°C in the winter, egg laying, moulting and feeding stops and the population declines as eggs and young nymphs die. Under such conditions there is only one generation per year. Where temperatures do not fall so dramatically, breeding may continue throughout the year and two generations can be attained.

### Control

In all infestations, particularly those newly established in well-kept houses, an attempt should be made to determine the source of infestation, so that proper measures can be taken.

A thorough inspection of infested premises should also seek to uncover the extent of the infestation, since the measures necessary for control will depend on whether the infestation is established and widely distributed throughout the premises, or recently introduced and likely to be more localised.

Control measures used must be thorough and be directed at all the harbourages. In circumstances where the infestation has originated from birds' nests, it will be necessary to treat the nests and advisable to birdproof the building.

**a) Hygiene/management**

High standards of hygiene and house-keeping are unlikely to provide an adequate method of control, but will reveal the presence of bed bugs at an early stage, making control easier. Bed bugs can only proliferate if they are tolerated. If they are suspected, a close inspection of the bed, the mattress around the seams, the back of the head-board, etc., should reveal their presence. The use of a pyrethroid-based aerosol sprayed lightly around these areas may help, as the insects will be driven out of their hiding places. The finding of eggs or egg cases and the blackish spots of bug excrement will also indicate their presence. Infested bedding (e.g. sheets) and clothing should be laundered or burnt and the fabric of infested rooms thoroughly cleaned. Particular attention should be paid to removing dust, fluff and debris from insect harbourages eg cracks, crevices, seams of fabrics, buttons on mattresses etc.

**b) Insecticidal control**

To eradicate the infestation it will be necessary to treat the premises thoroughly with suitable insecticides (see recommended products), including the beds, other furniture and harbourages in the fabric of infested rooms. A professional pest control organisation should be used, as the detection and thorough treatment of all bed bug hiding places is a job which requires experience.

### Glossary of terms:

**Instars:** Any stage in an insects life cycle, especially between moults. Prothorax: First thoracic segment.

**Rostrum:** Beak or snout.

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Bed Bugs

## Order: Hemiptera (‘half-winged’ true bugs)

## Recommended Products

**Insecticide**

**K-Othrine WG 250**

K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.

**Insecticide**

**Ficam D**

Ficam D is ideal to use where liquid-based formulations are unsuitable.

**Insecticide**

**Ficam W**

Ficam W is a residual broad spectrum spray control of a wide range of insect pests.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Biscuit Beetles

## Order: Coleoptera ('sheath wings')

**Biscuit Beetles**
2.7mm Long

**Intergrated Pest Management**

Recommended products for: **BISCUIT BEETLES**

- ✓ K-Othrine WG 250 Go to Page 25
- ✓ AquaPy Go to Page 13
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Anobiidae

Antennae of commonly encountered species 11-segmented with loose club-like tip; prothorax more or less covering downward-turned head; 5-segmented tarsi.

**Species Characteristics**

**Biscuit Beetle** (Drug-Store Beetle)

(Stegobium paniceum) Adult, 2-3.5mm long; colour, reddish-brown; body has dense covering of short yellowish hairs; base of thorax not humped.

Related species are the Tobacco Beetle

(Lasioderma serricorne) and the Common Furniture Beetle (Anobium punctatum).

### Areas where found

The biscuit beetle is a cosmopolitan pest. It is widely found in shops and domestic larders, infesting a wide variety of dried vegetable matter.

In a warm atmosphere there may be as many as four generations per year.

### Importance as a pest

Stegobium paniceum is a pest of cereal products, e.g. flour, bread, breakfast cereals, spices, beverage concentrates and even drugs – indeed there have been reports of it infesting poisonous substances such as strychnine, belladonna and aconite.

Infested products may lose value or cause contamination of other products and packaging may be damaged, the larvae reputedly being able to penetrate tinfoil and sheet lead. Books and manuscripts may also be attacked.

### Life-Cycle

Over a period of about 3 weeks the female biscuit beetle will lay, singly, about 100 eggs, either in the foodstuff or in the surrounding areas. At 19-24°C they hatch in 1-2 weeks to produce very tiny, active larvae which wander about and may penetrate packaging to infest the foodstuffs inside. Development takes 2-5 months, during which time the larvae go through four moults to reach a full-grown length of 5mm.

Eventually they become incapable of movement and construct cells of food particles and saliva in which to pupate. The pupal stage lasts 9-18 days, but the adults may then remain in the cocoons for up to two weeks before emerging. On emergence, the adults disperse, living (without feeding) for up to 8 weeks.

# Biscuit Beetles

## Order: Coleoptera ('sheath wings')

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning.

They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products).

Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises. The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues (stored commodities or secondary sources, e.g. birds' nests) in which beetles can breed and develop to infest new materials. All infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

**Glossary of terms:**

**Prothorax:** First thoracic segment.

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Black Ants

## Order: Hymenoptera ('membrane-winged')

**Black Ant (worker)**
4mm Long

**Intergrated Pest Management**

Recommended products for: **BLACK ANTS**

- ✓ Maxforce Quantum Go to Page 31
- ✓ Maxforce LN Go to Page 27
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Elbowed antennae; biting mouthparts; if present, two pairs of membranous wings, fore and hindwings hooked together; abdomen constricted at base giving appearance of a waist which bears charactererstic nodes or scales; metamorphosis complete, with egg, larval, pupal and adult stages; possess complex social system.

**Family:** Formicidae

**Species characteristics:**

**Black Ant** (Lasius niger)

Workers 3.4-5mm long, queens 15mm long; colour: workers dark brown-black, queens mid-brown; waist of only one segment.

### Areas where found

In Britain comparatively few indigenous species, which nest outdoors, are likely to enter houses regularly. One such species is the Common Black Ant (Lasius niger).

An active insect, it nests outside in grass and walls and under paving. It will forage widely in search of food, which is how it comes to enter domestic premises.

### Importance as a pest

Foraging worker ants cause a nuisance as they travel widely in search of food, following well-defined trails and clustering around the food source. Sweet foods are preferred.

In gardens their excavations around plant roots make the soil excessively dry. They will also cultivate greenfly, themselves pests, in order to obtain the sugary honeydew secretions that these aphids produce. On the other hand they can be beneficial as predators of other insects and general scavengers. They are obviously an unpleasant sight and may damage food used for human consumption.

### Life-Cycle

The gregarious habits of ants have resulted in the development of a caste system, whereby individuals are responsible for specialised duties within the community. There are: workers (sterile females); fertile males; and queens (fertile females). The worker ants build and extend the nest, look after larval forms and forage for food, whereby they become pests. The queens perform none of these duties, but remain almost exclusively within the nest. Mating amongst sexual individuals takes place on the wing. These spectacular swarms involve large numbers of ants.

The actual swarms only persist for 2-3 hours.

# Black Ants

## Order: Hymenoptera (‘membrane-winged’)

### Life-Cycle Cont...

After mating the males perish but the females shed their wings and dig a cell in the soil where they overwinter.

The eggs are laid in late spring and the white legless larvae hatch 3-4 weeks later. The larvae are fed on secretions from the queen’s salivary glands until fully grown, when they will pupate, forming the well-known “ant eggs”. From these pupae emerge the first brood of worker ants. These workers take over foraging duties and tend subsequent broods. The sexual forms are not produced until later. The entire cycle takes about 2 months to complete. Under favourable conditions a nest may persist for several years.

### Control

**A) Hygiene/management**

Although frequently inaccessible and difficult to destroy, ants’ nests must be eradicated if infestations are to be successfully controlled. The nests of black ants can be located by following their trails. Potential food sources should be identified and protected from attack.

**B) Insecticidal control**

Insecticide treatments (see recommended products) can be applied in and around the nests and should aim to ensure that a residual film of insecticide is maintained at strategic points, for example points of entry to buildings, such as doors, windows, ventilators, ducts and drains. Wall/floor junctions, ant runs and all other harbourages should be treated, using the product according to the label directions. Particular attention should be given to small insignificant cracks which may be major points of entry for the ants. Insecticidal baits, too, can be used around the entry points.

# Recommended Products

**Insecticide**

**Maxforce Quantum**
A ready to use insecticidal gel bait for the control of Black, Pharaoh, Ghost and Argentine ants.

**Insecticide**

**Maxforce LN**
Maxforce LN is a ready to use ant bait which has been specifically developed for the control of black ants.

**Insecticide**

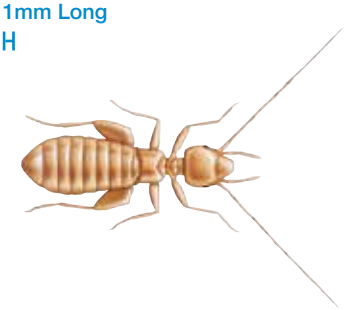
**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Booklice (Psocids)

## Order: Psocoptera (‘winged like Psocus’ with ability to grind to pieces)

**Booklouse**
1mm Long
H



**Intergrated Pest Management**

Recommended products for: **BOOKLICE**

- ✓ Ficam W Go to Page 21
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Soft-bodied insects, rarely exceeding 6mm in length. Typical forms have two pairs of membranous wings, but there is an evolutionary tendency to loss of wings in many species. Antennae long and threadlike, with 12-50 segments; compound eyes, poorly developed; biting mouth parts; tarsi 2 or 3 segmented, each bearing two claws; incomplete metamorphosis with egg and nymphal stages.

**Species characteristics:**

**Liposcelis bostrychophilus (bostrychophila)**

Adults about 1mm long; colour, light brown; broad, flat hind femur; no wing rudiments; abdomen flattened.

**Liposcelis entomophilus**

Colour, yellowish brown, with conspicuous dark reddish bands across abdomen.

**Death Watch** (Trogium pulsatorium)

Adults very active, about 1.5-2.0mm long; pale yellow or white in colour; well developed eyes; wing flaps present; rows of dark spots on front margins of some abdominal segments.

**Lepinotus patruelis**

Adults about 2mm long; colour, dark brown or black; wing flaps present.

### Areas where found

Most booklice species are found in natural habitats such as animal nests, tree trunk crevices, under bark (hence the alternative name of barklice) and on leaves. However, those species that have achieved pest status are widely distributed and often found in ware-houses, food manufacturing premises, granaries and museums as well as domestic and retail premises. Here they will infest materials of plant and animal origin including stored food, plaster, leather, woodwork and even books.

Many species are cosmopolitan and their countries of origin are unknown. Different species exhibit different temperature requirements. Thus Lepinotus patruelis is frequently encountered in cool situations, e.g. warehouses, whilst Liposcelis bostrychophilus, which is thought to have originated from Africa, prefers warmer situations. In heated buildings continuously brooded species (e.g. Liposcelis spp.) will continue to breed throughout the year. Other species (e.g. Trogium spp.) produce only one generation per year and may overwinter as nymphs.

# Booklice (Psocids)

## Order: Psocoptera (‘winged like Psocus’ with ability to grind to pieces)

### Importance as a pest

Psocids rarely cause damage directly by feeding and are virtually harmless in small numbers. Large infestations, however, may cause significant damage to delicate materials such as books and furs. Signs of spoilage of dried meat have included holes and tunnels in which the insects hide plus a covering of white powdery material and salt crystals.

The major problem posed by psocids is the nuisance which they cause. The insects will contaminate raw or processed foods. They may contribute to a gradual heating of grain stored in bulk with an eventual impairment of its properties and reduction in its value. Contaminated products must be identified and destroyed, which is time-consuming and wasteful. Eggs may be down-graded because of spotting caused by the crushed bodies of dark booklice, e.g. Lepinotus spp. Finished products may be infested in retail premises or in the home, with a consequent loss of goodwill. Pallets, dunnage and packaging may be infested and act as a source of infestation of stored products.

Among the wide variety of commodities and materials which may be infested by psocids are the following: bagged nuts, bat guano, chocolate, fish meal, milk powder, museum specimens and books, oil seeds, processed cereals, pollen, salami, skin scales, springbok biltong, stored cereal grains, sugar beet seeds, yeast and even damp plaster.

Although harmless to man, booklice are often confused with true lice and therefore regarded with alarm. As well as infesting foodstuffs in the home they may be encountered swarming over furnishings and walls, including newly plastered surfaces which are still damp. Clearly, materials of both animal and vegetable origin may be attacked but the insects show an undeniable preference for micro-organisms, including bacteria, yeasts, moulds and algae, and populations will develop more successfully in damp conditions where these thrive. This close association with micro-organisms results in these becoming entangled in their bodies and in this way the insects are instrumental in disseminating the organisms which cause spoilage.

### Life-Cycle

(Based on that of Liposcelis bostrychophilus) The females of some species of booklouse may reproduce without fertilisation, the males being suppressed, dwarf or entirely lacking. During her life each female produces some 200 eggs. They are usually laid separately at a rate of 1-3 per day and, being sticky, become covered with frаments of food or rubbish or adhere to the substrate. The eggs of some outdoor species are however laid in batches and covered with a silken web. The smooth, pearl-coloured eggs hatch in 1-2 weeks. The emerging nymph closely resembles the adult and will pass through 3-8 moults depending on species (four in the case of L. bostrychophilus) to reach maturity in about 15 days.

With each successive moult the nymph becomes progressively more like the adult as eyes, antennae and wings (if present) begin to develop. Ambient conditions and the quality of the diet profoundly influence the speed of psocid development. The life-cycle is usually completed in one month, the adults surviving for up to 6 months. The insects are only moderately well adapted to the environments they inhabit. Their small size and flattened bodies mean that they can readily hide in cracks and crevices. They do, however, possess a relatively thin cuticle which, coupled with a large surface/volume ratio, means that they are not well adapted to survive adverse conditions, and, in particular, low relative humidities.

# Booklice (Psocids)

## Order: Psocoptera (‘winged like Psocus’ with ability to grind to pieces)

### Control

**A) Hygiene/management**

Because of the opportunities for re-infestation, booklice are difficult to control with insecticides. The most effective method of control is to ensure that premises are thoroughly aired and dry, thereby deterring the development of moulds and denying the insects their food source.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see  recommended products). Badly infested commodities should be destroyed.

Infested pallets can be identified by ‘knocking out’, i.e. dropping a pallet held end on about 75mm (3”) above a sheet of white paper.

**B) Insecticidal control**

Booklice are susceptible to a wide variety of insecticides (see recommended products). The problem lies in ensuring contact between the pests and the toxicant in order to bring infestations under control.

### Glossary of terms:

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Recommended Products


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Carcinops

## Order: Coleoptera ('sheath wings')

**Carcinops**
2-3mm Long

**Intergrated Pest Management**

Recommended products for: **CARCINOPS**

✓ Carcinops should not be controlled. Its is a beneficial insect which eats fly larvae.

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hind- wings membra-nous; biting mouthparts; well-developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Histeridae

Generally hard, shining black or black with red markings; no hairs or scales; very convex under-side; elytra short/ moderately long.

**Species characteristics:**

**Carcinops pumilio** (no common name)

Adults 2–3 mm long; body broadly oval, flattened, shiny dark brown to black; elytra moderately long but with some exposure of the abdomen; antennae with orange clubs; first antennal segments will retract into grooves in front of eyes; legs short, retracted beneath body when disturbed.

### Areas where found

Carcinops pumilio is widely distributed in temperate regions and will naturally colonise the manure in poultry houses. It prefers the drier areas, exhibits a preference for the crest of the manure and is often associated with the spillage of meal. The insect is a late-stage coloniser of the manure, which is probably due to its preference for drier conditions. It may take several weeks for significant populations to develop. Adults are adapted for digging and will tunnel the manure. Carcinops pumilio tolerates a wide range of physical conditions and larval colonies have been encountered at temperatures well in excess of 30°C. Populations will occasionally disperse in response to some environmental factor.

### Importance as a pest

The adults and larvae are predators of insects and mites. They may also feed on manure and other rotting materials. In particular they feed on housefly eggs and first stage larvae. Adults are reported to consume up to 24 eggs per day and, even at relatively low densities, up to 54 immature forms of fly per day, so making a useful contribution to control. Carcinops pumilio is therefore regarded as a beneficial insect. The manure dries as it is tunnelled and aerated by the beetles. This makes it less attractive for the flies to lay eggs and for the fly larvae to develop, so effecting a further measure of control. The dried manure is also easier to clear.

Salmonella spp. and parasites e.g. tapeworms may be transmitted by the beetle.

### Life-Cycle

Female C. pumilio lay their eggs in manure with a moisture content ca 50%. The eggs are about 1 mm long, smooth, creamy-white and slightly convex. They hatch to give cream-coloured larvae with dark brown heads. There are 2–3 larval stages and the fully grown larva is ca 6.5 mm long. It constructs a resilient cocoon in which to pupate and may utilise empty housefly puparia for the purpose. The pupa is initially creamy-white in colour but turns black with time. The full life cycle takes about one month depending upon conditions and the adults are long lived.

# Carcinops

## Order: Coleoptera ('sheath wings')

### Control

The following factors are pertinent to the use of C. pumilio for the control of houseflies in poultry houses:

Houseflies thrive in manure with a moisture content of 50–85 %; they are unlikely to breed in manure with a moisture content below 30%.

C. pumilio thrives in manure with a relatively low moisture content.

Staggering the removal of manure and/or leaving some manure when clearing a house preserves beneficial insect populations.

When seeding poultry houses to introduce populations of C. pumilio be alert to:

Their potential to transmit diseases e.g. Salmonella spp., and parasites e.g. tapeworms.

The introduction of other pests e.g. Hide Beetles.

C. pumilio can be trapped for re-location to other parts of the farm.

Commercially reared C. pumilio may be available for release into suitable manure at a rate of e.g. 10,000 insects per pit.

Care should be taken when planning the use of insecticides in poultry houses to ensure

C. pumilio populations are not detrimentally affected.

### Glossary of terms:

Elytra: Hardened forewings of the beetle.

# Carpet Beetles

## Order: Coleoptera ('sheath-wings')

**Carpet Beetle**
3mm Long

**Intergrated Pest Management**

Recommended products for: **CARPET BEETLES**

- ✓ K-Othrine WG 250 Go to Page 25
- ✓ Ficam D Go to Page 19
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface: hindwings membranous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Dermestidae (skin feeders)

**Species Characteristics:**

**Varied Carpet Beetle** (Anthrenus verbasci)
Adults, 2-4mm long, body strongly convex; colour: variable, brown or black and mottled with yellow or white scales on the dorsal surface; ventral surface clothed with fine grey-yellow scales; 11-segmented antennae with 3-segmented clubs at tip, clubs have nearly parallel sides; at rest, antennae lie in recesses in thorax; eyes smoothly rounded; legs short, retracting into grooves on the ventral surface; larvae brown, bearing 3 bunches of golden hairs on tip of abdomen.

**Furniture Carpet Beetle** (Anthrenus flavipes (formerly vorax))

Adult, 2-4mm long, body strongly convex; colour: variable, brown or black and mottled with yellow or white scales on the dorsal surface; ventral surface clothed with white scales; 11-segmented antennae with 3-segmented oval clubs at tip; at rest, antennae lie in recesses in thorax; eyes indented on inner side; legs short, retracting into grooves on ventral surface; legs thickly clothed with yellow scales; larvae brown, bearing 3 bunches of golden hairs on tip of abdomen.

**Museum Beetle** (Anthrenus museorum)

Adult, 2-2.8mm long, body strongly convex; colour: variable, brown or black and mottled with yellow or white scales on the dorsal surface; antennae are 8-segmented, with 2-segmented clubs; at rest antennae lie in recesses in thorax; legs short, retracting into grooves on the ventral surface; larvae brown, bearing 3 bunches of golden hairs on tip of abdomen.

**Fur Beetle** (Attagenus pellio)

Adults, oblong shape and 4.5-6mm long; colour: black, but for small patch of white hairs on either side of elytra; base of thorax also covered with white hairs; larvae have distinctive tuft of very long hairs which project backwards.

# Carpet Beetles

## Order: Coleoptera ('sheath-wings')

### Areas where found

The varied carpet beetle is indigenous to Europe and in England is common south of a line drawn between Bristol and the Wash. The furniture carpet beetle is of subtropical origin and more cold sensitive.

Both species are pests of animal products and occasionally food products of plant origin. Consequently, they may be found wherever these commodities are stored or handled. Carpet beetles are now one of the major pests of textiles, their success being attributed to central heating, which ensures uniform temperatures, and to the increasing use of wall-to-wall carpeting, which allows the insects to breed undisturbed. Furthermore, the success of industrial mothproofing treatments has effectively removed the moth challenge.

Warm, dry conditions are ideal for their development, but they can survive in foodstuffs of very low moisture content, e.g. 11-12%.

As its common name suggests the museum beetle is commonly encountered in museums where it is a particular pest of dried specimens. It will also attack textiles and has been recorded as infesting grain.

The fur beetle may be found in a wide variety of products including furs, skins, textiles and grain.

Adult carpet beetles live outdoors on pollen and nectar, taken in particular from Umbelliferae and Spiraes. They can also be found wandering on walls and windows. In temperate climates the larvae are particularly evident in the autumn when they wander in search of food and hibernation sites. Carpet beetles thrive in situations where they remain undisturbed, for example beneath carpets, around skirting boards and in wardrobes. Bird and rodent nests, animal remains and dead insects are frequently reservoirs of infestations.

### Importance as a pest

Larval forms can cause considerable damage to keratin-containing products such as wool, fur, leather, silk and dried animal remains. Occasionally, food products of plant origin, such as cereals and fibres, will also be attacked. Damage takes the form of clean, irregular holes and in textiles these generally occur around seams. There is no webbing or excrement present and by the time larvae are observed, considerable damage has often been done. Because of the large number of larval moults, when cast larval skins are seen they tend to exaggerate the extent of the infestation.

Carpet beetles are of limited significance as a health hazard, although they are potential vectors of anthrax. In certain situations the larval hairs cause skin irritation to those exposed to large numbers of the insects.

**Life-Cycle of the two most common species**

**Varied Carpet Beetle**

Mating occurs immediately after emergence. The females produce 20-100 cream-coloured eggs which are 0.5mm long, and have spine-like projections at one end. Over a period of 2 weeks these are deposited in suitable crevices, or stuck on to a potential larval feeding site by sticky secretions. In 2-4 weeks these eggs hatch to give the characteristic hairy, squat 'woolly bears'. When mature, these are 4-5mm long, brown in colour and possess 3 bunches of golden hairs arranged in pairs on the posterior abdominal segments. The short legs are 5-segmented and well developed, with a single claw on the terminal segment. The larvae avoid light and curl up into a ball when disturbed. The length of the larval life depends upon humidity, temperature and quality of diet. Soiled commodities are usually preferred. During this time they generally moult at least 6 times, but the longer they persist the more moults occur.

Pupation takes place in the last larval skin, at the site of larval development and lasts for 10-30 days. The adults live for 2-6 weeks, and are able to fly to the particular flowers on which they feed and search for egg-laying sites.

**Furniture Carpet Beetle**

One to three days after emergence the female lays up to 100 eggs which are produced in 1 to 3 batches. After 3 weeks the eggs hatch, to give larvae which vary in colour from white, through yellow, to chestnut brown, depending upon the colour of food consumed. Their legs are short, 5-segmented and well developed. The larvae persist for up to 12 months and are 5mm long when fully grown.

The pupa develops inside the last skin. It is white in colour and lasts for 2-3 weeks, after which time the adults emerge.

# Carpet Beetles

## Order: Coleoptera ('sheath-wings')

### Control

The wandering habits of these insects means that they frequently infest wide areas, making them difficult to control.

**Assessment of infestations**

The first step in carpet beetle control is to trace the source of infestation. This may be an old nest, animal remains, wool-based lagging, sound-proofing, wool-based furnishings or the debris that accumulates between and around floor-boards.

**A) Hygiene/management**

All sources of infestation should be removed and burnt if possible. Routine surveillance and regular cleaning are also important.

**B) Insecticidal control**

Thorough surface spray treatments with residual activity (see recommended products) are vital where infestations are extensive in order to ensure that all larvae are killed. Care should be taken when treating carpets and other valuable furnishings.

### Glossary of terms:

Elytra: Hardened forewings of the beetle.

# Recommended Products


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity


**Insecticide**

**Ficam D**
Ficam D is ideal to use where liquid-based formulations are unsuitable.


**Insecticide**

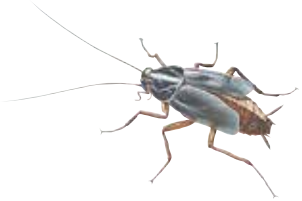
**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

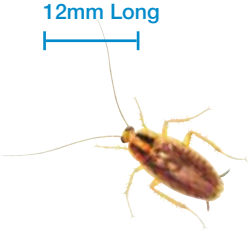
# Cockroaches

## Order: Dictyoptera ('net-winged')

**Oriental Cockroach**
22mm Long



**German Cockroach**
12mm Long



**Intergrated Pest Management**

Recommended products for: **COCKROACHES**

- ✓ Maxforce Prime Go to Page 29
- ✓ Maxforce White IC Go to Page 33

### Description

**Characteristics:**

Generally two pairs of wings, although these may be reduced or even absent; forewings have well developed veins and tend to be hardened, they overlap down the mid-dorsal line; membranous hindwings are folded below forewings; long whip-like, many-segmented antennae; omnivorous, with mouth parts adapted for biting; tarsi, 5-segmented; incomplete metamorphosis, with egg and nymph stages.

**Family: Order:** Blattidae

**Species Characteristics:**

**Oriental Cockroach** (Blatta orientalis)

Adults, 20-24mm long; colour, dark-brown, nearly black; wings of male cover two-thirds of abdomen, wings of female are vestigial; can climb rough but not smooth vertical surfaces.

**German Cockroach** (Blattella germanica)

Adult, 10-15mm long; colour, yellowish-brown with two longitudinal dark marks on pronotum; wings well developed in both sexes; can readily climb rough and polished vertical surfaces.

**American Cockroach** (Periplaneta americana)

Adult, 28-44mm long; colour, red-brown with yellow border around pronotum; no yellow submarginal stripes on forewings; last segment of cerci, twice as long as wide.

**Australian Cockroach** (Periplaneta australasiae)

Adult, 30-35mm long; colour, light brown with ivory-yellow circular band enclosing large, distinct, bilobed black spot; yellow submarginal stripe at base of forewings.

**Nymphs:**

The nymphs of all species are similar in appearance to the adult but smaller. Immediately after hatching or moulting the nymphs are white, but the cuticle soon darkens to the normal colour.

### Areas where found

Cockroaches are common in commercial premises associated with the production or handling of food. Also in public buildings and domestic premises eg apartment blocks. Gregarious and nocturnal, they spend the day hiding in cracks and crevices around such areas as sinks, drains, cookers, the backs of cupboards and in refrigerator motor compartments. They especially favour buildings with service ducts and complex plumbing installations. Infestations may be introduced as egg cases or adults in incoming laundry, on raw materials, in crates and packaging, or arise as the insects enter buildings via such routes as drains or refuse chutes.

B. orientalis and B. germanica are the most common species in Northern Europe. They are occasionally found together, but B. germanica generally prefers warmer, humid environments, e.g. centrally heated buildings, whilst B. orientalis is frequently encountered in cooler, less humid areas such as basements and drains.

P. americana and P. australasiae are tropical and sub-tropical species but are also found in ports and shipping areas in temperate climates.

# Cockroaches

## Order: Dictyoptera ('net-winged')

### Importance as a pest

Cockroaches are potential vectors of diseases such as dysentery, gastroenteritis, typhoid and poliomyelitis. Their diet is omnivorous and includes fermenting substances, soiled septic dressings, hair, leather, parchment, wallpaper, faeces and food for human consumption. The latter may be contaminated either by the mechanical transfer of causative agents of disease from the insect's body, or by transmission in the faeces. An outbreak of food poisoning in a Brussels hospital subsided immediately an infestation of B. germanica was controlled.

Cockroaches and their faeces may cause allergic reactions especially amongst sensitive individuals eg asthmatics. Exposure may result from ingestion or through the inhalation of materials derived from cockroaches in airborne dust. In addition, food may be tainted with the characteristic smell of the cockroach, which is produced by faeces and salivary/abdominal gland secretions, or by the dead insects.

### Life-Cycle

#### Oriental Cockroach

The female produces 5 egg capsules at monthly intervals. The thick-walled resistant capsules, 12mm in length, each contain up to 16 eggs and are cemented to the substrate or dropped in the vicinity of a food supply. They may then be covered over with debris.

Nymphs emerge 6-12 weeks later and progress through 7-10 moults before reaching maturity, a process which takes 10 months-2 years depending upon temperature and food supply. With each successive moult the wings, antennae and cerci develop and the nymph becomes progressively more like the adult. Adults live approximately 4.5 months at 25°C. The slow proliferation of B. orientalis will limit its success where reasonable standards of hygiene exist.

#### German Cockroach

The female of this species produces 4-8 egg capsules at approximately 1 month intervals. Each thick-walled resistant capsule is 6mm long and contains up to 30 eggs, but unlike B. oriental-is, the female carries the capsule until just before the eggs hatch - some 2.5-4 weeks later. Efforts are made to conceal the capsules near a food source, where the nymphs will hatch and pass through 5-7 moults before reaching maturity. At a temperature of 25°C maturity is reached in 3.5 months, but this time can be profoundly influenced by temperature. Adults live approximately 8.5 months at 25°C.

The German cockroach is particularly successful for the following reasons:

1. A large number of eggs per capsule;
2. The female protects the egg capsule, by carrying it until just before hatching;
3. Short development period to hatching and maturity;
4. Small size, therefore readily conceals itself.

# Cockroaches

## Order: Dictyoptera ('net-winged')

### Control

Successful control of cockroaches is a complex subject, and depends very much upon tailoring control measures to the species concerned.

**Assessment of infestations**

An assessment of the infestation must be made to determine the species and extent of the infestation. Plans of the area will be required. The entire site should be inspected, including where appropriate adjoining premises, normally inaccessible places, drains etc. A night survey is useful as this is the time of maximum insect activity.

The survey may be carried out using cockroach monitoring traps, searching for droppings, cast skins and egg cases etc. A pyrethroid-based aerosol sprayed around and into potential hiding places will flush out cockroaches (other than the Oriental cockroach).

**Control measures**

**a) Hygiene/management**

A high standard of hygiene is important in the control of cockroaches and involves the following components:

Deny access to food and water. This will increase cockroach activity and directed movement improving the opportunity for the insects to encounter insecticides.

Deny access to harbourages in buildings or equipment which would otherwise provide hiding places, a means of gaining access and dispersing and breeding sites.

Ease of cleaning. Buildings and equipment should be designed to minimise the accumulation of debris and facilitate ease of cleaning.

Surveillance of incoming materials including packaging and laundry. Environmental controls eg. ventilation which will accelerate dehydration of the insects and interfere with the operation of antennal chemoreceptors.

**b) Insecticidal control**

**Surface sprays**

Effective treatment depends upon the selection and thorough application of a suitable insecticide. Many insects and egg cases are well hidden; therefore, the insecticide must be placed at and around these harbourages and maintained over the developmental period of the particular species. To control an infestation the insecticide should ideally persist until all egg cases have hatched but continued immigration may demand routine treatments.

**Space sprays**

Regular treatments are necessary eg at weekly intervals until the infestation is brought under control. Thereafter, maintenance treatments, at less frequent intervals, should keep the insect population at an acceptable level. Initially there will be a massive kill of adults and nymphs resulting in only the appearance of young nymphs from time to time. The technique is particularly useful using pyrethroid insecticides to flush cockroaches from their harbourages and over surface deposits of insecticide.

**Insecticidal baits**

Baits (see recommended products) offer the opportunity for controlled placement of insecticides formulated in attractive food bases. When placed in areas infested with cockroaches the insects feed on the baits picking up a lethal dose of insecticide in the process. Baits offer the opportunity for continuous control of cockroaches over extended periods. They can be integrated with surface or space spray treatments.

### Glossary of terms:

**Cerci:** Paired appendages located at the tip of the abdomen.

**Pronotum:** Dorsal surface of first thoracic segment.

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Cockroaches

## Order: Dictyoptera (‘net-winged’)

## Recommended Products

**Insecticide**

**Maxforce Prime**
Formulated to offer the best consumption rates across cockroach species and cockroach development stages.

**Insecticide**

**Maxforce White IC**
A ready to use insecticidal gel bait for the control of cockroach nymphs and adults.

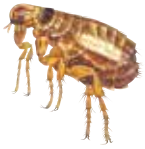
**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Fleas

## Order: Siphonaptera

**Cat Flea**
2.6mm Long

**Dog Flea**
2.6mm Long



**Intergrated Pest Management**

Recommended products for: **FLEAS**

- ✓ Ficam W Go to Page 21
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Adults 1-8mm long; brownish in colour, body laterally compressed (streamlined) and covered with backward-directed bristles; reduction or loss of eyes; piercing mouth parts; no wings, although transitory wing buds may appear in pupae of some species; muscular legs, with hind limbs adapted for jumping; metamorphosis complete with egg, larval, pupal and adult stages.

**Species characteristics and host/habitat:**

**Cat Flea** (Ctenocephalides felis)

Adults, 2-3.25mm long; forepart of head longer than it is high; prominent pronotal and genal combs (first teeth of genal comb nearly as long as second); basal section of legs equipped with stout spines.

**Host/habitat:** especially members of Felidae family, also dogs, other animals and man; found particularly in host bedding. Many infestations in commercial and institutional premises derive from feral cats.

**Dog Flea** (Ctenocephalides canis)

Adults, 2-3.25mm long; forepart of head as long as it is high; prominent pronotal and genal combs (first teeth of genal comb only about half as long as second); basal section of legs equipped with stout spines.

**Host/habitat:** especially members of Canidae family, also domestic animals and man; found particularly in host bedding.

**Human Flea** (Pulex irritans)

Adults, 2-3.5mm long; no pronotal or genal comb; basal section of legs equipped with stout spines.

**Host/habitat:** especially man, but will also breed on pigs, hedgehogs, foxes and badgers; found in homes, usually in bedrooms.

**Rabbit Flea** (Spilopsyllus cuniculi)

Adults, 1.5-2.25mm long; pronotal and genal combs, the latter with five vertically arranged rounded spines; basal section of legs equipped with stout spines.

**Host/habitat:** especially rabbits, in whom it is the main vector of the myxomatosis virus, but will also attack cats; the females are sedentary and attach themselves to the host, especially around the ears and head.

**Tropical Rat Flea** (Xenopsylla cheopis)

Adults, 1.5-2.5mm long; no pronotal or genal comb; row of bristles along back of head; basal section of legs equipped with stout spines.

**Host/habitat:** various rodents, but will also attack man; found especially around ports.

**Hedgehog Flea** (Archaeopsyllus erinacei)

Adults, 2-3.5mm long; genal comb of 1-3 short spines; pronotal comb of 2-9 spines.

**Host/habitat:** generally associated with hedge-hogs, but occasionally brought indoors by dogs, cats and humans; also found in gardens and outbuildings.

# Fleas

## Order: Siphonaptera

**Bird Flea** (Ceratophyllus gallinae)

Adults 2-2.5mm long; no head folds to retain antennae; pronotal comb with more than 24 teeth; no genal comb, no spines on basal section of legs.

**Host/habitat:** especially birds nesting in dry situations but will also attack animals and man; breeding mostly limited to birds' breeding season, migrating from the nests when fledglings leave. Often originating from birds' nests in roof spaces.

**Mole Flea** (Hystrichopsylla talpae)

Adults 3.5-6mm long; genal comb of 9-12 spines; pronotal comb of 42-58 spines.

**Host/habitat:** associated with moles; also found in gardens and outbuildings.

### Areas where found

Adult fleas live exclusively as parasites of warm-blooded animals, especially mammals, although birds may also be attacked. Whilst they show a certain degree of host preference, fleas are by no means specific and will feed on other animals in the absence of the normal host. In fact they tend to be more nest than host-specific, for whilst the adults may feed on the blood of a variety of animals the larvae require more precise conditions which are associated with the habitats and nesting habits of the hosts rather than the characteristics of their blood.

Cat fleas are responsible for many flea infestations, the remainder being attributable to a variety of bird and animal species. Pulex irritans infestations are now uncommon. The significance of Ctenocephalides felis is explained by the increased number of pets being kept and the tendency for their beds to be neglected during cleaning. Wall-to-wall carpeting also provides a relatively undisturbed environment for flea larvae to develop, whilst the spread of central heating has served to ensure ideal temperature conditions.

### Importance as a pest

Fleas can be vectors of disease or may transmit parasitic worms. The most serious infection which they can spread is bubonic plague, transmitted to man by rodent fleas (Xenopsylla cheopis) which carry the causative bacillus from infected rats. In the past rodent fleas have been responsible for serious epidemics of the disease, notably the Black Death in Europe and Asia in the 14th to 17th centuries. Rodent fleas may also carry murine typhus and, because of their readiness to attack humans as well as rats, are probably the major flea vector of disease. The dog flea is an intermediate host of the dog tapeworm

(Dipylidium caninum), whose vertebrate host is usually the dog (occasionally the cat) but which can sometimes be transmitted to man.

In Europe fleas are not generally responsible for the transmission of disease. However, they are still objectionable because of the bites they inflict and the deep-rooted social stigma attached to humans with flea infestations. Occasionally psychological problems arise with the induction of delusory parasitosis, in which the victim imagines they are infested with ectoparasites.

Flea bites are identified as a tiny dark red spot surrounded by a reddened area. The bite persists for one or two days and is intensely irritating. First bites are not generally liable to cause serious reactions, but they may lead to hypersensitivity. Reactions are usually delayed following regular biting over a long period; there will then follow a period when reactions are immediate. The cycle then repeats until a state of non-reactivity -immunity - is achieved.

# Fleas

## Order: Siphonaptera

### Life-Cycle

Flea eggs are about 0.5mm long, oval, pearly-white in colour and laid indiscriminately in the fur or feathers of the host or in its nest or bedding. They do not adhere to the host but readily fall from the animal, are shaken or scratched off. The same applies to the dark coloured faeces of the adult fleas thus creating the black and white - salt and pepper - effect associated with flea infestations. Four to eight eggs are laid after each blood meal and a single female may produce 800-1000 eggs during her lifetime, which may be as long as two years.

The eggs hatch in about one week to give white, threadlike, legless larvae 1.5mm long.

These are distinguished by an identifiable, usually brownish head without eyes; jaws adapted for biting; three thoracic segments and 10 abdominal segments all equipped with bristles; and peg-like processes on the terminal abdominal segment. The larvae thrive in dark, humid places such as animal bedding and carpet fluff, and feed on organic debris and adult flea excrement. The latter forms a valuable part of the diet as a source of blood, which some larvae, while not attacking the host, require for their development. Larvae may also be predacious, living on small and weak arthropods. Cats' bedding may support a flea population of 8000 immature and 2000 adult forms. A typical flea infestation may be composed of adults 5%, larvae 35%, pupae 10% and eggs 50%.

After 2-3 weeks, by which time they will have moulted twice and be about 5mm long, the larvae spin silken cocoons, incorporating debris, in which to pupate. The cocooned larvae then moult within three days to give the pupae which are initially creamy-white but change to dark brown as they mature to become adults. This phase is the quiescent stage and the flea may overwinter in this state. The adult flea will then be stimulated to emerge by the vibrations set up by a passing host. This explains the occasional mass attacks which take place in deserted premises.

The development cycle from egg to adult is normally completed in 4 weeks but at low temperatures will take much longer.

### Control

Selecting flea control measures depends to a large extent on the size of the problem. In many instances infestations of well kept houses can be easily traced to pets. Where this is not the case it is useful to establish the pest species. This will help to identify possible hosts and even the foci of the infestations. Control measures must be directed at the brood as well as the adult fleas.

**a) Hygiene/management**

Regular cleaning will deny the insects their breeding site and so make an important contribution towards their control. Infested clothing, beds and bedding should be destroyed by burning or thoroughly cleaned and the same measures employed when dealing with old bird and animal nests. Accumulations of debris should also be removed from cracks and crevices such as the cracks between floorboards, and the whole area thoroughly cleaned.

**b) Insecticidal control**

Insecticides (see recommended products) can be used to treat infested premises and protect them from reinfestation. In addition, hosts can be treated directly, or rodenticides employed.

**Host treatments:**

Insecticidal products are available which have been specifically formulated and registered for use on the host animals. Only these products should be applied to animals and care should be taken to follow the manufacturer‘s instructions.

**Rodenticides:**

Where rats and mice have been identified as the primary hosts in flea infestations, rodenticides can be used to control them and, indirectly, the fleas.

# Fleas

## Order: Siphonaptera

**Glossary of terms:**

**Genal and pronotal combs:** Rows of stout spines on cheek and first thoracic segment respectively.

# Recommended Products


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Flour Beetles

## Order: Coleoptera ('sheath-wings')

**Flour Beetles**
3.5mm Long

**Intergrated Pest Management**

Recommended products for: **FLOUR BEETLES**

- ✓ AquaPy Go to Page 13
- ✓ K-Othrine WG 250 Go to Page 25
- ✓ Ficam D Go to Page 19
- ✓ K-Obiol Go to Page 23

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Tenebrionidae

Usually 11-segmented antennae; front and middle tarsi are 5-segmented and hind tarsi 4-segmented.

**Species characteristics:**

**Confused Flour Beetle** (Tribolium confusum)

Adult elongate, 2.6-4.4mm in length; colour, red-dish-brown; antennae with loose, indistinct, 5 or 6 segmented club which may be lacking; slight ridge evident above each eye.

**Rust-Red Flour Beetle** (Tribolium castaneum)

Adult elongate, 2.3-4.4mm in length; colour, red-dish-brown; antennae with distinct, 3-segmented club at tip; no ridge present above each eye.

**Dark Flour Beetle** (Tribolium destructor)

Adult elongate, 4.5-5.75mm long; colour, black or very dark brown.

**Small-Eyed Flour Beetle** (Palorus ratzeburgii)

Adult elongate, 2.4-3mm long; eyes small and round; antennae with no well-marked club.

**Long-Headed Flour Beetle** (Latheticus oryzae)

Adult elongate, 2.6-3mm long; colour, pale yellow; antennae with compact 5-segmented club.

**Broad-Horned Flour Beetle** (Gnathocerus cornutus

Adult elongate, 3.5-4.9mm long; male with conspicuously enlarged, toothed mandibles, broader at base than near apex.

**Slender-Horned Flour Beetle** (Gnathocerus maxillosus

Adult elongate, 3-4mm long; male with conspicuously enlarged, toothless mandibles, slender and in-curved.

### Areas where found

Flour beetles are cosmopolitan. Two of the most common species are the Confused flour beetle, which is commonly encountered in bakeries and flour mills, and the Rust-red flour beetle. Both are serious pests of cereal products, including grain, flour, porridge oats and rice bran.

Other products which may be attacked are oil seed, oil cake, nuts, dried fruit, spices, chocolate, even bones and other animal products. The beetles are not cold hardy, so they will only overwinter under warm conditions. They are active insects which will seek cover if disturbed and, because they are so small, can exploit the smallest crevice. They are a particular problem in machinery where cereal and other food residues accumulate.

### Importance as a pest

Flour beetles are generally recognised as secondary pests of grain and therefore increase the feeding damage done by primary pests. When present in large numbers, flour beetles will:

1. Cause flour to become prone to moulding and will also turn the product grey;
2. Taint commodities with secretions from scent glands.

# Flour Beetles

## Order: Coleoptera ('sheath-wings')

### Life-Cycle

Up to 450 eggs are laid singly at a rate of 2-10 per day, depending on temperature. The white eggs are sticky and rapidly become coated with food particles and other debris. At 22-27°C they hatch in 6-14 days.
The larvae are white tinged with yellow and pass through 5-11 moults before reaching a full-grown length of 5mm. This process takes 3-9 weeks. Pupae lie naked in the same foodstuff as the larvae. They are initially white, but gradually darken in colour prior to adult emergence after 9-17 days. Adults feed on the same food as the larvae and live for 15-20 months. There may be five generations per year.

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning. They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products). Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises.

The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues (stored commodities or secondary sources, e.g. birds' nests) in which beetles can breed and develop to infest new materials. All infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

**Glossary of terms:**

**Mandible:** Jaw.

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Flour Beetles

Order: Coleoptera ('sheath-wings')

## Recommended Products

**Insecticide**

**K-Othrine WG 250**

K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity

**Insecticide**

**AquaPy**

AquaPy can be used for the fast flushout, rapid knockdown and control of a range of flying and crawling insects

**Insecticide**

**K-Obiol**

K-Obiol EC25 is a liquid grain protectant for the control of stored product pests including crawling insects.

# Ghost Ants

## Order: Hymenoptera (‘membrane-winged’)

**Ghost Ant**
1.5mm Long

**Intergrated Pest Management**

Recommended products for: **GHOST ANTS**

✓ Maxforce Quantum
Go to Page 31

### Descrpiton

**Characteristics:**

Ghost ants are an invasive species and in Europe, occupy roughly the same habitat as Pharaoh ants including public buildings, residential homes and warmer habitats such as greenhouses, zoos etc. Ghost ants have polygyne colonies (multiple queens in a single colony) with individual nests containing between 100-1000 workers. One colony may consist of several nests which readily exchange workers. Ghost ants are usually not aggressive to each other when they originate from the same area.

**Family: Order:** Formicidae

**Species characteristics:**

**Ghost Ant** (Tapinoma melanocephalum)

Ghost ants are very small ants with a pale abdomen hence the name “Ghost ant”. In detail they are characterised as follows:

- Dark head and thorax; pale abdomen and legs
- Uneven thorax; no spines
- 12-segmented antennae; segments gradually thicken toward tip
- Anal opening on gaster is slit-like with no circle of hairs
- No stinger
- Monomorphic workers, very small, 2 mm long

### Areas where found

Indoor Ghost ants nests in Europe tend to prefer warmer habitats due to their high moisture needs, therefore, often trails can lead to sinks, baths, toilets and showers. Indoor nests are generally located within wall voids, behind skirting boards, under and between cabinets and walls or in potted plant soil. Workers run rapidly and erratically, trailing along edges and corners. Trails are often hidden, under carpet edges and along electrical wires in wall voids. Foragers collect all kinds of nutrients but prefer sweet food.

### Importance as a pest

Ghost ants are considered a nuisance but they can through passive transfer disseminate germs and spores. Ghost ants may be distributed easily via household goods, packages and flower pots.

# Ghost Ants

## Order: Hymenoptera (‘membrane-winged’)

### Life-Cycle

Ghost ants are social insects and live in moderately sized colonies with up to several thousand members. Colonies consist of: workers (sterile females), fertile males and queens (fertile females). There are usually many queens in a colony (multiqueen colonies) and they co-exist amicably. The queens can be replaced so colonies will survive indefinitely. New colonies are typically formed by budding and may be encouraged by disturbing nests. Adult ants are responsible for this process which may include queens. Worker ants carry larval stages to a new nest site from which they can rear queens and males. Temporary nests may be established whilst the workers search for new sites. If established in mobile equipment infestations can be widely distributed. The workers provide food for the colony and maintain the nest. Only 5-10% of workers are actually engaged in foraging. Fertile males and females develop from well fed larvae. Flying swarms are never seen, mating taking place in the nests and small spaces in buildings.

### Control

Successful control requires the eradication of all nests. Baiting is the preferred control method to achieve this goal. The use of conventional contact treatments usually leads to a reduction of numbers but this method is less successful in complete nest eradication because it relies on contact rather than the ants feeding on it and taking it back to the colony.

However, the repellent nature of contact insecticides may even increase the number of satellite colonies. Maxforce® Quantum applied on the foraging tracks of Ghost ants will lead to effective control of the population within several weeks depending on the size of the colony.

# Recommended Products

**Insecticide**

**Maxforce Quantum**
A ready to use insecticidal gel bait for the control of Black, Pharaoh, Ghost and Argentine ants.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Grain Beetles

## Order: Coleoptera ('sheath-wings')

**Grain Beetle**
3mm Long

**Intergrated Pest Management**

Recommended products for: **GRAIN BEETLES**

- ✓ AquaPy Go to Page 13
- ✓ K-Obiol Go to Page 23
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts; well-developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Silvanidae.

Narrow, flattened insects with 11-segmented, clubbed antennae and 5-segmented tarsi.

**Species characteristics:**

**Saw-Toothed Grain Beetle** (Oryzaephilus surinamensis)

Adults, 2.5-3.5mm long; colour: dark brown; distance from eye to prothorax more than half vertical diameter of eye; 6 teeth along each side of prothorax (hence the name 'Saw-toothed').

**Merchant Grain Beetle** (Oryzaephilus mercator)

Very similar in appearance to Saw-toothed grain beetle with the characteristics described above, except that distance from eye to prothorax less than half vertical diameter of eye.

**Foreign Grain Beetle** (Ahasverus advena)

Adults, 2-3mm long; colour: reddish-brown; sides of prothorax not toothed but each apical angle of prothorax has single large tooth.

### Areas where found

As indicated by its species name, which is taken from Surinam, the Saw-toothed grain beetle probably originated from the Americas. It is now cosmopolitan in distribution.

The species will infest cereals and a wide range of foodstuffs. Retail premises and warehouses can suffer infestations and the beetles will frequently appear in packaged food.

Infestations arise from the presence of insects in the fabric of grain stores (including sacks), in grain being transferred from one establishment to another and in vehicles used for transportation. Relatively small numbers of insects can rapidly give rise to serious infestations.

They are small, active insects which readily exploit cracks and crevices where they can hide. Being cold-hardy they are able to overwinter in temperate lands without difficulty. Their life-cycle may be completed in as little as 20 days and serious outbreaks may occur within a month of harvest.

The Merchant grain beetle is also widely distributed. Like the Saw-toothed grain beetle, it too will infest a wide variety of foodstuffs. However, since it is more sensitive to low temperatures and humidities, infestations only become established in heated buildings where suitable conditions exist.

The Foreign grain beetle also originated in the tropics. It is capable of infesting a variety of materials but only in the presence of moulds.

# Grain Beetles

## Order: Coleoptera ('sheath-wings')

### Importance as a pest

Saw-toothed grain beetles are potentially important pests of farm-stored grain. They also infest cereal products, dried fruit, dried meats, oilseeds, nuts, rice and even drugs.

In grain, the mere presence of insects may result in its rejection. The germ may be damaged and when infestations become heavy they cause the grain to heat. This in turn leads to caking, moulding and even sprouting.

Both the quality and weight of the grain may be reduced. Malting barley may be rejected because of poor germination, whilst milling wheat is adversely affected by tainting and discoloration. The presence of insects in other foodstuffs will render them unpalatable and cause their rejection.

Merchant grain beetles mainly infest oilseeds and dried fruit whilst Foreign grain beetles attack cereal products and cocoa as well as these commodities.

### Life-Cycle

The female Saw-toothed grain beetle lays up to 400 eggs, either singly or in small batches, at a rate of 6-10 per day. These are laid in, or adjacent to, a suitable food supply and at a temperature of 20-23°C hatch in 8-17 days to give flattened larvae about 0.9mm long. They are yellowish-white in colour, with brown flecks and a brown head. Typical of coleopterous larvae, they have a well-developed head, biting mouthparts and 3 pairs of legs on the thoracic segments. The larvae are active and feed on damaged grains, so they can be regarded as secondary pests of grain. The larval stage lasts 4-7 weeks during which the larvae go through 2-5 moults, attaining a length of 3mm. They then construct a cell of food particles and other debris in which to pupate, emerging after 1-3 weeks as adults.

On emergence the adult beetles live for 6-10 months, breeding within a temperature range of 17.5-40°C. At 20°C the full life-cycle is completed in 12-15 weeks whilst at 32-35°C it takes only 20 days.

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning. They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products). Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises. The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues (stored commodities or secondary sources, e.g. birds' nests) in which beetles can breed and develop to infest new materials. All infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

# Grain Beetles

## Order: Coleoptera ('sheath-wings')

**Glossary of terms:**

**Prothorax:** First thoracic segment.

## Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Obiol**
K-Obiol EC25 is a liquid grain protectant for the control of stored product pests including crawling insects.

**Insecticide**

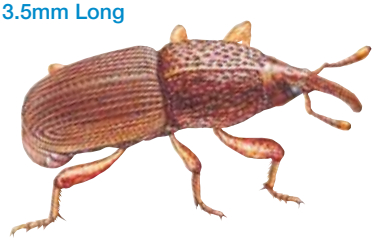
**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Grain Weevils

## Order: Coleoptera ('sheath-wings')

**Grain Weevils**
3.5mm Long



**Intergrated Pest Management**

Recommended products for: **GRAIN WEEVILS**

- ✓ K-Obiol Go to Page 23
- ✓ AquaPy Go to Page 13
- ✓ K-Othrine WG 250 Go to Page 25

### Descrption

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Curculionidae.

Insects with cylindrical bodies and a pronounced rostrum (snout) equipped with mouthparts which is used by females as a boring tool; elbowed, clubbed antennae set on rostrum; 4-segmented tarsi.

**Species characteristics:**

**Grain Weevil** (Granary Weevil) (Sitophilus granarius)

Adults, 3-4mm long; colour: dark brown, nearly black, with shiny appearance; 8-segmented antennae; prothorax with distinct oblong/oblong-oval punctures; hindwings absent.

**Rice Weevil** (Sitophilus oryzae)

Adults, 2-3.5mm long (average 2.5mm); colour: dark brown, nearly black, with four clearly defined reddish spots on the elytra; less shiny than the Grain weevil; 8-segmented antennae; prothorax with round or irregular punctures; hindwings present.

**Maize Weevil** (Sitophilus zeamais)

Very similar in appearance to the Rice weevil with the characteristics described above, except that the insects are longer, adults reaching a length of 3-3.5mm (average 3mm).

### Areas where found

Grain weevils are encountered in all temperate and warm-temperate climates and are widely distributed in grain stores throughout Europe. Infestations arise as a result of their regular importation in grain and cereal products and from the fabric of vehicles or buildings used for the transportation and storage of these and other vulnerable commodities. Sacks, too, are an important source of infestation, the insects finding harbourage in the seams and weave.

Being well suited to temperate conditions the species will breed readily in Europe and there may be three or more generations per year in unheated conditions. Both adults and larvae are cold-hardy.

Rice and Maize weevils are widely distributed in tropical and sub-tropical areas and will be carried to temperate areas on imported commodities. The Maize weevil will breed on maize in the field, but the Rice weevil only breeds in stored grain. Both insects are less cold-hardy than the Grain weevil and will not normally overwinter in unheated premises or grain stored at normal temperatures.

# Grain Weevils

## Order: Coleoptera ('sheath-wings')

### Importance as a pest

Grain weevils are important pests of farm-stored grain. They are frequently regarded as primary pests of grain since they are able to infest other-wise undamaged grain. Grain weevils will also attack other hard cereal products, e.g. macaroni and spaghetti. Fine cereal products are unsuitable for breeding purposes unless they become caked.

The following damage may be caused:

1. Reduction in the weight and quality of grain as a result of the larvae feeding on the endosperm. The germ is not always attacked so germination may take place, producing a weak seedling which is vulnerable to attack by moulds, bacteria and other insects. Both larvae and adults will feed upon grains.

2. Tainting with white, dusty excreta which contaminate the product as well as rendering it unpalatable.

3. Heating of the grain, accelerating development of the insects and making the commodity liable to caking, moulding and even germination. Temperatures may be attained which actually kill the insects. Weevil-damaged grain can be readily recognised by the presence of large holes which are the exit holes of the emerging adults. Some idea of the huge numbers of weevils that can be generated is provided by the results of one study in which, 5 weeks after wheat was infested with larval forms, adults were seen to be leaving the grain at a rate of 100 per kg per day.

### Life-Cycle

The Grain weevil can only breed in grain with a moisture content of more than 9.5% and at temperatures within the range 13-35°C. The female lays about 200 eggs at a rate of 2-3 per day depending upon temperature and humidity, placing each one in a small hole bored in the grain and sealing it in with a mucilaginous plug of saliva. At 18-20°C the eggs hatch in 8-11 days to give small, white, legless larvae which feed on the endosperm of the grain. Only one larva develops in small grains such as wheat and rice but large grains such as maize will support the development of several. Larvae are never free-living and develop entirely within the grain. They moult four times, finally pupating within the grain after 6-8 weeks. The adults emerge after a further 5-16 days and will live for about 9 months. If disturbed they will feign death by drawing their legs up to their bodies and remaining still. At 15°C and a grain moisture content of 11.3% the full life-cycle takes 6 months.

The life-cycles of the Rice and Maize weevils follow a similar course to that of the Grain weevil.

# Grain Weevils

## Order: Coleoptera ('sheath-wings')

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

a) Hygiene/management

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning. They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products). Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises.

The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues (stored commodities or secondary sources, e.g. birds' nests) in which beetles can breed and develop to infest new materials. All infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

b) Insecticidal control

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

### Glossary of terms:

**Elytra:** Hardened forewings of the beetle.

**Prothorax:** First thoracic segment.

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Obiol**
K-Obiol EC25 is a liquid grain protectant for the control of stored product pests including crawling insects.


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Hide & Larder Beetles

## Order: Coleoptera ('sheath wings')

**Larder Beetle**
7-9mm Long

**Intergrated Pest Management**

Recommended products for: **HIDE & LARDER BEETLES**

- ✓ AquaPy Go to Page 13
- ✓ Ficam W Go to Page 21
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hind- wings membra-nous, sometimes lacking; biting mouthparts; well- developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Dermestidae (skin feeders)

Densely covered with hairs or scales; 5–11 segmented antennae with distinct club; 5-segmented tarsi.

**Species characteristics:**

**Hide Beetle** (Leather Beetle) (Dermestes maculatus)

Adults, 5.5 -10 mm long; body, oval-shaped and densely covered with round scale-like hairs; thorax with patches of white hairs on the sides; elytra: uniformly coloured brown/black with an even scattering of white hairs; underside predominantly white; inner apex of each elytron produced backwards into a fine point.

**Larder Beetle** (Bacon Beetle) (Dermestes lardarius)

Adults, 7-9 mm long, body, oval-shaped and densely covered with round scale-like hairs; broad light band crosses elytra, with three black spots on each side; fine yellow underside.

### Areas where found

The Dermestes beetles are typically associated with materials with a high protein content, for example hides, skins, feathers, bones, dried meat, fish meal and dog biscuits. They are scavengers associated in nature with carcasses and bird's nests but can be encountered and may be wide-spread in manufacturing and storage premises handling animal products, intensive poultry units, piggeries and domestic premises. The Hide beetle is more commonly encountered in poultry houses than the Larder beetle. Feathers, carcasses, spilt food, droppings and other insects in the poultry manure can all provide a source of food for the beetles.

Where the sources of infestations are not immediately obvious e.g. domestic or catering premises, attention should be paid to food stores and spillage, or the presence of dead rodents, birds, fur and feathers in attics, under floor spaces etc.

### Importance as a pest

Large populations can be encountered, especially where hygiene is poor. Heavily infested poultry manure may be spread onto fields and lead to the infestation of nearby properties. Hairs dislodged from the larvae may lead to skin irritation or conjunctivitis in people exposed to the insects. They play only a very minor role in disease transmission, although may act as mechanical vectors of anthrax. Adults and larvae require a high protein diet and the beetles can be serious pests in hide warehouses, tanneries, milk-processing plants and other premises where animal products are handled.

In poultry units the beetles can feed on feathers, carcasses, spilt food, droppings and other insects. Different species exhibit different food preferences, the Hide beetle preferring hides and skins whilst the Larder beetle exhibits a preference for meats, cheese etc.

# Hide & Larder Beetles

## Order: Coleoptera ('sheath wings')

### Importance as a pest cont...

Particular damage is caused as the mature larvae excavate chambers in which to pupate. They usually move away from the foodstuff in which they have developed in order to avoid being eaten by other larvae whilst they are inactive. This migration encourages cross-contamination between goods, packaging etc. Materials, which can be damaged, include soft sapwood, plywood, cork, polystyrene insulation and fibreglass wadding. Round holes approximately 4 mm in diameter are evidence of infestations and the burrows may extend up to 300 mm. Heavy infestations may result in the structural weakening of wooden pillars, catwalks etc. Plastic water pipes and plastic-covered electric cables can be damaged. Packaging e.g. egg trays may also be damaged. Plaster, lead and tin may be excavated, but not zinc or aluminium. Adult beetles are also occasionally implicated causing this damage.

### Control

**Assessment of infestations**

The first step in control is to trace the source of infestation. This is usually obvious although in some premises it may be obscure and found to be associated with a dead animal that has passed unnoticed or an old bird's nest.

**a) Hygiene/management**

All sources of infestation should be removed and disposed of, taking care not to spread the infestation. Routine surveillance and regular cleaning are important.

Metal proofing strips provide physical barriers that can be built into structures to restrict migrating larvae reaching pupation sites in the fabric of buildings.

**b) Insecticidal control**

Thorough surface spray treatments (see recom-mended products) with residual activity are vital where infestations are extensive. Poultry units should be treated when they are empty and when infestations become unacceptable. Barrier treatments can be applied to prevent migrating larvae reaching pupation sites. The treatment of infested manure is of limited value and may kill beneficial insects e.g. Carcinops pumilio.

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.


**Insecticide**

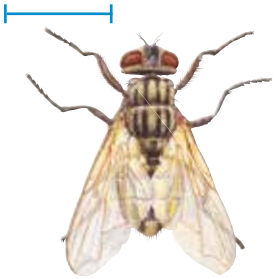
**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

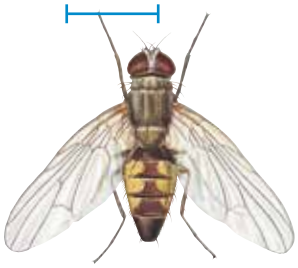
# Houseflies

## Order: Diptera (two-winged)

**Common Housefly**
14mm Wingspan



**Lesser Housefly**
12mm Wingspan



**Intergrated Pest Management**

Recommended products for: **HOUSEFLIES**

- ✓ AquaPy Go to Page 13
- ✓ QuickBayt Go to Page 37
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Single pair of membranous wings; hindwings modified as halteres; suctorial mouthparts, piercing or non-piercing; large compound eyes; tarsi, 5-segmented; metamorphosis complete with egg, larval, pupal and adult stages.

**Family:** Muscidae

**Species characteristics:**

**Common Housefly** (Musca domestica)

Adults, 6-8mm long with 13-15mm wingspan; grey thorax with 4 longitudinal dark stripes; basal half of abdomen buff-coloured and occasionally transparent at sides, with central dark band broadening to cover last abdominal segments; at rest, wings are spread; venation shows a sharp upward bend of 4th vein at apical end.

**Lesser Housefly** (Fannia canicularis)

Adults, 6mm long with 12mm wingspan; grey thorax with 3 longitudinal stripes, less pronounced than those of Common housefly; extensive yellow patch at base of abdomen; at rest, wings are folded along back; venation shows 4th vein extending straight to wing margin.

### Areas where found

**Common Houseflies** (M. domestica) are ubiquitous insects, with a flight range of at least 8 kilometres (5 miles). They are highly active indoors. In colder climates breeding generally ceases before winter, whereupon the insects overwinter either as pupae or adults. However, in warm environments houseflies remain active and reproduce throughout the year.

**Lesser Houseflies** (F. canicularis) are frequently encountered in poultry houses. They have an erratic flight pattern and are often seen flying in large numbers around indoor light fittings. The Lesser housefly is more tolerant of cool conditions than the Common housefly. This species survives the winter mainly in the form of pupae, although, as with the Common housefly, adults remain active and reproduce throughout the year in warm conditions.

# Houseflies

## Order: Diptera (two-winged)

### Importance as a pest

Houseflies can transmit intestinal worms, or their eggs, and are potential vectors of diseases such as dysentery, gastroenteritis, typhoid, cholera and tuberculosis. They will frequent and feed indiscriminately on any liquefiable solid food, which may equally be moist, putrefying material or food stored for human consumption. Flies liquefy food by regurgitating digestive juices and their stomach contents on to the food substance. This 'liquid' is then drawn up by the suctorial mouthparts and in so doing the insects pick up pathogenic organisms, which may collect on their bodies to be transferred on contact with other surfaces or survive passage through the gut to be deposited as fly spots.

Fly spotting, produced when the insect feeds or defecates, results in rejection of contaminated farm produce, for example eggs, at point of sale. Furthermore, flies are frequently the subject of complaints to environmental health authorities, causing major problems where infestations over-spill from breeding sites such as rubbish tips and animal houses.

The Lesser housefly makes longer flights and spends less time resting than the Common housefly. Females of the species tend to remain near the breeding sites and only the males migrate. For these reasons F. canicularis is less prone to transmit disease than M. domestica, but large populations and similar feeding habits mean that this insect, too, has a considerable potential to act as a vector of disease. It has occasionally been implicated in intestinal or urinary myiasis.

### Life-Cycle

#### Common Housefly

Forty-eight hours after emergence as an adult, the female commences egg laying. During her adult life of 1-3 months she is capable of producing 4-5 batches of 100-150 eggs. The pearly-white cylindrical eggs, 1mm in length, are laid in moist decaying matter such as household refuse, compost or dung. The eggs hatch in 8-48 hours, giving the smooth, white, legless maggot larvae. These burrow away from light, seeking an optimal temperature of 21-32°C, and after 3 moults reach maturity at a length of 10-12mm.

In the summer larval development may be completed within a few days, but in winter this process may take more than a month. When mature, the larvae leave the breeding site for the cooler surrounding areas; e.g. soil. Here they develop as yellow, brown or black pupae 6mm long. Depending upon conditions, adults emerge 3 days to 4 weeks later. The full cycle is generally completed between one and 4 weeks, depending upon temperature.

It is clear that there is considerable potential for the development of huge populations.

Under temperate conditions as many as 12 generations of flies may breed in one season whilst under tropical conditions even this rate of reproduction will be exceeded.

#### Lesser Housefly

Lesser houseflies are prolific breeders in poultry manure, but will also breed in other moist decaying matter. Egg laying commences when the female is 10 days old. The eggs are banana-shaped, 1mm in length and bear a pair of longitudinal ridges which assist flotation in a liquid medium. The flattened, legless, grey-brown maggots hatch within 24-48 hours. Hairy protuberances on their dorsal surface are thought to aid progression and floating in a semi-liquid medium. The newly hatched larvae frequently wander for a time before burrowing into a suitable food. Larval development requires a minimum period of 8 days, during which time the larva passes through 3 stages, eventually attaining a length of 6mm. Pupation requires a drier location and lasts for at least 10 days. Development from egg to adult emergence takes 3 weeks, although cooler conditions prolong this period.

# Houseflies

## Order: Diptera (two-winged)

### Control

**Flies have rapid, prolific breeding habits and high mobility. In order to break the life-cycle, control measures should be directed against larval and adult flies.**

**a) Hygiene/management**

Satisfactory hygiene is necessary to limit potential breeding sites and food sources.

**Domestic refuse:** this must be stored in well sealed bins, for early removal to disposal sites. High-risk material should be sealed in bags and burnt wherever possible. Refuse tips should be covered with earth, to a depth of at least 230mm (9 inches), and then compacted. This will minimise adult emergence and promote fermentation temperatures at which larvae cannot survive.

**Farm manure:** manure should be kept as dry as possible, especially in poultry houses, where leaking water feeders can provide ideal, moist breeding conditions. The Biothermic method of storing dung involves compacting manure into a cuboid stack, a method particularly suited to horse manure.

This form of storage promotes uniform, persistent fermentation throughout the dung, which is lethal to larvae.

Tarpaulins can also be used to cover heaps, in order to prevent egg laying and conserve the heat of fermentation.

Entry of adult flies into buildings can be prevented by 1.18mm-mesh fly-screens (which can easily be removed for cleaning), air curtains, bead screens or self-closing doors equipped with rubber flaps.

**b) Physical control using maggot traps**

Maggot traps take advantage of the fact that larvae need to migrate from breeding sites to cooler surroundings in order to pupate. A simple trap consists of a concrete platform, on which manure or refuse is stored, surrounded by a water-filled moat in which migrating larvae are trapped.

**c) Insecticides**

In order to obtain the best results, insecticidal control measures (see recommended products) should be integrated with good hygiene.

**Glossary of terms:**

**Halteres:** Club-shaped balancing organs.

**Suctorial:** Capable of sucking.

**Tarsus (Tarsi):** Apical section of leg (the foot)

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects

**Insecticide**

**QuickBayt**
QuickBayt is an insecticidal bait for the control of domestic house flies.


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Lesser Grain Borers

## Order: Coleoptera ('sheath wings')

**Lesser Grain Borer**
3mm Long

**Intergrated Pest Management**

Recommended products for: **LESSER GRAIN BORERS**

- ✓ K-Obiol Go to Page 23
- ✓ AquaPy Go to Page 13
- ✓ K-Othrine WG 250 Go to Page 25

### Decription

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membra-nous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Bostrichidae

Antennae usually less than 11 segments with loose 3-segmented antennal club; prothorax more or less covering downward-turned head; hind coxae touching.

**Species characteristics:**

**Lesser Grain Borer** ('Root destroyer from Dominica') (Rhyzopertha dominica)

Adult, 2.3 – 3.0 mm long: colour dark red-brown/black; cylindrical body with prothorax tuberculate, especially anteriorly; elytra with well defined rows of punctures; 5-segmented tarsi.

### Areas where found

The Lesser grain borer originated in South America but is now a cosmopolitan pest especially in warm countries. It is a thermophilic pest which is particularly successful where temperatures are elevated; it is not cold hardy and there is only limited development at temperatures less than 23°C. It is associated with a wide variety of vegetable materials including wheat, barley, maize, rice, millet (dari seeds), sorghum, dried potatoes, dried herbs and biscuits. Infestations have also been recorded in wood and books.

In Australia and India it is a serious pest of grains. Infestations are encountered in grain stores including ships holds, flour mills and animal feed mills.

### Importance as a pest

Lesser grain borers are primary pests of grain and will therefore attack undamaged grain rendering it susceptible to attack by secondary pests. Both the adults and larvae feed on the grain creating floury dust and potentially leaving little but empty husks. The adults are active and may infest a large number of kernels whilst the larvae penetrate kernels and develop within the grain. Infestations in wheat can lead to reduced flour yields and will affect the quality of dough. Both volume and loaf characteristics can be adversely affected.

Commodities may be tainted by insect excreta and secretions. Heavily infested wheat is reputed to have an honey-like odour.

### Life-Cycle

The female Lesser grain borer lays between 300-500 eggs over a period of ca three weeks. They are laid singly or in clusters from 2-30 and are often attached to the grain. Depending upon temperature the eggs hatch in 7-18 days to give white larvae with brown heads and relatively small legs. These bore into the grains where they feed and develop into fleshy forms with a typical C-shape. There are up to five moults leading to pupation in the grain. The pupal stage lasts about one week. The total life cycle lasts from 24-133 days depending upon temperature. At 26°C and 70% RH (14% MC in commodities) the life cycle lasts 45 days. Adults can live for 10 months.

# Lesser Grain Borers

## Order: Coleoptera ('sheath wings')

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning.

They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products). Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises. The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues in which beetles can breed and develop to infest new materials. Infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

**Glossary of terms:**

**Prothorax:** First thoracic segment.

**Tarsus (Tarsi):** Apical section of leg (the foot).

# Recommended Products


**Insecticide**

**K-Obiol**
K-Obiol EC25 is a liquid grain protectant for the control of stored product pests including crawling insects.


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects

**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Lesser Mealworms

## Order: Coleoptera ('sheath wings')

**Lesser Mealworm**
5.5 - 6.7mm Long

**Intergrated Pest Management**

Recommended products for: **LESSER MEALWORMS**

- ✓ AquaPy Go to Page 13
- ✓ Ficam D Go to Page 19
- ✓ K-Othrine WG 250 Go to Page 25

### Decription

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hind-wings membranous, sometimes lacking; biting mouthparts; well-developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Tenebrionidae

Usually 11-segmented antennae; front and middle tarsi are 5-segmented and hind tarsi 4-segmented.

**Species characteristics:**

**Lesser Mealworm Beetle (Darkling Beetle)**
(Alphitobius diaperinus)
Adults, 5.5 - 6.7 mm long; body, broadly oval, shiny dark-brown or black; elytra: uniformly coloured with moderately impressed striae; underside, dark red brown; fore tibia strongly broadened at apex.

### Areas where found

A cosmopolitan species thought to have originated in sub-Saharan Africa. In temperate areas they are typically found indoors although, being reasonably cold tolerant, they will survive in unheated buildings. The Lesser mealworm beetle is widely distributed in animal houses and especially poultry houses where the conditions reflect those of its tropical origin.

Infestations are encountered in deep-pit and deep-litter poultry houses.

They are associated with a variety of stored products. Infestations in animal houses may be introduced by way of contaminated feed. The insects live in the manure and litter of poultry houses and are often associated with the feed and water lines.

# Lesser Mealworms

## Order: Coleoptera ('sheath wings')

### Importance as a pest

Lesser mealworm beetles will infest a range of stored products including cereals, farinaceous products, oilseeds, groundnuts and bones but are not regarded as major pests. They are associated with cereal grains, which have previously been damaged by e.g. moulds and, where infestations are encountered in residues, indicate poor hygiene.

They are of particular significance in animal houses, especially those where poultry and pigs are kept. The following problems may be encountered:

Transmission of diseases and parasites. Lesser mealworm beetles are vectors and reservoirs for a variety of poultry diseases including Marek's disease and Newcastle disease. They are intermediate hosts for tapeworms, roundworms and protozoan parasites and can transmit the causative agents of bacterial diseases e.g. Salmonella spp.

Allergic reactions may be triggered following the exposure of people to the quinones released by the insects as a defence reaction.

Welfare of poultry. The birds are disturbed by the presence of the insects. They may feed on the larvae, which detrimentally affects their food conversion rate, runs the risk of intestinal obstruction and puts them at risk of ingesting harmful organisms. Young, weakly chicks may be attacked and killed. Damage to the structure of poultry houses. The larvae will tunnel earth floors rendering them uneven and difficult to clean. Significant structural damage can be caused as the larvae excavate tunnels in which to pupate. Wall plaster, which is in poor condition, may be damaged. In particular, polystyrene, fibreglass and other insulation materials can be damaged resulting in a significant increase in heating bills.

Litter may be rendered so powdery that it must be replaced.

Nuisance may be caused where beetles disperse to adjacent properties perhaps following the spreading of manure onto fields. The adults will fly if the temperature is sufficiently high and are attracted to artificial light.

The beetles will consume housefly larvae although they are not generally regarded as a significant factor in fly control. They will also feed on the immature forms of Carcinops pumilio so reducing its effectiveness as a predator on houseflies. As a result of burrowing, they will aerate manure, causing it to dry and making it less attractive for houseflies to breed.

### Life-Cycle

Females lay up to 400 eggs in manure, litter, cracks and crevices in buildings or commodities. The eggs are about 1mm long and sticky so are soon covered in debris and cease to be recognisable. They hatch within a week to give larvae, which are grey-brown in colour and exhibit a characteristic "tail horn." The larvae are very active, avoid light and feed on litter, manure, spilt food and even dead or weak birds. There are approximately 5–11 larval stages and dark banding becomes more prominent with time. The larvae are fully-grown after 1–2 months and may be up to 15 mm long. Mature larvae seek suitable sites where they can pupate. These include the fabric of buildings which they may excavate causing significant damage. The pupae are light coloured and hatch in about a week, to give adults which can live beyond a year. Under optimal conditions the full life-cycle takes about five weeks.

# Lesser Mealworms

## Order: Coleoptera ('sheath wings')

### Control

**Assessment of infestations**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. The population may be measured by counting larvae on the fabric of buildings e.g. walls and posts. Samples of insulation materials can be placed around buildings and monitored for the entry holes of larvae seeking pupation sites.

**a) Hygiene/management**

All sources of infestation should be removed and disposed of, taking care not to spread the infestation. Regular removal of manure and litter from poultry houses will control the beetle. Routine surveillance and regular cleaning are important but this can be difficult as the adults and larvae burrow making them inaccessible. Care should be taken to ensure that infested food is not taken into animal houses.

Metal proofing strips provide physical barriers that can be built into structures to restrict migrating larvae reaching pupation sites in the fabric of buildings.

There may be scope for employing insulation materials which are resilient to the larvae.

Cooling premises to sub-zero temperatures for a number of days may help to control residual populations.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of infested premises concentrating on potential insect harbourages ideally after cleaning. It is difficult to control the insects in animal houses with insecticides because they are readily protected by the litter in poultry houses and as they burrow, whilst residues can be rendered ineffective by accumulations of manure and dust. Barrier treatments can be applied to prevent migrating larvae reaching pupation sites. Care should be taken not to kill beneficial insects e.g. Carcinops pumilio.

### Glossary of terms:

**Elytra:** Hardened forewings of the beetle.

**Striae:** Grooves along or across body.

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity.


**Insecticide**

**Ficam D**
Ficam D is ideal to use where liquid-based formulations are unsuitable.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Mosquitoes

## Order: Diptera ('two-winged')

**Intergrated Pest Management**

Recommended products for: **MOSQUITOES**

- ✓ AquaPy Go to Page 13
- ✓ Ficam W Go to Page 21
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Adults: Globular head, a large part of the surface of which is taken up by the compound eyes; a pair of antennae, which are about three times as long as the head, are somewhat hairy in the female and quite bushy in the male; this difference provides a ready means of distinguishing between the sexes with the naked eye.

Also on the head a pair of palps, one on each side of the proboscis; in the female they are smooth, in the male they have tufts of bristles. Mouthparts form a long thin projecting proboscis which in the female are designed for piercing; there is a single pair of membranous wings which bear tiny scales along the veins as well as a fringe of scales along the hind margin. The wing venation is also typical with 6 longitudinal veins of which the second, fourth and fifth are forked; tarsi are 5-segmented.

**Larvae:** Entirely aquatic. They have a well developed head followed by a swollen unsegmented thorax; abdomen is segmented and there is a pair of spiracles on the last but one segment through which they breathe at the water's surface. Tufts of bristles arise from many of the body segments.

**Pupae:** Comma-shaped with a curved tail which ends in a pair of paddles; head is equipped with a pair of respiratory trumpets through which the pupa breathes. The fused head and thorax show traces of the wings and long legs of the adult which are developing inside.

**Family:** Culicidae (mosquitoes)

Metamorphosis is complete with egg, larval, pupal and adult stages. There are about 3000 species of mosquitoes in the world.

**Sub-Family:** Anophelinae

**Genus:** Anopheles spp.

**Characteristics:**

Wings speckled with dark and pale-coloured scales and there are no scales on the abdomen. Female palps almost as long as the proboscis, the male palps are usually clubbed. When resting the abdomen is held at an angle from the surface on which the mosquito is standing, forming a straight line with the proboscis (e.g. Anopheles gambiae).

**Sub-Family:** Culicinae

**Characteristics:**

Female palps are short and the abdomen is covered in scales. The resting stance is parallel to the surface.

**Genus:** Culex spp.

**Characteristics:**

Vary in size but all have a blunt tipped abdomen and usually lack distinctive markings on the body or wings (e.g. Culex quinquefasciatus).

**Genus:** Aedes spp.

**Characteristics:**

Medium to large; most have pointed abdomen and well separated eyes; usually distinctly marked by patches of dark and light scales; often general appearance of black with silver markings (e.g. Aedes aegypti).

# Mosquitoes

## Order: Diptera ('two-winged')

**Genus:** Mansonia spp.

**Characteristics:**

Medium sized and heavily covered in scales which are of mixed colours giving a 'salt and pepper' appearance. Larvae are rarely seen since they remain submerged and pierce plant tissues with their breathing siphons to obtain oxygen (e.g. Mansonia uniformis).

**Note:** There are several other Genera of mosquitoes some of which are implicated in disease transmission but others are of no risk to humans. Space does not allow consideration of all the other Genera here.

### Areas where found

Mosquitoes are ubiquitous insects, they can be found in nearly every type of climatic region of the world from the arctic regions to the tropics, surviving severe winters or dry seasons depending on the region. Depending on species they can be found breeding in all types of water; from heavily polluted, to clean; from small collections of water in tin cans, to pools or streams; such is their adaptability. Their distribution is increased and aided by transport systems such as boats and aircraft and non-indigenous species have been introduced to new territories in this way, even infected mosquitoes have been transported to temperate climates, thereby transmitting tropical diseases.

### Importance as a pest

Primarily a seasonal biting nuisance in cooler climates but in the tropics they can also be major vectors of disease. They can transmit many diseases to both humans and animals, e.g. malaria, filariasis, yellow fever, encephalitis, and dengue fever. Only a few species of mosquitoes are implicated as vectors of human diseases. It is those which utilise humans as their primary host and are also willing to enter houses in their pursuit of a blood meal which are the most important. Some species do not feed on humans at all but utilise other mammals, birds or even reptiles as their hosts. Statistics show that 270 million people are infected with malaria alone and  of those up to two million will die annually. It is this that makes the mosquito the most dangerous creature in the world.

### Lifecycle

The mosquito mates within 48 hours of emergence from the pupa. The female only mates once in her lifetime, because she is able to store the sperm in sacs within her body and fertilise subsequent batches of eggs herself.

Most mosquitoes feed from sunset onwards, both sexes feed on nectar or fruits for sustenance but the female usually requires the high protein content of blood to produce eggs and soon after mating she will go in search of a blood meal. The female has powerful sensory organs which are able to detect body smell, carbon dioxide, warmth and moisture emanating from the host, she follows these stimuli upwind until she locatesthe host. Adults can fly several kilometres in search of food but can disperse further when carried by the wind. The female pierces the host's skin with her mouthparts and locates a blood vessel from which to suck blood. She takes approximately her own bodyweight in blood at each feed. While feeding, saliva which contains an anti-coagulant passes into the wound to stop clotting and keep the blood flowing.

It is the host body's allergic reaction to this which causes the irritating marks left behind. Whilst the infected mosquito feeds, disease causing parasites are able to enter the host's body via the saliva or mouthparts of the infected mosquitoes. Conversely an uninfected mosquito becomes infected when it feeds on a person carrying infective forms of the parasite. These develop within the mosquito until the  insect becomes infective and can transmit the parasites to new hosts. The relationships between parasite, mosquito and host have evolved over many years and are often highly specific to the species involved. The blood meal stimulates egg production and provides the nutrients required for the eggs to develop. They are fertilised from stored sperm just before they are laid, between 30-350 eggs are laid in each batch, depending on the species.

They are spindle-shaped averaging 1.5mm in length and are laid either on surfaces surrounding the water's edge or in small floating rafts of eggs glued together or laid singly and scattered over the surface of the water, depending on the species. Eggs hatch after several days and the first stage larva swims free. The larva feeds by the action of mouth brushes which cause a current of water to flow past the mouth bringing with it organic particles. They will also browse on algae or plants. Culicine larvae obtain their food at various depths but the Anopheline larvae feed only on substances floating on the surface of the water. Culicine larvae hang from the surface of the water by their breathing siphon in contrast to Anopheline larvae which lay horizontal to the surface.

# Mosquitoes

## Order: Diptera ('two-winged')

The larvae pass through 4 developmental stages or instars, at the end of each instar the larva sheds its skin or moults. When the 4th instar larva sheds its skin it becomes a pupa. The pupa does not feed but remains at the water's surface.

When disturbed they dive with a jerking motion returning to the surface passively. The adult mosquito develops within the pupa. When it is fully developed the pupal skin splits along the dorsal surface and the adult emerges. Within a short time when the cuticle has hardened and the wings expanded, it will fly off. The adult's life expectancy is not usually more than a few weeks unless it is in diapause. During its life however the female may lay several batches of eggs each containing several hundred eggs.

The length of the complete life cycle is very dependent on temperature and can range from 10 days to 6 months or longer in those species which overwinter as larvae.

### Control

Control measures can be directed against the larvae or adults.

#### Larvae

Larval habitats may be minimised especially in urban environments by sealing drains and soakaways, removing receptacles containing water such as old tins or tyres etc. In other situations physical methods such as ensuring drainage channels run freely or draining standing water from building sites, earthworks etc. will contribute to reducing the problem. Where these physical measures are not possible larvicides may be applied regularly to the water to kill the larval stages before they pupate.

#### Adults

Adult mosquitoes may be killed indoors using an aerosol, or the biting nuisance may be minimised by the use of repellents, treated bed nets, vaporisers eg. mosquito coils, mats etc. Vector control programmes may use surface sprays with residual activity applied inside houses. Alternatively, the use of space sprays eg Ultra Low Volume (ULV) aerosols or fogs will rapidly reduce adult populations indoors or outside.

### Glossary of terms:

**Diapause:** A period of suspended development or growth.

**Instars:** Any stage in an insects life cycle, especially between moults.

**Palps:** Sensory organs associated with the mouthparts.

**Spiracle:** External opening of the trachea; breathing pore.

**Tarsus (Tarsi):** Apical section of leg (the foot).

**Vector:** An animal which transmits parasites.

# Recommended Products


**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knockdown and control of a range of flying and crawling insects


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Pharaoh Ants

## Order: Hymenoptera ('membrane-winged')

**Pharaoh Ant (Worker)**
2mm Long

**Intergrated Pest Management**

Recommended products for: **PHAROH ANTS**

✓ Maxforce Quantum
Go to Page 31

### Description

**Characteristics:**

Elbowed antennae; biting mouthparts; if present, two pairs of membranous wings, fore and hind-wings hooked together; abdomen constricted at base giving appearance of a waist which bears characteristic nodes or scales; metamorphosis complete, with egg, larval, pupal and adult stages; possess complex social system.

**Family: Order:** Formicidae

**Species characteristics:**

**Pharaoh's Ant** (Monomorium pharaonis)
Workers 1.5-2mm long, yellow-brown in colour occasionally with a brown abdomen. Antenna with 12 segments and 3-segmented club. Well developed black eyes. Thorax with no spines and relatively small gaster. Binodal pedicel. Males 3mm long, black. Winged (but do not fly). Queens 3.6-5mm long, dark red in colour. Winged (but do not fly). Wings are lost soon after mating.

### Areas where found

Originated in the North Africa/Mediterranean region. Spread along international trade routes and now widely distributed. Their need for warm humid conditions means that in temperate lands they are confined to buildings. Infestations can be found in a wide variety of locations including residential blocks, hotels, hospitals and other institutions, food handling premises, zoos and on board ship. In warm climates infestations can be found outside.

The insects may be associated with the fabric of buildings (e.g. wall voids, windows, storage areas etc.), plants and sterile supplies.

Infestations spread through buildings by way of service ducts (e.g. heating and electrical conduits). The ants will forage for water around sinks and where condensation has occurred (e.g. windows, walls etc.).

The ants can survive low temperatures for prolonged periods with the workers continuing to forage for food. The minimum temperature for success is 18°C and the colonies thrive at 30°C. Infestations in buildings are relatively unaffected by the seasons although may be encouraged when heating systems are switched on during the winter.

# Pharaoh Ants

## Order: Hymenoptera (‘membrane-winged’)

### Importance as a pest

Worker ants are a nuisance as they forage widely for food and water following scent marked trails. Although omnivorous they tend to prefer proteinaceous foods. They will feed on meat, cheese, fats, sugar, honey, jam, chocolate etc. In hospitals they will also feed on blood, intravenous diet fluids, the fluid associated with wounds and vomit. Dead insects, mice and mouse droppings can also provide food for the ants. Clothing and laundry may be infested.

Packaging may be damaged and the ants can penetrate plastic bags containing sterile dressings and instruments.

Pharaoh’s ants pose a risk to health. Pathogenic organisms may be transmitted mechanically as the ants feed in unhygienic places including drains, refuse bins, wound dressings etc. Their ability to infest sterile supplies in hospitals is of particular concern.

### Life-Cycle

Pharaoh’s ants are social insects and live in colonies. These range in size from a few dozen to 300,000 ants. Colonies consist of: workers (sterile females), fertile males and queens (fertile females). There are usually many queens in a colony (multiqueen colonies) and they co-exist amicably. The queens can be replaced so colonies will survive indefinitely.

New colonies are typically formed by budding and may be encouraged by disturbing nests. Adult ants are responsible for this process which may include queens. Worker ants carry larval stages to a new nest site from which they can rear queens and males. Temporary nests may be established whilst the workers search for new sites. If established in mobile equipment infestations can be widely distributed.

The workers provide food for the colony and maintain the nest. Only 5-10% of workers are actually engaged in foraging. Fertile males and females develop from well fed larvae. Flying swarms are never seen, mating taking place in the nests and interstices of buildings. Each queen produces up to 350 eggs. These hatch in about a week to give legless larvae which are fed by the queens and tended by the workers. Larval development takes approximately three weeks. The pupal stage lasts about nine days. The whole cycle from egg laying to adult takes about 51⁄2 weeks depending upon temperature.

# Pharaoh Ants

## Order: Hymenoptera (‘membrane-winged’)

### Control

Successful control of Pharaoh’s ants requires the destruction of nests. This is difficult to achieve because nests are often located in inaccessible places. The most effective control measures involve a thorough insecticide treatment so all the insects constituting the infestation will be exposed to the toxicant within a short space of time. This is best achieved by baiting but conventional insecticide treatments may be necessary to effect a rapid control of ants in some situations or establish perimeter treatments to protect areas from ant immigration. However, conventional treatments alone are of limited value for the control of Pharaoh’s ant nests.

Surveys must be conducted to determine the extent of the infestation. These should involve visual assessments and the collection of information about the distribution of ants from clients. Additionally a survey can be conducted by baiting. Baits may be based upon various materials including honey, sugar and meat (e.g. raw liver).

Once the extent of the infestation has been identified the insecticidal bait can be applied (see recommended products). It is recommended that bait placement commences outside the infested area and progresses inwards until the whole area has been treated. Care must be taken to ensure no pockets of infestation are missed during the treatment. The success of the treatment can be determined by further surveys.

# Recommended Products

**Insecticide**

**Maxforce Quantum**
A ready to use insecticidal gel bait for the control of Black, Pharaoh, Ghost and Argentine ants.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Poultry Red Mites

## Order: Acarina Mesostigmata/Gamasina

**Poultry Red Mite**
0.7-1mm long
H

**Intergrated Pest Management**

Recommended products for: **POULTRY RED MITES**

✓ None Presently

### Description

**Characteristics:**

Usually less than 2 mm long. There is little evidence of segmentation. The body consists of the sac-like idiosoma and the gnathosoma, which carries the mouthparts and sensory organs. The mouthparts include a pair of 3-segmented chelicerae, which may be pincer-like or piercing. The idiosoma is rounded or oval and the dorsal surface sclerotized with shield-like plates. Adults have eight legs, which are usually well developed, the front pair being employed as sensory organs rather than for walking. There is a single pair of spiracles opening between the second and third or third and fourth pair of legs. Metamorphosis is incomplete with egg, larval and nymphal stages.

**Species characteristics:**

**Poultry Red Mite (Chicken Mite)**
(Dermanyssus gallinae)

Adults, 0.7 –1.0 mm long; idiosoma oval, colour-less to bright red or grey-black (if containing partially digested blood); chelicerae of females well developed, narrow towards the tip and approximately half as long as the idiosoma; dorsal surface with weak sclerotisation and pairs of setae.

**Northern (European) Fowl Mite**
(Ornithonyssus sylviarum)

Sometimes confused with the Red Poultry Mite although it lives on the host and is active during the day. Chelicerae do not narrow at the tip and bear shear-like chelae with no teeth or setae; sternal plate with two pairs of setae.

### Areas where found

A cosmopolitan species widely distributed throughout Europe. It is found naturally in wild bird nests, the small size of the mites making them ideally suited to a close association with birds. They feed on blood and are particularly associated with the nests of pigeons, starlings, sparrows, swallows and house martins. When the birds fledge and leave their nests the mites may disperse and infest nearby buildings including poultry units. Adult mites are resistant to dessication and starvation and can survive without food for several months. Extreme temperatures e.g. 45° C and -20°C are lethal and survival is best at higher relative humidities e.g. 70%.

Red poultry mites are important pests in poultry units and appear in all types of production systems. Conditions in poultry houses are ideal for the mites and large populations can rapidly develop. The mites are nocturnal and spend the day resting in cracks and crevices where they are safe from predation by the birds. At night time they quickly move onto the birds and will feed for up to two hours. Freshly fed mites are bright red in colour but, as the blood is digested, they gradually turn darker and eventually become colourless.

Mites can be introduced into poultry units from infestations associated with wild birds, with newly introduced poultry, on equipment, transport or clothing.

# Poultry Red Mites

## Order: Acarina Mesostigmata/Gamasina

### Importance as a pest

When the mites infest buildings they will attack people causing painful and irritating bites.

Large infestations in poultry houses may lead to a number of problems including:

Disturbance and stressing of the birds, which may be reluctant to use infested nests.
Increased feather pecking.
Anaemia, leading in severe cases to death.

**Transmission of diseases.**

Red poultry mites are implicated in the transmission of Salmonella spp., Erysipelothrix rhusiopathiae (the causative agent of erysipelas), Newcastle virus etc.

Reduced productivity:
Reduced weight gain.
Reduced egg production.
Reduced quality of eggs:
Smaller eggs.
Inferior shell quality.
Inferior yolk colour.
Contamination with mites and their faeces.

### Life-Cycle

Female mites lay as many as 40 eggs in batches up to seven at a time, 12–24 hours after taking a blood meal. The eggs are oval, cream-coloured and approximately 0.4 mm long. They are laid in nests, cracks and crevices around roost sites and hatch in 1–3 days to give 6-legged larvae. The larvae do not feed and remain inactive until they moult within two days to give 8-legged nymphs. Like the adults, nymphs take blood meals, usually during the night, and spend the day sheltering in cracks and crevices in and around the nests. There are typically two nymphal stages before they moult to become adults. Under favourable conditions the full life-cycle takes about a week.

### Control

**Assessment of infestations**

Populations of Red poultry mites can establish themselves very quickly and, as infestations become deep-seated, they are difficult to control. Regular monitoring is important to ensure infestations are dealt with at the earliest opportunity. Mites may be collected from birds or resting sites, but the fact that they are not active during the day and hide in cracks and crevices means it may be difficult to measure populations. They can be expelled from harbourages e.g. equipment by tapping them onto sheets of paper.

**a) Hygiene/management**

Infestations associated with wild bird nests can be controlled by removing and destroying the nests with due regard to any statutory protection which exists for the bird species involved.

In poultry houses, efforts should be made to limit the harbourages available for the mites. This can be achieved by limiting the use of wood, employing impervious materials which are easy to clean, equipment design and sealing potential refuges.

Care should be taken not to introduce infestations via newly introduced poultry, on equipment, transport or clothing. Buildings should be proofed to prevent the ingress of wild birds, which may be infested.

Thorough cleaning of the empty poultry house, including the outside, by power washing, steam cleaning etc. will control the mites and should precede the application of acaricides. Equipment should be dismantled as necessary and be thoroughly cleaned.

**b) Acaricidal control**

Where infestations are associated with wild bird nests, the infested areas should be treated with a suitable acaricide.

Infested areas of poultry houses should be treated as soon as they are identified, paying particular attention to mite harbourages. Thorough treatments with acaricides should also be made when houses have been cleared and cleaned.

See recommended products.

### Glossary of terms:

**Chelicerae**: Anterior appendages (mouthparts).
**Gnathosoma:** Segments bearing the mouth and its appendages.
**Idiosoma:** Sac-like body bearing legs.
**Setae:** Bristle or “hair” of invertebrates.

# Rodents (Commensal)

## Order: Rodentia

**Norway Rat**
220-260mm Long

**Black Rat**
180-230mm Long

**House Mouse**
60-90mm Long

**Intergrated Pest Management**

Recommended products for: **RODENTS**

- ✓ Rodilon Wheat Tech Go to Page 43
- ✓ Rodilion Trio Go to Page 43
- ✓ Rodilon Blocks Go to Page 43
- ✓ Rodilon Soft Blocks Go to Page 43
- ✓ Racumin Foam Go to Page 39
- ✓ Racumin Paste Go to Page 41

### Description

**Characteristics:**

Brownish or greyish rodents with a tail approximately as long as the body. Omnivorous, often live in or around buildings.

**Family:** Muridae

**Species characteristics:**

**Norway Rat** (Rattus norvegicus)

Common names are Norway rat, Common rat and Brown rat. Adults: 220-260mm long; tail length 160-200mm; weight 150-450g; droppings are approx 20mm long. Upper brown body with a white, yellowish belly.

**Black Rat** (Rattus rattus)

Common names are Ship rat, Roof rat or Black rat. Adults: 180-230mm long; tail length 180-240mm long; weight 120-300g; droppings are approx 12mm long.

Despite its name it is usually black to light brown in colour with a lighter underside.

**House Mouse** (Mus musculus)

Common name is the House mouse. Adults: 60-90mm; tail length 80-100mm long; weight 15g-33g max; droppings are approx 3-6mm long.

### Areas where found

**Norway Rat** (Rattus norvegicus)

The Norway rat originated from Central to East Asia. It is thought to have arrived in Europe later than the Black rat, c. 16-17th century.

**Black Rat** (Rattus rattus)

The Black rat originated from India to Eastern Africa and was introduced into Europe over 2,000 years ago. The Black rat can now be found world-wide.

**House Mouse** (Mus musculus)

The House mouse originated from East-Asia and has spread throughout the world in distributed grain and food.

# Rodents (Commensal)

## Order: Rodentia

### Importance as a pest

**Human health**

- Carriers of over 45 types of diseases including spirochaetes causing Weil's Disease (Leptospirosis), Salmonella, E.coli, enteritis, listeriosis, rickettsiosis, dysentery and many others.
- Contamination of water and food
- Contamination of environment

**Direct food losses:**

- Field crop losses
- Stored food and food prod. chain losses

**Indirect food losses**

- Packaging destruction, spillage
- Contamination with faeces

**Construction**

- Damages in buildings
- in sewers, dikes etc.
- in electric facilities and cables
- in communication

**Animal production**

- Feed losses and spillage
- Vector and reservoir of pathogens

**Life-Cycle**

**Norway Rat** (Rattus norvegicus)

The Norway rat reaches sexual maturity in about 2-3 months and are reproductive for one year. Norway rats can breed throughout the year if conditions are suitable. The gestation period is only 21 days and a female can produce up to a maximum of five litters a year. 14 pups per litter is the maximum, although six is the average.

**Black Rat** (Rattus rattus)

The Black rat's live-cycle is very similar to the Norway rat, but it may live longer.

**House Mouse** (Mus musculus)

The House mouse reaches sexual maturity at 35-40 days. Outdoors they will breed throughout the summer only and indoors they will breed continuously. The gestation period is 19-21 days and a female can produce up to a maximum of 10 litters a year. 20 pups per litter is the maximum, although six is the average.

### Control

An integrated pest management approach using a combination of control measures (e.g. improving hygiene, proofing) is necessary in order to gain control of a rodent infestation. Baiting alone is not sufficient. To effectively control rat and mouse problems there are six golden rules which should be followed:

**Inspection / Assessment of infestation**

A thorough survey of the infested site before treatment begins is an essential key to success when using any rodenticide. It is important to determine the exact source of the infestation so that the problem can be tackled at source. Typical signs of an infestation are the smudge marks left by a rodent's oily hair, its droppings and any damage to goods or structures. Draw up a simple site plan or location list identifying areas of particular concern pertinent to the site and retain this on file.

**a) Identification**

Rats and mice have significantly different behaviour patterns and need to be controlled in different ways. It is important to identify the species of the infestation so that the correct tactics can be employed to eliminate the problem. An inspection of the droppings can help in the identification.

**b) Use an effective bait**

Rodenticides with good palatability used correctly and in accordance with the CRRU (Campaign for Responsible Rodenticide Use) Code can be used to control rat or mice infestations.

**c) Remain vigilant**

Once an infestation has been controlled there will always be new rodents waiting to move into the same territory, always monitor for new activity and begin a baiting programme as soon as possible.

**d) Sanitation**

Removing the rodents' food sources is a key factor in successful rodent control. Rubbish, food or feed should be stored where possible in sealed containers. Outside debris and vegetation partic-ularly where it is in contact with a building should be removed. In addition try to reduce the number of water sources where rodents are able to drink from.

# Rodents (Commensal)

## Order: Rodentia

**e) Rodent proofing**

Keeping rodents out of buildings by closing off the typical places where they can gain access is a key factor in good rodent control. Try to close all holes in external walls, reinforce the base of wooden doors with metal strips to prevent gnawing and access, install self closing devices on doors that are frequently used.

## Recommended Products

**Rodenticide**

**Rodilon Wheat Tech**
Rodilon Wheat Tech is a highly potent anticoagulant whole wheat bait with no known resistance in rats or mice.

**Rodenticide**

**Rodilion Trio**
Rodilon Trio is a highly potent anticoagulant mixed grain bait with no known resistance in rats or mice.

**Rodenticide**

**Rodilon Blocks**
Rodilon Blocks are a highly potent anticoagulant extruded block with no known resistance in rats or mice.

**Rodenticide**

**Rodilon Soft Blocks**
Rodilon Soft Blocks are a highly potent anticoagulant paste with no known resistance in rats or mice.

**Rodenticide**

**Racumin Foam**
An anticoagulant contact rodenticide for indoor use against rats and house mice.

**Rodenticide**

**Racumin Paste**
A convenient, premeasured, 100g ready to use soft block formulation suitable for almost any environment when secured in a bait box.

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Spider Beetles

## Order: Coleoptera ('sheath-wings')

**Spider Beetle**
3.2mm Long

**Intergrated Pest Management**

Recommended products for: **SPIDER BEETLES**

- ✓ AquaPy Go to Page 13
- ✓ K-Othrine WG 250 Go to Page 25
- ✓ Ficam D Go to Page 19

### Description

**Characteristics:**

Forewings hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts; well developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

**Family:** Ptinidae

Members of this family possess long, 11-segmented antennae, positioned between the eyes, plus a number of characteristics which give them a spider-like appearance: a stout body with hairy surface; a waist-like constriction at the base of the prothorax; 6 (not 8) long thin legs with 5-segmented tarsi.

**Species characteristics:**

**Australian Spider Beetle** (Ptinus tectus) Adult, 2.5-4mm long; elytra clothed with dull-brown to golden-brown hairs; striae not distinct unless hairs rubbed off.

**White-Marked Spider Beetle** (Ptinus fur)

Adult, 2-4.3mm long; red-brown with yellow hairs; prothorax with dense cushion of pale hairs on each side; elytra with white scales; striae visible.

**Golden Spider Beetle** (Niptus hololeucus)

Adult, 3.0-4.5mm long; elytra and thorax clothed in silky golden-yellow hairs and fine scales.

**Hump Spider Beetle** (Gibbium psylloides)

Mite-like appearance, 1.7-3.2mm long; colour, shiny red-brown to black; lacks characteristic waist-like constriction; devoid of hairs.

### Areas where found

Ptinus tectus originated in Australasia. It is a cosmopolitan species which reached Europe in the 19th century and is now widely distributed. It is rarely imported and infestations often originate in birds' nests. There are 2-4 generations per year in unheated conditions. All stages except eggs and young larvae can overwinter.

Ptinus fur is a closely related species which is also cosmopolitan in distribution.

The Golden spider beetle has similar feeding habits to the Australian species, exhibits a preference for moist places and will occasionally infest textiles, especially if soiled with grease. It is increasingly common in domestic premises. There is usually one generation per year in unheated conditions in temperate lands and peak activity is reached between August and November.

Gibbium psylloides. This insect is tolerant of cool conditions and can survive for long periods without food supplies.

# Spider Beetles

## Order: Coleoptera ('sheath-wings')

### Importance as a pest

Spider beetle larvae will infest all manner of dry animal and vegetable matter including grain, spices, fish meal, dog biscuits, dried fruit and a wide variety of miscellaneous debris. They will scavenge among the debris of neglected stores, and have even been reported infesting insecticidal derris powder. The larvae bore holes in which to pupate, and in so doing may damage packaging or the commodities themselves.

They also contaminate commodities with droppings and silk webbing. Adult beetles, too, will damage packaging including bags and sacks.

Gregarious and nocturnal, they spend the day in cracks and crevices amongst packaging and the fabric of the store. Consequently they can thrive in old buildings where they find many harbourages.

### Life-Cycle

The female Australian spider beetle may produce 120 or more eggs over 3-4 weeks in early summer. They are laid either singly or in batches and, being sticky, will adhere to the substrate. At 20-25°C the eggs hatch in 3-16 days, giving larvae which are fleshy, curved, covered with fine hairs and relatively immobile, although they will rapidly curl up when disturbed.

Development takes at least 6 weeks, during which time the larvae moult 4 or 5 times. When mature, they wander in search of a pupation site where they will spin a cocoon cell in which to pupate. These cocoons are often found on the outside of cartons through which the larvae have bored. Adults emerge after 20-30 days and will live for as long as 12 months. If disturbed they will feign death.

The full life-cycle takes 3-6 months, depending upon ambient conditions, and can take place in a temperature range of 5-28°C.

The life-cycle of the Golden spider beetle resembles that of the Australian species. The eggs hatch in 11-30 days at 15-20°C, the larvae live for 150-250 days and pupation takes 18-26 days, after which the adults live for up to 8 months.

Gibbium psylloides again has a similar life-cycle to the Australian and Golden spider beetles, but the adults are particularly long-lived, surviving for up to 1.5 years. The optimum temperature for development, which can take place within the range 20-35°C, is 33°C, when it takes about 45 days.

### Control

**Assessment of infestations:**

A variety of trapping techniques are available for measuring stored product beetle infestations. These include pit fall traps, bait bags, insect probe traps and adhesive traps. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

Stores should be soundly constructed to ensure maintenance of correct storage conditions and allow for easy cleaning. They should be insulated, well ventilated and damp-proof. Cracks and crevices, which may provide harbourages for the beetles, should be kept to a minimum.

Commodities should be stacked neatly above the floor level using pallets, away from walls and should not touch the ceiling. A gap between stacks will allow for ventilation, regular inspection, cleaning and, if necessary, treatment with insecticides (see recommended products). Appropriate stock rotation is important and if possible there should be a one-way passage of commodities through the premises. The careful choice of packaging can help to deter insect attack. Generally, thick, tough materials with a smooth, shiny finish are preferred. Packs should be strong and well sealed.

It is important to ensure that there are no food residues (stored commodities or secondary sources, e.g. birds' nests) in which beetles can breed and develop to infest new materials. All infested commodities should be destroyed or fumigated. Stores should be kept scrupulously clean and farm stores should be thoroughly cleaned before harvest.

All grain taken into store should be dried to a suitable moisture content (MC) and temperature e.g. <15%MC and <15°C and maintained in that condition.

**b) Insecticidal control**

Insecticides (see recommended products) can be applied to the fabric of stores concentrating on potential insect harbourages. Alternatively it may be appropriate to employ grain protectants.

# Spider Beetles

## Order: Coleoptera ('sheath-wings')

**Glossary of terms:**

**Elytra:** Hardened forewings of the beetle.

**Prothorax**: First thoracic segment.

**Striae:** Grooves along or across body.

## Recommended Products

**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity

**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knockdown and control of a range of flying and crawling insects

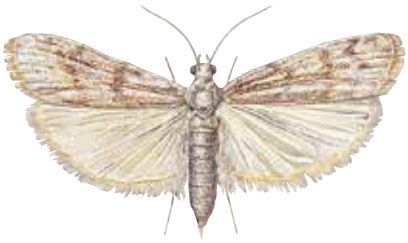
**Insecticide**

**Ficam D**
Ficam D is ideal to use where liquid-based formulations are unsuitable.

# Stored Product Moths

## Order: Lepidoptera ('scale wings')

**Mediterranean Flour Moth**
22mm Wingspan



**Brown House Moth**
8mm Long

**Intergrated Pest Management**

Recommended products for: **STORED PRODUCT MOTHS**

- ✓ AquaPy Go to Page 13
- ✓ K-Obiol Go to Page 23
- ✓ K-Othrine WG 250 Go to Page 25

### Description

**Characteristics:**

Two pairs of well developed membranous wings, with few cross veins; clothed with broad scales; generally suctorial mouthparts; metamorphosis complete with egg, larval, pupal and adult stages; larvae frequently have eight pairs of limbs.

**Superfamily:** Pyraloidea
(family Pyralidae)

**Superfamily:** Tineoidea
(families Oecophoridae, Tineidae)

**Species characteristics:**

**Family:** Pyralidae

**Warehouse Moth** (Cacao Moth, Tobacco Moth)(Ephestia elutella)
12mm wingspan; upper forewing: well defined, rather sinuate outer band on grey-buff back-ground.

**Tropical Warehouse Moth** (Dried Currant Moth)(Ephestia cautella)

12-18mm wingspan; upper forewing: dull grey-brown; straight dark inner band has broad pale band along inner edge; outer band is obscure.

**Mediterranean Flour Moth** (Mill Moth/Flour Moth)
(Ephestia kuehniella)

20-25mm wingspan; upper forewing: oblique irregular inner band spotted or streaked, lacking pale band along inner edge; outer band is obscure.

**Indian Meal Moth** (Dried Fruit Moth)
(Plodia interpunctella)

10-15mm wingspan; upper forewing: inner third, pale yellowish buff; remainder of wing bronze-coloured.

**Rice Moth** (Corcyra cephalonica)

15-25mm wingspan; upper forewing: uniform pale buff-brown; no distinctive markings, although veins may be slightly darkened.

**Family:** Oecophoridae

**Brown House Moth**
(Hofmannophila pseudospretella)

15-25mm wingspan; upper forewing: dark buff-brown with black-brown spots.

**White-Shouldered House Moth**
(Endrosis sarcitrella)

15-25mm wingspan; upper forewing: buff-coloured and speckled brown; resembles Brown house moth, but distinguished by white scales on head and thorax.

**Family:** Tineidae

**Common Clothes Moth** (Tineola bisselliella)

10-15mm wingspan; upper forewing: pale ochreous buff, unmarked.

# Stored Product Moths

## Order: Lepidoptera ('scale wings')

### Areas where found

Moths can be found in a variety of stored products. Some species are associated with goods of vegetable origin, to which they may be adapted with varying degrees of specificity, whilst others are associated with animal products -particularly textiles.

**Warehouse Moth**

Widely distributed throughout temperate regions. It is rarely imported except on products from other temperate areas.

**Tropical Warehouse Moth**

A tropical or subtropical species which is frequently found on imported cargoes.

**Mediterranean Flour Moth**

Originated in Central America but now cosmopolitan. It is a particular problem in provender mills, bakeries and occasionally even in catering premises. One generation is usually produced, but in warm conditions adults will be present through-out the year when there may be 4-6 generations.

**Indian Meal Moth**

A cosmopolitan species which originated in South America. It will survive all year round in warm conditions.

**Rice Moth**

A tropical species often found in countries of northern Europe in imported foodstuffs. In these temperate areas it can survive all year round in heated stores but usually produces only one generation.

**Brown House Moth/White-Shouldered House Moth**

Both species are cosmopolitan and widespread on materials of animal or vegetable origin.

**Common Clothes Moth**

Common on animal products.

### Importance as a pest

Moth larvae can cause considerable damage to stored goods by feeding or by contamination with their own products, e.g. webbing and frass. Adult insects are not responsible for damage as they either feed on liquid food and water or do not feed at all. The larval by-products, webbing and frass, are a particular problem. Webbing can entirely coat commodities and may be responsible for blocking machinery and ducts. The problem is exacerbated when webbing becomes mixed with frass, food and general debris.

**Warehouse Moth**

A major pest of warehouses and, more recently, retail premises. This species will infest cereals, fruit, shelled nuts, cocoa beans, fish, spices and tobacco. In the case of tobacco, "sweet" varieties are preferred and entire interveinal leaf areas may be destroyed. Moth infestations are especially serious where wheat and flour are stored in bulk, although they seldom infest goods which are stored in silos.

**Tropical Warehouse Moth**

A particular problem in dried fruit and nuts, although this moth will attack cereals, oil seeds and chocolate products.

**Mediterranean Flour Moth**

Larval webbing can cause serious blockages in provender mills. The larvae eat holes in sifting silks and may also reach the mill's finished products.

**Indian Meal Moth**

Another species which is a particular problem of the fruit-drying industry. It will also attack cereals, oil seeds and shelled nuts. Larval webbing may occasionally reach problem proportions.

**Rice-Moth**

This moth will attack grain (especially rice), oil seeds, cocoa beans, dried fruit, spices and beverages.

**Brown House Moth/White-Shouldered House Moth**

Both species attack a wide variety of materials including cereals, cereal products, textiles, leather and cork. The Brown house moth tends to scavenge whilst the White-shouldered house moth is generally found infesting food.

**Common Clothes Moth**

Attacks animal products, for example wool, fur, skins and leather. Fibres are bitten off and the loose ends discarded, thus destroying much more commodity than is consumed.

### Life-Cycle

Larval development is greatly influenced by the environmental conditions of temperature and food supply. The larvae themselves are unique and readily identifiable: well-developed head; clearly segmented body; three thoracic segments, each bearing a pair of five jointed legs; ten abdominal segments: numbers 3-6 bear false feet (prolegs), the tips of which are equipped with crochets; segment ten bears one pair of claspers.

# Stored Product Moths

## Order: Lepidoptera ('scale wings')

### Warehouse Moth

Within 4 days of emergence, the female produces 100-150 eggs which are laid in cracks and crevices. These hatch in 10-14 days to give larvae which are creamy white with dark spots on their sides. They penetrate food, covering it with webbing as they feed. In temperate climates larvae pass through 4-5 moults to attain full growth when they are 12mm long, whereupon they will leave the food and wander for 1-3 days, searching for a dark place in which to spin a silken cocoon. They may diapause in this state throughout the winter before pupating in April or May and emerging as adults in late spring. Under temperate conditions development takes from 82-206 days.

### Tropical Warehouse Moth

Egg laying commences within 24 days of the adult's emergence and up to 350 eggs are laid during the first 4 days. These hatch 3-17 days later. The larvae are dirty white and may be tinged brown or have purple spots. At 25°C they will be fully grown in 25 days. The larvae do not diapause. Pupae develop in 12-17 days in the vicinity of food, and breeding is continuous. Where temperatures are low the moth overwinters as larvae.

### Mediterranean Flour Moth

Mating takes place immediately after the adults emerge. Up to 350 eggs are laid and these may be stuck to various foods by a sticky secretion. The eggs hatch in 4-28 days to give white or pinkish larvae and spin silken tubes in which they live. After 3-5 moults the larvae are full grown and 15-19mm long.

They then wander away from food and pupate for 7-16 days in the dark corners of buildings or machinery. In temperate climates these moths overwinter as larvae but, in contrast to other species, usually remain in the foodstuff.

### Indian Meal Moth

Females produce up to 500 greyish-white eggs which hatch in 1-18 days depending upon conditions. The larvae migrate over the foodstuff, covering it with silk as they move. Their colour depends upon the type of food: they are generally dirty-white but may be tinged pinkish-brown or green. After 4-7 moults the larvae are full grown and have attained a length of 12mm.

In this species food and environmental conditions have a dramatic influence on the larval phase, so that development may take 13-288 days. When mature the larvae leave the foodstuff and spin thick white cocoons, in which the 7mm long pupae develop. After a pupation period of 12-43 days, the adults emerge. These moths may over-winter as larvae which diapause in a silken cocoon.

### Rice Moth

Up to 160 eggs are laid in or near the larval food. The larvae are dull white in colour with brown heads, and have long, fine hairs covering the body. They persist for 15-20 days under favourable conditions. Rice moth larvae produce large amounts of strong webbing and frass, before spinning a dense white cocoon in which to pupate. The pupal stage lasts 7-10 days.

### Brown House Moth/White-Shouldered House Moth

These species have similar life-cycles and mixed infestations frequently occur. The Brown house moth lays up to 650 eggs, preferring rough open surfaces, whilst those of the White-shouldered house moth are sticky and laid in crevices. Brown house moth larvae are glossy white and reach a length of 16mm. Larvae generally diapause for varying lengths of time, depending upon the conditions under which they have developed. Those of the White-Shouldered house moth are dull white and rarely exceed 14mm in length. Both species burrow into the food, forming a silk tunnel. Pupal cocoons are rough and incorporate foodstuff and debris.

### Common Clothes Moth

Eggs are laid amongst fibres or scattered at random. Each female lays up to 160 eggs during a period of 2-3 weeks. During the summer these hatch in 4-10 days to give an active, white translucent larva. This grows up to 10mm in length and the head becomes darker in colour. Feeding tunnels may be constructed from silk and there are at least 5 moults. Larvae construct a tough cocoon in which they moult to produce a pupa up to 7mm long. The full cycle takes between 88-254 days, depending upon conditions.

## Control

The method and timing of control measures against moths, depends upon the species involved. The larvae are frequently difficult to reach because they are concealed in foodstuffs or the fabric of buildings and may be obvious only when they migrate.

### Assessment of infestations

Adhesive traps are used for trapping stored product moths. Attractant capsules containing a pheromone are attached to a sticky surface on which the moths are caught and which is partially protected from the environment. The trap is then suspended ca 2-3 m above the floor. They perform best in locations which are not dusty. Alternatively

# Stored Product Moths

## Order: Lepidoptera ('scale wings')

funnel traps may be used. These are usually constructed of plastic and incorporate a funnel system leading to a retaining chamber in which moths are trapped and killed using a toxicant strip, water or detergent.

They incorporate a pheromone lure and are particularly useful in dusty locations. The simplest traps are a dish of water containing a little detergent. Whatever system is employed adequate records must be kept.

**a) Hygiene/management**

This is important in order to avoid conditions suitable for the development of moth infestations.

Warehouses should be constructed so as to ensure maintenance of correct storage conditions and allow easy cleaning. Cracks and crevices which might serve as harbourages should be kept to a minimum. Stacks of commodities should be neatly arranged above the floor on pallets, with a gap between stacks to allow for ventilation, regular inspection, cleaning and treatment with insecticides if necessary. Good packaging is particularly important to prevent entry of larvae.

Spillages should be removed promptly, and infested goods dealt with immediately either by fumigation or destruction. Uncontaminated products should not be stored in the vicinity of infested materials.

In the case of the house and clothes moths, fabrics should be regularly inspected and cleaned, and alternative breeding sites, for example birds' nests, removed if possible. It should be remembered that soiled fabrics make a more acceptable diet to these insects than clean ones.

**b) Insecticidal control**

In order to obtain the best results, insecticidal control measures (see recommended products) should be integrated with good hygiene.

**Glossary of terms:**

**Crochets:** Hooks on the end of the false feet – used for clasping.

**Diapause:** A period of suspended development or growth.

**Frass:** Excrement or other refuse of larvae.

**Prolegs** (false feet): Non-jointed, fleshy conical legs.

**Webbing:** Silk spun by moth larvae.

# Recommended Products


**Insecticide**

**AquaPy**
AquaPy can be used for the fast flushout, rapid knock-down and control of a range of flying and crawling insects


**Insecticide**

**K-Obiol**
K-Obiol EC25 is a liquid grain protectant for the control of stored product pests including crawling insects.

**Insecticide**

**K-Othrine WG 250**
K-Othrine WG 250 is a water dispersible broad spectrum insecticide with long term residual activity

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Ticks

## Order: Acarina Ixodides (Metastigmata)

**Ticks**
3-8mm Long

**Intergrated Pest Management**

Recommended products for: **TICKS**

✓ Ficam D
Go to Page 19

### Description

**Characteristics:**

Arthropods with a sac-like body ranging from 3-30mm long. They are the largest Acarines. The head, thorax and abdomen are closely fused and unsegmented. The body consists of the idiosoma and the gnathosoma (capitulum) with mouthparts consisting of a pair of chelicerae for cutting the skin of hosts, a central hypostome (beak) armed with recurved teeth which help to anchor the tick to its host and a pair of sensory palps. The idiosoma is membranous or leathery and sometimes equipped with a scutum (shield). There is one pair of stigmata (eyespot) with a stigmal plate near the legs. Adults are typically eight-legged. There are two major families:

**Ixodidae, Hard Ticks.**

With a dorsal scutum which covers the whole dorsal surface in males but only developed anteriorly in females to permit distension of the body with blood and eggs. The hind end of the scutum is sometimes grooved. There is a prominent gnathosoma which is visible from above. The stigmata are situated behind coxae IV. A pulvillus (sticky pad) is situated at the extremity of each leg.

Examples are:

**Brown Dog Tick** (Rhipicephalus sanguineus)
**Hedgehog Tick** (Ixodes hexagonus)
**Castor Bean Tick, Sheep Tick** (Ixodes ricinus)

**Argasidae, Soft Ticks**

No scutum and mouthparts not visible from above. The cuticle is granulated and appears shrivelled when the tick is starved. The stigmata are usually located between coxae III and IV. There is no pulvillus (sticky pad) on the extremity of each leg.

**Pigeon Argas (Argas reflexus)**

Body ca 4.0mm long with granulations and small discs. Thin margin around idiosoma flexed upwards with striations on margin.

# Ticks

## Order: Acarina Ixodides (Metastigmata)

### Areas where found

There are over 850 species of tick. They are all blood-sucking parasites of vertebrates, principally mammals and birds but sometimes reptiles and amphibians. They are cosmopolitan and distributed across a wide range of habitats.

Ticks can survive long periods of starvation which is a useful characteristic where hosts are limited. Periods of starvation ranging from 3-21 months have been variously quoted for nymphs and adult Rhipicephalus spp. and Ixodes spp. whilst A. reflexus is reported to be capable of surviving for at least five years without food.

The Ixodidae are usually active by day and are typically three-host ticks, the larvae, nymphs and adults all spending time, often separated by extended periods, on different hosts. They are referred to as “ticks of the host” because they spend much of their active life on hosts. The adult females typically feed only once.

By contrast the Argasidae ticks frequent the habitats of their hosts. They are nocturnal and typically take small meals from a number of hosts. They are referred to as “ticks of the habitat.”

R. sanguineus is encountered between 35°S and 50°N. It is found in cracks and crevices in buildings and is particularly associated with dogs. In Europe it can survive outdoors only in the summer and is best adapted to the warm dry environments encountered indoors. Humans may be attacked.

I. hexagonus is principally encountered in the burrows of its host which provide stable temperature and humidity conditions. It is not generally associated with buildings. Hosts include hedgehogs, foxes, cats and dogs. Humans may also occasionally be attacked.

I. ricinus is encountered in Europe to about 65°N. In urban areas it is associated with parks and gardens etc where it is limited by the availability of hosts. An humidity in excess of 80% RH is required for incubation and this can be found in the leaf litter of temperate deciduous forests and in conifer forests where the rainfall is sufficiently high. Hosts include sheep, deer, foxes, hedge-hogs and birds. Humans may also be attacked. Small mammals and birds are only host to immature forms. The walking range of the tick does not exceed 15m so dispersal is achieved by way of the hosts and, in particular birds that forage on the ground.

A. reflexus is encountered in Europe to about 55°N where it is dependent for its survival upon elevated urban temperatures compared with the surrounding areas. It is particularly associated with pigeons and, as a result is associated with attics. Harbourages are found in crevices of buildings and furnishings. Pigeons are the principle host but other avian and mammalian species may be involved. Humans may also be attacked. The tick will only walk ca 10m and, because the larval blood meal takes six to eleven days it is thought dispersal is principally achieved by the feeding larva.

# Ticks

## Order: Acarina Ixodides (Metastigmata)

### Importance as a pest

The need to take blood meals makes ticks important in terms of nuisance, the direct effect loss of blood has on a host and their potential to act as vectors of disease.

Tick bites as such are not generally serious. Anti-coagulin agents in tick saliva can, however, lead to haemorrhages. Heavy infestations of A. reflexus can cause the death of pigeons as a result of the loss of blood. In some cases the skin reacts to form a cup-like cyst which will cover the tick. Particular problems occur where the bites cause irritation or become infected.

I. ricinus will bite man, I. hexagonus only rarely bites man whilst A. reflexus bites pigeons in preference to man.

Tick paralysis can arise from the bite of ticks such as I. ricinus. It is caused by toxic saliva produced when females are developing eggs rapidly. Ascending motor nerve paralysis can lead to death when respiratory muscles are affected. If the ticks are removed at an early stage recovery is generally rapid. The problem has been recorded in Europe in cattle and sheep and there is a potential threat to children depending in part where the bite occurs.

Ticks can transmit a variety of diseases and arise particularly from wild animal reservoirs. The ticks are not affected by the pathogens. The following are examples of some diseases which are encountered in Europe:

| Virus | Tick Species |
|---|---|
| Central tick borne encephalitis | I. ricinus |
| Louping ill | I. ricinus |
| **Rickettsial diseases** | |
| Boutonneuse fever | Ixodes spp. |
| **Spirochaetes** | |
| Lyme disease | I. ricinus |

### Life-Cycle

Female Ixodidae ticks feed once increasing body weight up to 150 times. A large batch of eggs, globular, light brown and shiny in appearance is then laid in suitable harbourages and covered with a secretion to reduce dessication. The female then dies. The eggs hatch to yield 6-legged larvae which cling to vegetation awaiting a passing host. The whole brood may attach to the same host. When fully fed the larva drops to the ground and eventually moults to form an 8-legged nymph. Some species, the one host ticks, spend their entire life on a single host. Otherwise the process of attaching to the host will be repeated by the nymph and subsequently the adult. There is only one nymphal stage in the Ixodidae. The process is governed by temperature and the availability of hosts and may last several years. The opportunity to take three substantial blood meals means that given optimal conditions the life cycle could be completed in approximately six months so numbers of ticks eg. R. sanguineus could build up very quickly.

In the case of the Argasidae ticks the females feed at intervals only increasing their body weight by up to three times. The globular, dark brown shiny eggs are then laid in batches of  20-50. The 6-legged larvae feed on the hosts for six to eleven days although the 8-legged nymphs and adults only feed for up to 12 hours. The nymphs may moult up to eight times. Those of some species produce a coxal fluid. It is believed to be separated plasma from the blood meal and may be infected with pathogens. The process is governed by temperature and the availability of hosts and extends from two to four years.

# Ticks

## Order: Acarina Ixodides (Metastigmata)

### Control

The method adopted for the control of ticks will depend upon the species involved and its distribution. Ixodidae ticks infesting areas out-doors can be detected by dragging a light coloured woollen blanket through potentially infested vegetation. Larva, nymph and adult forms will appear as small dark spots.

Protective clothing is important for those working outdoors in areas known to be infested with ticks. Clothing can be treated with suitable repellents. Boots and trousers should be worn and the trousers tucked into socks. Frequent inspections should be made to ensure that ticks have not attached themselves. If ticks are found attached to the skin care should be taken when removing them to ensure the capitulum does not remain behind. They can be removed by touching them with a suitable volatile solvent pressing them inwards to disengage the teeth before removing them. Alternatively they can be soaked with medicinal paraffin or olive oil and removal attempted some hours later.

The wide distribution of ticks outdoors means control measures are usually limited to restricted areas eg parks and other recreational areas. The availability of resting sites and the habitats of hosts can be restricted by cutting vegetation and removing debris. Infested vegetation can be treated with suitable insecticides exhibiting acaricidal and residual activity. It is important to ensure adequate penetration and coverage of the vegetation.

Ixodidae ticks may be controlled by treating hosts whilst the Argasidae ticks are typically controlled by treatment of the habitat ie the harbourages of the ticks.

# Recommended Products


**Insecticide**

**Ficam D**

Ficam D is ideal to use where liquid-based formulations are unsuitable.


**Insecticide**

**Ficam W**

Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Wasps

## Order: Hymenoptera ('membrane winged')

**Common Wasp (worker)**
18mm Wingspan

**Intergrated Pest Management**

Recommended products for: **WASPS**

- ✓ Pybuthrin 33 Go to Page 35
- ✓ Ficam D Go to Page 19
- ✓ Ficam W Go to Page 21

### Description

**Characteristics:**

Up to 30mm long; eyes kidney shaped; two pairs of membranous wings, the hind wings smaller than the forewings and linked to them by a row of hooklets; wings folded longitudinally at rest; mouthparts adapted for chewing and licking; dorsal surface of the first thoracic segment extends back to a small lobe which overlies the base of the front wing; abdomen constricted at base giving appearance of a waist; metamorphosis complete, with egg, larval, pupal and adult stages; typically possess complex social system (sub-family Vespinae).

**Family:** Vespidae

**Species Characteristics:**

**Genus:** Vespula and Vespa.

Similar in appearance. Distinguished by patterns on the face and abdomen. The following species are found in Northern Europe:

**Common Wasp** (Vespula (Paravespula) vulgaris) Nests underground and in cavities in trees and buildings.

**German Wasp** (Vespula (Paravespula) germanica) Nests underground and in cavities in trees and buildings.

**Tree Wasp** (Vespula (Dolichovespula) sylvestris) Nests suspended from the branches of trees or constructed underground.

**Norwegian Wasp** (Vespula (Dolichovespula) norvegica)

Constructs small nests on twigs e.g. on goose-berry bushes and hawthorn.

**Cuckoo Wasp** (Vespula austriaca)

Worker caste lacking. It is parasitic usually laying its eggs in the nests of the Red Wasp.

**Red Wasp** (Vespula rufa)

Nests underground.

**Hornet** (Vespa crabro)

The largest of the wasps but relatively uncommon. Nests in hollow trees and occasionally buildings.

**Genus:** Odynerus, Mason wasps.

Solitary wasps about 13mm long predominantly black with yellow markings. The females construct nests of a few cells each of which contain an egg and is provisioned with food e.g. caterpillars. The larvae which hatch from the eggs feed themselves and live independently from their neighbours. Nests will be constructed in the ground and in soft mortar.

# Wasps

## Order: Hymenoptera ('membrane winged')

### Importance as a pest

Wasps can be regarded as beneficial insects. As the nests develop during the spring and early summer the workers collect insect larvae, scraps of meat and even fish to feed to larvae. They therefore help to control insect pests and clear carcasses. The workers prefer high energy carbohydrates which they obtain from fruits and the nectar of flowers. They could act as pollinators although are unlikely to be as efficient as honey bees.

In general, however, wasps are regarded as nuisance pests or a threat to health.

They feed on fruits e.g. apples, pears and plums although they are regarded as scavengers extending the damage caused by other pests and diseases. The need to collect wood to construct nests means that wasps may damage the wooden fabric of buildings, fences and even perhaps garden furniture.

Wasps are a particular nuisance at the end of the summer when the workers are freed of the need to collect proteinaceous foods for their young and can indulge their passion for sweet materials e.g. jam and syrup. They cause a nuisance when they enter kitchens, bakeries and other premises handling sweet aromatic materials. Foodstuffs can be contaminated and staff will be disturbed or even stung. Where wasp densities are high and a real threat is perceived, production in work-places can be halted.

It is the ability of wasps to cause painful stings that concerns most people. Unexplained road accidents have sometimes been attributed to the distraction of drivers by wasps. They are not regarded as particularly aggressive and the ability to sting is employed by the social wasps to defend their nests.

The sting is caused by the injection of venom into the victim by means of the modified ovipositor of the females. Unlike the sting of bees the wasp sting can be withdrawn from the victim. The venom is haemolytic, haemorrhagic and neurotoxic. Histamine is also present which causes the redness, flare and weal in skin.

Wasp stings around the throat may lead to respiratory obstruction. Alternatively they may be directly toxic causing faintness, respiratory difficulty, vomiting, diarrhoea and perhaps urticaria. These are only likely to appear following a mass attack. The main hazard is the risk of anaphylactic shock arising from repeated stings or even a single one which may lead to death.

Symptoms may appear rapidly and include respiratory distress, faintness, an itching rash, swelling of the face and vomiting with abdominal pain, cramp or diarrhoea. Medical assistance should be sought immediately where anaphylactic shock is suspected.

Stings can be treated with a cold compress and antihistamine creams applied within twenty minutes of stinging. A suitable antiseptic cream should also be rubbed into the skin to prevent infection.

# Wasps

## Order: Hymenoptera (‘membrane winged’)

### Life-Cycle

Wasps are typically social insects with new nests constructed each year. The queens, which are larger than the workers, overwinter in harbourages in buildings, under loose bark or even in old nests. They emerge in the spring and will feed on nectar and sap. Nests are located underground, in buildings, trees or bushes and constructed of wasp paper made by chewing wood and other plant debris with saliva. First a canopy is fixed to the top of the nest location and then a central pedicel from which the nest is suspended. The queen then builds a layer of hexagonal down-ward-facing cells radially from the pedicel. Layers of wasp paper envelop the nest providing protection from the elements and conserving heat.

Eggs are laid in the first tier of the nest built by the queen. They are cemented into place and the emerging larvae, which hatch in a few days depending upon temperature, only partially emerge in order to stop them falling from the cells. The fully grown larvae construct silken cocoons and seal themselves into the cells in order to pupate. Four to six weeks after the eggs are laid the first generation workers emerge. These are female wasps but smaller than the queens and males which emerge later in the season. The workers then take responsibility for maintaining the nest. They extend it by adding further radial layers of cells suspended by wasp paper stalks below the first tier. In this way up to eight tiers may be constructed and the whole enveloped in wasp paper with the entrance at the bottom. If the nest overheats the workers ventilate it by vibrating their wings or even by introducing water droplets which cool it by evaporating. The workers also forage for food and in particular high protein foodstuffs for the larvae e.g. flies, caterpillars, spiders etc. In their turn the larvae exude a secretion which contains sugar and proteases. This is taken by the workers and provides a useful food supplement whilst also helping them to break down the proteinaceous foods destined for the larvae.

This is trophallaxis a relationship in which both parties gain and which probably helps to ensure the workers allegiance to the nest.

As the workers develop the nest the queen devotes her time to egg laying. Each cell may be employed several times to rear larvae and by the end of the summer the nest may contain 20,000 or more wasps.

In the autumn, new queens and males are produced. The latter fertilise the queens who then search for hibernation sites. With the onset of severe weather the nests die out.

# Wasps

## Order: Hymenoptera ('membrane winged')

### Control

Measures to control wasps can be directed at the foraging wasps or their nests.

**Foraging wasp control**

**a) Hygiene/management**

Foraging wasps can be excluded from buildings by the use of 3mm screens. Bait traps may be of value on a limited scale.

**b) Insecticidal control**

**Space sprays:**

Large or small scale (e.g. hand held aerosols) space sprays can be used indoors to knockdown and kill flying wasps. Operators should take care to avoid being stung by intoxicated wasps.

**Surface sprays:**

The application of a residual film of insecticide can assist wasp control in localised areas e.g. around syrup intake points.

**Wasp nest control using insecticides**

Nests can be located by searching likely sites on fine days for signs of wasp activity. Flight lines of foraging wasps converging towards, or diverging away from nests may be observed in order to pin-point the nests. Ideally nests should only be treated with insecticides when activity around the nest is quiet.

Operators should wear suitable protective clothing including a veil, gloves and tight fitting sleeves and trouser cuffs. Other people should be kept away.

**Nests can then be treated by:**

**Powder treatment:**

An insecticidal powder can be applied around and into the entrance of the nest. Workers are contaminated when they return to the nest and carry the powder inside. Powders are applied using mechanical dusters which may be equipped with extension tubes, a spoon (which can be attached to a cane) or a suitably labelled proprietary puffer pack.

**Surface spraying:**

A liquid surface spray may be applied liberally and directly to the nest or to the entrance holes of concealed nests.

**Smokes:**

An insecticidal smoke can be released in the cavity occupied by the nest.

See recommended products.

# Recommended Products


**Insecticide**

**Pybuthrin 33**
A pyrethrin spray suitable for use in food handling premises.


**Insecticide**

**Ficam D**
Ficam D is ideal to use where liquid-based formulations are unsuitable.


**Insecticide**

**Ficam W**
Ficam W is a residual broad spectrum spray control of a wide range of insect pests

**Safety data sheet and product label is available for download at www.environmentalscience.bayer.co.uk**

# Notes

Do you need expert advise and a solution tailored to your specific needs?

Speak to our Pest Solutions team today.

# Pest Solutions

## Backed by **Bayer**

Bayer

**Contact the Pest Solutions team with your questions** at **pestsolutions@bayer.com** or on **0800 1214 9451**.

You can also subscribe to receive regular updates from the team at **www.environmentalscience.bayer.co.uk**

# Our mission: “Bayer: Science For A Better Life”

Bayer is an inventor company with a long tradition of research. By applying science to the major global challenges, we deliver innovations that address unmet customer and market needs.

Bayer CropScience Limited
230 Cambridge Science Park
Milton Road, Cambridge CB4 OWB
Tel: 00800 1214 9451
Email: pestsolutions@bayer.com

www.environmentalscience.bayer.co.uk

All information contained herein was deemed correct at the time of print.
Designed & Produced by Bubble Design & Marketing Ltd, Nottinghamshire DN22 7HJ.