

®



BATTOF

Zinc
Phosphide
Bait Sachets
*Protecting crops
from rat infestation*



This technical booklet describes RATTOFF® Zinc Phosphide Bait Sachets and how they are used as part of an integrated program to control serious infestations of rats in crops.

RATTOFF® ZP Sachets have been developed by scientists at Applied Biotechnologies (ABT) and Animal Control Technologies (ACTA) with the assistance of several state government agencies and industry bodies.

ACTA would like to acknowledge the specific assistance and cooperation of the following groups and organisations:

- Bureau of Sugar Experimental Stations (BSES)
 - Mackay Area Cane Productivity Services
 - Tully Cane Productivity Services
 - Other Cane Productivity Services
 - CaneGrowers Organisation
 - Qld Dept of Natural Resources and Mines
- and many farmers who assisted in testing and monitoring the effectiveness of the product.

During the production of this booklet, staff of the Queensland Parks & Wildlife Service (QPWS) and Queensland University of Technology (QUT) also contributed helpful comments and photographs. Some RATTOFF® research has been supported by an R&D grant from AusIndustry and the Australian Banana Growers Council. The assistance of all contributors is gratefully acknowledged.





RATTOFF[®] **Zinc Phosphide Bait Sachets**

Protecting Australia's Crops

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RATTOFF[®]
ZP Bait Sachets



Rat species in Australia

Introduced rodent pests

There are many different species of rats that exist in Australia and control options can vary greatly between species. The best known rat is the black rat *Rattus rattus*, which like the house mouse *Mus domesticus* is an introduced pest. Both these rodents serve no purpose in the Australian environment and can and should be destroyed wherever they occur.

Native rodents

There are more than 50 native rodents species in Australia. Generally these cause little harm in their natural habitat of grasslands or forest.

However these native rodents can cause serious problems in modified environments such as sugarcane and plantation crops. In some states a damage mitigation permit is required for the destruction of these overabundant native rodents in crops.

Examples of native rats that cause problems in crops include: *Rattus villosissimus*, a grassland rodent that can infest cotton and other crops; *Rattus tunneyi*, a ground nesting rat that can eat the roots of young trees resulting in stunting



Rattus sordidus



Melomys burtoni



Rat infestations of crops

Rats breed quickly and can infest crops and food storages, where they cause serious economic damage. This is a major international problem and represents one of the most significant causes of lost or spoiled food supply worldwide.

Eruptions of serious rat infestations in Australia are not easy to predict and the circumstances leading to infestations of crops are not fully understood.

In some crops, the development of significant rat numbers may occur only once or twice per decade. In other crops, such as tropical sugarcane and banana plantations, conditions are favourable for rat infestations in most seasons. Even so, the severity of infestation can vary widely between properties and between areas in any one season.

Because of this variability, and the unpredictable occurrence of infestations, the control of some types of rodents can be difficult.

Monitoring for the presence of rodents is essential.



*The black rat *rattus rattus* commonly infests food storages*



Rat damage costs the banana industry millions of dollars each year.



Rat damage is a huge problem in palm oil plantations



RATTOFF® ZP Sachets were developed in partnership with the Australian Sugar Industry and has saved many crops from rat devastation.



IPM Strategy

No single control measure will provide a total solution for rodent infestations in crops. A number of methods used in conjunction will minimise the risk of population build-up and prevent the escalation of rat numbers to prevent serious crop damage.

Using a combined approach is called 'Integrated Pest Management', often shortened to IPM. All landowners are encouraged to take this integrated approach to solving rodent problems.

IPM Options

It is inherent in IPM strategies that it is better to prevent a pest problem than to treat it once it has become serious or out-of-control.

As part of their IPM strategy farmers should adopt practices that make it difficult for rodents to establish or multiply in a crop.

Weed Control

In sugarcane crops and banana plantations the breeding of both the climbing rat (*M. burtoni*) and the ground rat (*R. sordidus*) is triggered by the availability of high protein food such as maturing grass seeds.

One study recovered 70 rats from just a few square metres of weed infested fence line.



Rats can breed in very small areas of weeds such as around a power pole (L). No weeds is best practice (R).



The maintenance of low grass in adjacent non-cropped areas will reduce cover and render the rats more vulnerable to birds of prey and other predators that may naturally cull rat numbers. These factors reduce the likelihood of explosive population growth.

If weeds and grass are controlled around crop verges rat infestations will be less frequent and less severe.

Weeds in a banana plantation provide food and a perfect habitat to protect rats from natural predators



Harbor Removal

Rats can move between paddocks, especially after harvest or flood. Long-term management practices that establish a population depletion zone around crops are encouraged.

The removal of breeding habitat around crops reduces the density of rodents adjacent to the crop and hence the threat of infestation.

This process can include revegetation of bare land, drains or watercourses and areas that are not suitable for cropping.

Once the tree canopy develops, the grassland habitat is shaded out and the rat density will reduce.

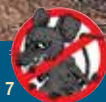


Established tree canopy provides unsuitable ground habitat for rats

Revegetation of areas not suitable for cropping alters the grassland habitat for the rats and can help reduce the chance of rat infestations.



Keeping crop verges clear and weed free helps reduce rat infestations.



Natural predators help control low levels of rat infestation

Birds of prey such as eagles, owls, kites and hawks provide a natural pressure on the rats within a local area.

While these predators cannot control a major infestation, they can help keep numbers low between major outbreaks, so maintenance of nesting sites and perches is an important part of any IPM strategy.



Owls and other birds of prey form an important part of any IPM strategy.



Erecting breeding boxes is a clever way to provide nesting habitat for owls.

Baiting rats in crops using second-generation anticoagulant poisons is illegal as it puts birds of prey at great risk.

Baiting as an IPM strategy



IPM management practices can help reduce background rat numbers and may delay large population build ups, but there are still seasonal conditions when rat numbers have the potential for rapid increases.

In such situations there is a need for strategic use of special rodenticides to damp off the population explosion before crops suffer serious crop damage.

RATTOFF[®] ZP Sachets are an integral part of IPM strategies to minimise the impact of serious rat infestations should seasonal conditions favour an over-abundance of rodents.



Modern farming practices & rats

Some farmers have queried whether modern farming practices including minimum tillage and retaining trash blankets in sugarcane crops have contributed to increased rodent problems.



While evidence is not complete, the weight of opinion is that adoption of sound conservation tillage practices and trash blanketing does not greatly increase the rodent problem.

The benefits of these practices including reduced cultivation, reduced erosion, improved water retention and organic content of soils, far outweigh the risk of rat infestation.

Trash blankets also help to suppress grassy weeds in the crop that can otherwise contribute to increased rat numbers.

Retaining trash blankets and reducing cane burning have a range of environmental and greenhouse benefits that far outweigh the risks of rat infestation.



Burning Cane

Farmers are not recommended to return to the practices of burning stubble or cane to control rats.

During fires, most rats will retreat to underground burrows that are well protected.

The burning of habitat areas can delay or prevent the development of forest canopy by the loss of tree seedlings and encourage grass regrowth which in-turn, encourages rats.



Managing high rat infestations in crops



What is RATTOFF®

RATTOFF® ZP Sachets are a new acute rodenticide to control rats in agricultural situations including sugarcane crops and plantations.



The product is a development of the highly successful MOUSEOFF® Zinc Phosphide Bait that is used throughout Australia for the control of heavy infestations of mice in crops.

RATTOFF® consists of sterilised whole wheat grain coated with zinc phosphide and packaged into a specially patented degradable sachet.

The special sachets are camouflaged and provide a source for the rats to consume a lethal dose of bait.

RATTOFF® ZP sachets are registered for use within the crop at intervals of 10 metres. This is equivalent to 100 sachets per hectare or a total of 1 kg of bait material per hectare.



RATTOFF®
ZP Sachets

Unlike anticoagulant rodenticides which act on the blood clotting system of the rodent, and take five or more days for the rodents to succumb, RATTOFF® ZP is an acute rodenticide killing the rat within hours of sampling the bait



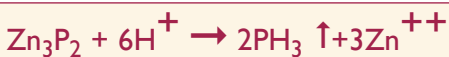
This explains why only a very small amount of RATTOFF® is needed in comparison with previous methods of rat control.

RATTOFF® ZP is one of the most powerful rat control products in the world and many times more potent than domestic rodenticides.



How does RATTOFF[®] ZP work?

The zinc phosphide coating on the grain is quite stable while in original packaging and kept dry. Once eaten by the rodent, the chemical quickly reacts with the stomach acids of the rat to release minute quantities of poisonous phosphine gas. The chemical reaction is as follows:



The phosphine gas is enough to kill the rat within hours of first sampling the bait.

Only a sample taste of a few grains of bait is required to kill a rat. Theoretically, each sachet has the potential to kill as many as 50 rats assuming the bait was equally divided between them.

There is enough poison in each kilogram of bait to kill several thousand rats, but in field conditions it is necessary to apply this evenly through the crop to ensure that pockets of high concentrations of rats or 'hotspots' are accounted for.



Rats succumb to the effects of the phosphine within hours



Applying RATTOFF® ZP in crops

RATTOFF® ZP Sachets are supplied in handy pails to suite any sized baiting program.

The sachets are ready-to-use and can be applied by hand from vehicles or tractors while other operations are being conducted in the crop (e.g. weed spraying).

For optimum results it is best to distribute the sachets throughout the entire crop and not just around the perimeters.

It is easier to apply the bait before the crop canopy closes or reaches a stage of development that prevents easy access.



RATTOFF® ZP Sachets are available in 2kg, 5kg and 10kg pails

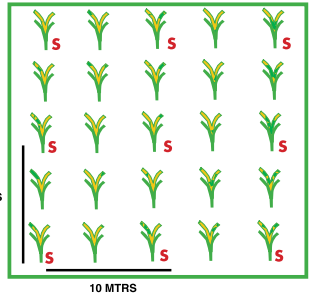
Dose Rate

Sachets should be simply dropped on the ground at 10 metre intervals within the affected crops.

Do not place more than one sachet at each point as this wastes bait.

An application rate of one kilogram of bait, or 100 RATTOFF® ZP Sachets per hectare gives adequate control in most situations.

The ideal time for rat control in sugar crops is from early ratoon stage to canopy closure, which for Australia is any time between October and March.



Baiting evenly throughout the crop or plantation brings best results.



RATTOFF® ZP Sachets can be applied when conducting other farming activities



When should baiting be used in sugarcane?

If IPM strategies discussed earlier are entirely successful, baiting may **not** always be required. However, if seasonal conditions are favourable, or if wet conditions prevent weed control, it may be necessary to bait using RATTOFF® ZP Sachets.

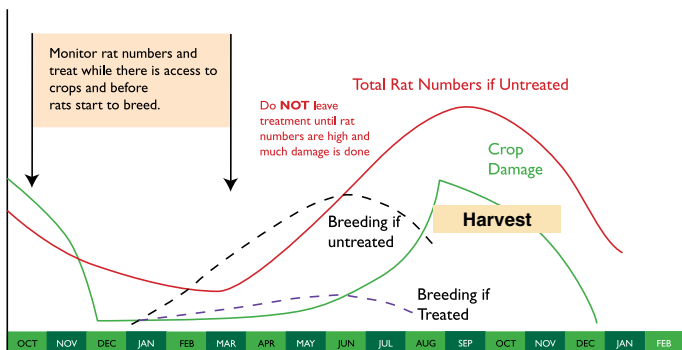
Standover cane provides suitable habitat, and increases the risk of future damage to any adjacent plant cane blocks. Generally treatment in and around standover cane will be required.



Standover cane can provide ideal habitat for rat populations to flourish

Maximum rat numbers normally occur later in the crop, around April to June, but the IPM approach is to try to reduce the population of breeders before the population explodes. This has the added advantage of reducing damage to ratoon cane by ground

Apply bait before rat numbers escalate



rats. (See diagram below).

Note the cost of treatment is the same whether applied early or late - but damage is much greater the longer treatment is delayed.

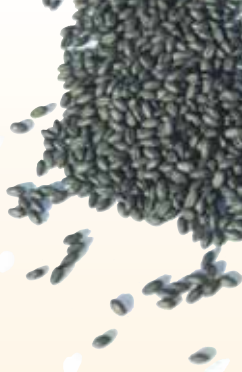
The objective is to prevent economic damage, not wait until rat numbers are catastrophic before taking preventative action.



RATTOFF® ZP Sachets and the environment

There are many features which make RATTOFF® one of the best methods of rat control available. Apart from multi-dose low potency anticoagulant baits, RATTOFF® ZP Sachets are currently the only approved method for rat control in crops. Second generation anticoagulant rodenticides are not approved for use in crops.

- Zinc Phosphide is a metal phosphide which breaks down gradually in the environment once wet.
- Carbon dioxide in the air degrades zinc phosphide slowly but completely to phosphine gas. While this gas is lethal if released in the rodent stomach, it degrades within hours in the open air due to the action of sunlight.
- Zinc phosphide does not move in soil and cannot contaminate watercourses.
- If small quantities of bait are ingested by a larger animal it quickly causes vomiting (emesis) and an awareness of danger. This process, known as 'learned aversion' limits the likelihood of repeat exposures and reduces the risk to larger animals when the bait is evenly spread at low rates.
- Over time the sachets, which are made of plant polymers, also degrade due to the action of UV in sunlight, moisture and soil microbes.
- The chemical degrades quickly in the carcass of the poisoned rodent and this greatly reduces the risk of poisoning other animals that scavenge the dead rodents.



RATTOFF® ZP Sachets degrade in the sunlight

RATTOFF® ZP in crops

Zinc phosphide is not readily absorbed by the leaves or roots of plants, does not diffuse in soil and degrades over time so there is no risk of contamination of crops when RATTOFF® ZP Sachets are used as directed.

Extensive residue studies have tested the potential for contamination if all the bait for 0.1 hectares was applied to a single plant. Even then the risk of residues is more than 1000 times lower than internationally accepted limits.



Risks to wildlife and birds

Secondary poisoning & second-generation anticoagulant poisons

Poisoning of birds or other animals with traditional anticoagulant baits is well known and these baits are now banned from use in crops in most countries.

Second-generation anticoagulant baits pose risks to wildlife because the active constituent chemicals - particularly brodifacoum - persist for long periods in most animals. The risk from second-generation anticoagulants is increased because these poisons take up to a week or more to act, and rodents can eat large quantities of poison before dying.

This means a bird occasionally eating sick or dead rodents poisoned with these chemicals can quickly accumulate a lethal dose, and as it will not be affected for a similar time, the bird has the opportunity to feed its young poisoned rats, potentially wiping out the next generation of these important natural predators.

As birds of prey are particularly sensitive to anticoagulant poisons, bans on the use of second-generation anticoagulant products for use in crops are well justified and should be strictly observed by all those with a concern for the environment.

Zinc Phosphide

Zinc phosphide is the preferred method of rodent control in crops on environmental grounds. Zinc phosphide used in RATTOFF® kills the target rodents quickly so they cannot absorb large doses of poison. What is ingested quickly degrades in the carcass and in the environment and does not bio-accumulate in tissues of the rat.

Because it causes vomiting in low doses (rodents cannot vomit or regurgitate so do not have a means of discharging bait materials) primary poisoning of non-target animals is rare.

Zinc phosphide used in RATTOFF® kills rats quickly, degrades in the carcass and in the environment and does not bio-accumulate in tissues of the rat.



Other special features

RATTOFF® sachets are camouflaged to blend in with soil or stubble material, making them less visible to baiters.

The bait itself is coloured grey/black, which is a preferred food colour for birds and as rodents are not dissuaded by unusual food colours.



RATTOFF® and bandicoots

Bandicoots are commonly present in sugarcane and banana crops so special studies have been conducted to test for the specific risk to these animals.

Bandicoots were live captured, tagged and released before baiting.

After baiting achieved a large reduction in rat populations, the tagged bandicoots were still present in the crop and could be captured again, alive and well.



A bandicoot captured after a RATTOFF® baiting program

The reduced risk to non-target animals has been confirmed in extensive studies and surveys throughout Australia during development of both the RATTOFF® and MOUSEOFF® ZP products.

As with any chemical product, it is important that all instructions and restrictions on the label are followed exactly.

Despite these excellent features, it is always recommended that RATTOFF® ZP Sachets are only used in the situations approved on the label and never placed in large quantities at one site, or in places accessible to pets or wildlife.



What happens to the rats & sachets?

Rats find the RATTOFF® formulation very palatable and quickly locate and eat into the bait sachets, no additional attractants are required.

Most sachets are opened within days of placement but often only small quantities of bait are eaten by each rat. This is a characteristic of this bait which means that only low quantities are required and recommended application rates need not be exceeded.



Some sachets are torn apart while others are just nibbled open.



Sachets are commonly taken down the rat hole by the rat.

Rats commonly drag the sachets back to their nests. Not only does this remove the sachets from above ground but it also delivers the product directly to the colony.

The majority of rodents are killed within 2-4 hours of ingesting the bait, but of course in a field situation it can sometimes take several days for all the rats to encounter the sachets.

The sachets will generally have sufficient residual bait to continue to kill new rodents entering the baited area after treatment.

Some dead rats are found scattered throughout the crop, but a great many more die in their nests underground. The total impact of treatment is greater than what is observed on the surface.



Some rats die in the entrances of burrows but many more die underground.

A small proportions of rats die above ground but carcasses can be difficult to find. One sachet (S) and two rat carcasses (R) are seen in the photograph above.



How to monitor rat activity

Crops can be inspected for evidence of rat activity such as runways, active holes or signs of fresh damage to the crop.

At night a simple spotlight survey can see rats moving about in the crop. Look for increased activity of birds of prey in the area, which is a tell-tale sign of rat presence.

Trap Monitoring

Best of all is to place a line of 10 rat traps at 10 metre intervals at a two or more sites in the crop.

The traps can be primed with a small piece of peanut butter and should be checked next morning.

If 10% or more of the traps (on average of all test sites) have captured rats, and the crop has some potential for damage over coming months, then rat control is required with bait.



To facilitate access to accurate monitoring tools, ACTA has developed the RATTOFF[®] Monitoring Kit. The kit contains 20 RATTOFF[®] Snap-E Traps and marker pins to help mark out the transects and to hold down the traps.



Look for damage in ratoon cane



Use traps to survey rats



Look for rat runways in crops

Burrow Monitoring

Standard talc powder or trash straw plugs can be used to test for burrow activity.



Inactive overnight



Unmarked burrow



Active overnight



Communication helps to manage rat problems



Rats are generally present throughout a district so it is helpful to communicate with your neighbours and also with staff of your local Cane Productivity Services or BSES Experts. They can assist with advice and help to manage supplies of product and other supporting activities on a regional and statewide basis.



There is absolutely no substitute for careful observation, inspection and monitoring of the crop. Every farmer should do this as neighbours may have greater or smaller problems.

RATTOFF® OH&S precautions

Products containing zinc phosphide are classified as Schedule 7 poisons. Containers must not be reused. A small quantity of phosphine gas is trapped in the head space of containers during storage and is released during opening.

Lids should be removed in the open air and breathing of the gas (feint garlic-like odour) should be avoided during handling. Wear gloves while handling bait. Follow all label precautions exactly.

Restrictions and permits

Native rodents in Queensland can only be destroyed if the Queensland Parks & Wildlife Service issues a Damage Mitigation Permit for the area to be treated. Other rodents in crops can be destroyed without permit requirements. Contact QPWS for more information.

Storage and supply

RATTOFF® is stable if stored in its original packaging at room temperature for several years. However, landholders are encouraged to purchase only that bait required for immediate programs. Use all bait purchased for the current program and destroy the containers.

During short term storage on farm the product must be stored in a locked area which is well ventilated.



Stocked locally by:



Other ACTA products for large scale pest animal management available through agencies or leading rural merchant stores:



FOXOFF®
Fox Bait

For the control of foxes



SLUGGOFF®
Slug & Snail Bait

For the control of snails & slugs in the home garden



FOXSHIELD®
Fox Bait

Fish based bait for fox control



DEN-CO-FUME®
Fumigation Cartridges

For the control of foxes in natal dens



DOGGONE®
Wild Dog Bait

For the control of wild dogs



RABBAIT®
1080 Oat Bait

For the control of rabbits



RABBAIT®
Pindone Oat Bait

For the control of rabbits



MOUSEOFF®
Zinc Phosphide Bait

For the control of mice in crops



MOUSEOFF®
Bromadiolone

For the control of rats and mice



RATTOFF®
Zinc Phosphide Bait Sachets

Reducing rat populations in sugarcane crops



PIGOUT®
Feral Pig Bait

For reductions in feral pig populations

**Animal Control Technologies
Australia Pty Ltd**

Phone: 03 9308 9688 Fax: 03 9308 9622

Email: enquiries@animalcontrol.com.au

More info at www.animalcontrol.com.au

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Excellence in Pest Animal Management