

Banishing pests from crops

Plastics and polymers have revolutionised the way we live in many ways. As well as their obvious effect on day-to-day living – such as wires and cables for telecommunications, or gas distribution pipes – there are two unique applications within the field of extruded film and sheet products: agricultural films and termite barriers.

Today, more than 860 million people in the world suffer from chronic hunger, with another 100m expected to be driven into poverty and hunger. There are many reasons for this, but one that has remained constant over the years – and has significantly contributed to the current food crisis – is the pre- and post-harvest losses on account of damage done by rodents and various insects such as locusts and moths.

More than 90% of the world's rice is produced in Asia. Rodents and insects inflict losses of 5-10% per annum. This amounts to around 30 million tonnes – enough rice to feed half the population of Europe.

But it's not just crops that are in danger. Termites are the most destructive of all structural pests. They are wood-destroying pests, found across the world, and they love to breed in centrally heated homes. According to Bjostad, termites cause \$22 billion in structural damage, including \$11bn in annual damage in the US.

Solutions galore

Agricultural films are laid onto a range of crops during or after planting as a way of retaining moisture and improving plant growth. But it is a proven fact that using agricultural films does not solve the problem of rodents and pests. A major constraint to banana production, a dietary staple for over 70m people in sub-Saharan Africa, is pest infestation. Although mulches can improve soil water and nutrient status they also promote the proliferation of the banana weevil, a serious pest. Its larvae burrow into the bulb and prevent the plant from taking up enough nutrients.

Termite barrier systems are specially developed trenches and plastic sheet coverings that block termites from entering a home through the basement, footings, and foundation to reduce the chances that they reach the walls. A termite barrier is a plastic sheet containing

Cleverly designed film and sheet products can help to repel pests from the home, as well as preserving precious crops, says **Sonal Sapale*** of C-Tech Corporation



anti-termite chemicals. Plastic sheets alone will not keep these disruptive insects away, as they tend to nibble their way through.

Currently, only toxic insecticides are used, but the use of these should be curbed as far as possible. Being toxic in nature they come with a set of liabilities: contamination of groundwater, cattle poisoning, effects on benign species (such as bees and earthworms), soil pollution and leachability. Thus, there is the need for an innovative, eco-friendly and non-toxic solution to get rid of pests and rodents.

Combirepal keeps rats and other rodents away because the chemicals within it inspire fear in the animal

Innovative answer

Combirepel, a non-toxic and non-hazardous solution developed by C Tech Corporation of India, has been successful in keeping away rodents, termites and insects from plastic materials in a sustainable way. It is compliant with ROHS and Reach, and is FIFRA-exempt. Unlike conventional pesticides, Combirepel is developed by a special manufacturing process that provides high temperature stability up to 400°C making it easier to process on any extruder at elevated temperatures. It acts through a series of intricate mechanisms that ensure insects and rodents are kept away from the target application. Also, it is effective in low dosages, has low vapour pressure (thus posing no problems of

Fear factor

C Tech's masterbatches use five different principles to ensure that agricultural films – and the crops that they protect – are not damaged by rodents.

The most important is **fear**. The additive is a potent mix of compounds that mimic the smell of predator urine, which exploits the olfactory response of the animal. This means that most rodents will keep their distance.

The second is **discomfort**. This is triggered by adding a chemical that causes distress to the mucosa of the animal, should it overcome its fear and chew the product.

On top of this, the product triggers **aversion** in the animal, so that if it bites the product, it is unlikely to do so again.

These reactions lead to **training**, in which the animal perceives it should avoid the product. The experience, implanted in the animal's memory, can be passed to the next generation – which should now avoid similar products through **conditioning**.

The banana weevil is a serious pest in the production of bananas, a dietary staple for many people in sub-Saharan Africa

fumes in the air) and lasts between five and 40 years depending on the application. Combirepel is compatible with all types of thermosetting and thermoplastic polymers and can also be customised, depending upon the target, application and region.

Real-life testing

C Tech has tested the anti-rodent and anti-termite product extensively, both in-house as well as in various government testing institutes in India and abroad (such

as the BAM Federal Institute for Materials Research and Testing). The recently concluded testing for the product for anti-termite efficacy at BAM yielded favourable results.

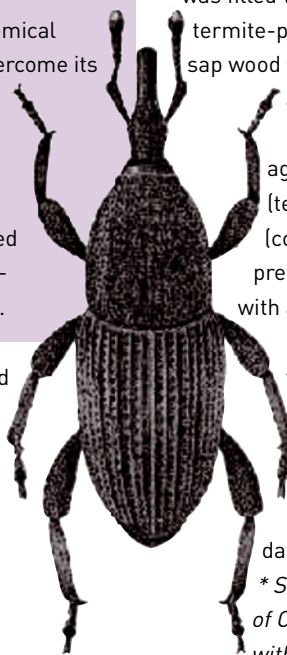
At the BAM the testing for anti-termite efficacy was carried out in accordance with the DIN EN 117 standards for anti-termite bio-efficacy. Plastic containers were filled with Vermiculite, pine sap wood and water. To this were added 250-300 termites, comprising both soldier and worker termites. A smaller plastic container was filled with pine sap wood and locked with a termite-proof plastic lid. In order to reach the pine sap wood within this container, the termites had to actively penetrate the plastic film.

The tests were carried out with undamaged films containing the 'aversive' additive (test film) as well as those without the additive (control film). The test was also done with pre-damaged films (which had pin holes), both with and without the aversive additive.

The species tested included subterranean termite species *Reticulitermes flavipes* and *Coptotermes formosanus*. The test duration was 12 weeks, after which the test film was found to be resistant to termite attack whereas the control film was damaged – especially the pre-damaged film.

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