COMBIREPEL®™

Non toxic and non hazardous, anti-rodent and anti-termite repellent

CTECHCORPORATION
uncompromising quality

WHITE PAPER ON COMBIREPEL®™

The uninvited guests:

Termites have been around since time began. They are social insects that feed upon dead plant material, usually wood. They live in colonies that can number in the millions and are found heavily concentrated in the tropics and within fifty degrees of latitude either side of the equator. There are an estimated 4,000 species of termites; of these 10% are the type that can cause problems for people. Rodents are aggressive, active, and adaptable; they have accompanied man throughout the world, travelling with them on ships, boats, deserts et al. These minute creatures have wreaked havoc in the functioning of human life. Considering the sensitiveness of the applications that these uninvited guests often attack and the massive amount of damage incurred, C Tech Corporation has come up with a unique and novel product which is a non toxic and non hazardous, environmentally friendly anti-rodent and anti-termite masterbatch- **Combirepel®™**

The unexpected damage:

The numbers are astounding, the facts are hard hitting but the truth is that these problems persist and are continuing to incur damage on an unprecedented scale in the absence of a solution that would address it effectively, sustainably and moreover in an environmentally friendly manner. Here is a short review of rodent and termite damage that would give you an idea of the extent of damage across different sectors incurred:

- Trouble of starting the car in the morning as a rat or a vole has eaten through the cable is one of the problems faced by every car owner. After spending thousands of dollars on the car it feels annoying to spend more on its maintenance which is not even covered by the insurance companies. Moreover, these dreadful rodents can chew on the engine wires to the tasty tune of **approximately $1,500 in parts and labour**.

- Rodents are often the direct reason behind the **disruption of underground train services and metro rail services**. *Beijing Subway Once, because mice caused several power outages, the longest outage in a more than 40 minutes, resulting in tens of thousands of passengers trapped in tunnel.*

- *In 1982, Hunan Dongting Nitrogenous Fertilizer Plant, caused by rodents burning transformer short-circuit, resulting in disruption of production, a few days on* ***the loss of millions of NT dollars***. The situation becomes more deadly when the gnawing may leads to fire explosions. *Shanghai Petrochemical Plant in the spring of 1980, a mouse jumped into the power plant due to high voltage switch positions, Deputy bus Knife cause a short circuit, causing lead to water, electricity, gas suddenly interrupted, causing* ***loss of up to 17 million yuan***.

- Rodents significantly damage crop before and after with an estimated 20% of the world's food supply consumed or contaminated each year. **About 23 kilograms (50 pounds) of grain are required to support a rat for a year, but the total amount of grain loss (including spoilage) is about 70 kilograms (150 pounds) per rat per year**.

- World over heritage structures which are the symbol of pride for any country suffer the ignominy of being vandalized by birds who sit on these heritage structures and make a mess with their pecking, food habits and droppings.

The termites are not far behind in this exercise in damage:

In an article entitled, "Termite Control: Answers for Homeowners" Mike Potter, Extension Entomologist for the University of Kentucky College of Agriculture, asserts that **"Entomology departments often receive more calls about termites than any other household insect."** It is safe to say that most of the calls probably involve questions about how to get rid of the termites. It is also another way of saying that the power of the termite attack is greater than the power of the human defense. Meanwhile the ingenious termites are also learning how to circumvent man. How severe is the problem?

Termites hold a diverse portfolio which lists the vulnerable areas susceptible to the damage they can unleash defying the norm that 'small is beautiful', rather in this case 'small is vicious'

The portfolio:

Heritage sites:

Every year new heritage structures are added to the **list of Most Endangered Sites of UNESCO**. This world over heritage structures which are the symbol of pride for any country suffer the ignominy of being vandalized by insects/termites who dwell in these heritage structures and make a mess of their internal structure. Heritage sites like Taj Mahal of India, Blue Mosque of Cairo, West Bank of River Nile, and Jantar Mantar of India have lost their pride and are fighting for their existence.

Railways:

The experience of a railway passenger, "As soon as I entered in the compartment I felt some abnormal ambience inside as the coach seemed to be quite old & unmaintained but thought it may be due to administrative exigencies or owing to the rainy season but

no sooner we went to bed, some **big cockroaches started crawling in the compartment**. I thought that some railway employee would come and spray some insecticides & relieve us but no one came throughout the night. After the cockroaches some insects started biting, I thought it may be mosquitoes but it started getting worse, & to our surprise **the bed was fully possessed by bed bugs.** It was too irritating & troublesome, that I did not sleep for a single minute throughout my journey." It's a story of every common man travelling by trains throughout the world. We always have the company of roaches or bed bugs or mosquitoes or termites. The condition becomes worse in the case of long distance journeys. Moreover, the pantry cars are also vulnerable to cockroach and other insect infestation which contaminate the food via droppings, wings etc., and an open invitation to thousands of diseases.

<u>The agricultural sector:</u>

In 1877, farmers in Minnesota were fearful they would experience a devastating locust plague. One had already been experienced in the summer of 1876, and if a similar plague occurred in 1877, the farming future of thousands of families would be wiped out permanently. The crops were saved then but today also the **losses are tuned to 10,000 hectares of paddy crops** due to insects and worms.

Several agricultural plants suffer significant damage due to termites such as sugarcane, upland rice, groundnut and eucalyptus. Other crops include maize, cotton, peanuts, soybean, coffee, fruit trees and vegetables. **Termites may cause injury to plants by feeding on roots, leaves, stems and woody tissue.** Termites are major agricultural pests, particularly in Africa and Asia, where crop losses can be severe. According to a 1990 survey of extension specialists throughout the United States, **stored grain losses exceeded $500 million for the year**.

Timber damage:

One of the news report says,*"U.S. scientists admitted that one war is being lost-this year the 58 U.S. varieties of termites, frail, pale, ¼-inch-long insects, will destroy the US property (by boring into and eating the wooden framework of buildings), and almost nothing can stop them".* Termites are wood-destroying pests most commonly found all over the planet. Development of new and centrally heated homes all over the United States, Europe and Australia has made them the breeding centers of termites. According to Bjostad, termites cause **$22 billion in structural damage annually around the world**. This includes **$11 billion in annual damage in the United States**, including damage in Colorado, where many residents are unaware of termite infestation. The estimated **cost of termite treatment is 200 million Euros per year**. If added the cost of repairs, replacement or destruction of structures, furniture, walls and other woodwork, the annual cost in France would be around 500 million Euros a year. In mathematical terms, **this equals the annual damage done by rats, mice or weevils, and exceeds that of tornadoes, earthquakes or arsonists.**

The Reason:

Research has shown that termites have the almost unique power of digesting cellulose. Hence, unlike most animals, they have little natural competition to check their increase. Most insects depend upon a seasonal food supply, and their life cycles allow them only brief intervals to feed and breed. Termites almost never stop eating. They live in and on cellulose. They build and bore for themselves airtight galleries which shut out light, diseases, most enemies. These galleries also keep their colonies humid and draftless, so that the soft-bodied insects do not dry up. This sheltered existence makes termites hard to fight. When soil-nesting termites travel to find wood, they construct long covered runways, which may reach even to the second floor of a house. A termite digests cellulose with the help of the swarms of protozoa (one-celled animals) which are present in its guts. Since termites reduce cellulose (the toughest part of plants) to humus and provide food for new plants, their destruction of wood is really a vital part of the

vegetative cycle of growth and decay. Going deep into the study of animal behaviour made us realize the bonding between the animals and the plastics. The bright colours and texture of polymer, the aromatic odour of polymeric products and the plasticizers used are all responsible for animals being attracted towards plastic goods. In addition, Rodentia, an order of mammals also known as rodents, is characterized by two continuously growing incisors in the upper and lower jaws which are kept short by gnawing. Thus to satisfy their own need, they hamper our living.

The Solution:

Employing novel techniques and focusing on environmental issues and safety norms are the need for the day and polymer-specific masterbatch for effective rodent and insect/termite repellence is now possible. C Tech Corporation offers novel and unique **non hazardous and non toxic masterbatches of Combirepel**®™ for insect and rodent repellence. These universal masterbatches are available in the form of plastic granules with a recommended **addition level of 1-5%** depending on end application.

Combirepel®™ works towards keeping insects/termites and rodents away by working on a unique multi-pronged strategy which can best be described by enumerating below:

For rodents/animals and birds:

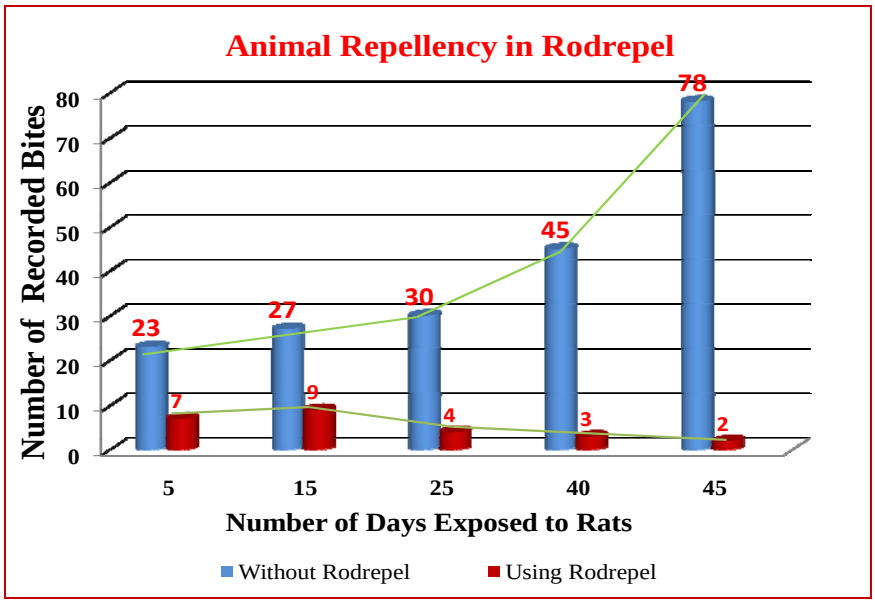
Aversion – By making the cable sheath or plastic component foul in taste.

Discomfort –By causing severe distress to the mucosa of the animal.

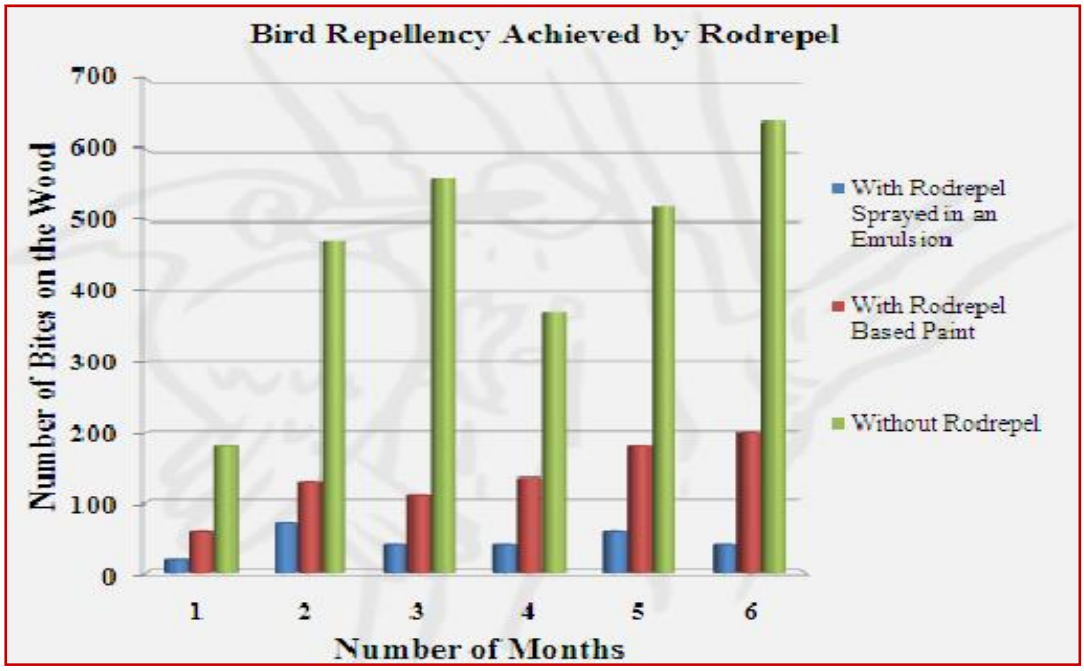
Fear - By exploiting the olfactory fear response of the animal.

Training – the unpleasant experience leads to behaviour modification and the animal avoids products made with Combirepel in the future.

Association and Conditioning – The fear response and unpleasant reaction is communicated to other animals in the vicinity.



The graph proves the validity of above principles. The Combirepel®™ treated cables are less chewed as compared to the untreated cables. Combirepel®™ is not only effective for rodents but for birds also. The testing was done by applying Combirepel®™ on woods by various techniques like coating and spray. The results have shown that Combirepel®™ is non toxic bird repellent.



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For termites and insects:

Repellence – It acts as a repellent and insects avoid going to the treated areas.

Feeding Disruption – They find the smell and taste of the treated area extremely unpleasant.

Oviposition Deterrence – It temporarily impairs the ability of insects to reproduce, i.e. the female will not lay eggs.

Growth Inhibition - It temporarily blocks the insect's reproduction system by hindering the release of the vital hormones for growth.

Mating Disruption – It temporarily inhibit the mating cycle of the termites.

Chemo sterilization – It temporarily hampers the reproduction cycle of insects by sterilization.

The Gist...

The issue of protection of polymeric goods from recurring attacks by rodents causing huge damages and economic losses; is global. Current rodenticides come along with their set of drawbacks including human health hazards and environmental hostility. Thus rodent repellent options based on natural extracts like, Rodrepel™® form better, safer and cost effective alternatives for rodent protection.

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