

## **Mythic Gel : a valuable tool for the control of cockroaches**

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Cockroaches are insects that live in colonies. There are many cockroach species around the world but only a few interact with humans. Cockroaches are generally large enough to be visible to the naked eye. Their size can vary from a few millimeters to nearly 100 mm in large species. The majority of species have two pairs of wings and some species are able to fly very quickly. There are also species that do not have wings or have wings of reduced size (1).

In total, less than 1% of the known species of cockroaches interact with humans and are considered undesirable. Only 4 or 5 species are considered to be harmful globally. In order of importance, we find the German cockroach (*Blattella germanica*), the Oriental cockroach (*Blatta orientalis*), the American cockroach (*Periplaneta americana*) and the Brown-banded cockroach (*Supella longipalpa*).

These species are able to adapt to a multitude of habitats but prefer the heat found in human dwellings. These cockroaches are generally omnivorous, exhibit gregarious behavior and it is therefore possible to find them in very large numbers in the same place where the food source is abundant.

Cockroaches are considered invasive and disruptive when they develop in the environment of humans. Their development is facilitated by access to the same food source as man, especially food waste.

It has been shown that their presence, including their fast multiplication, has a proven impact on human health. Cockroaches can transmit infectious agents (2). Even if transmission does not occur from insect bites, the cockroaches carry pathogens on the outside of their bodies; the texture of the cuticle is ideal for the binding of germs and these pathogens are also present in their intestines. These insects crawl on the ground, seeking access to food or heat. When they come into contact with food, these pathogens are deposited directly, or indirectly from the insect excrement.

These pathogens include bacteria, viruses, fungi and parasites. There are more than 30 species of bacteria, some of which are of medical importance in disease transmission, such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and various species of *Salmonella* and *Staphylococcus* (2).

Cockroaches can also cause allergies, especially in cases of heavy infestation. The allergic reaction can occur on the skin or via the respiratory system. The reaction may be severe and require intensive medical care. It appears that more than 20% of people are allergic to cockroaches. Therefore, in the event of an infestation of one of these species of harmful cockroaches, especially where there is contact with humans and in the presence of foodstuffs (food industry, restaurant, private houses), it is important to control these insects to avoid the negative health impact from their presence.

There are different methods of controlling these cockroaches. The most effective is the use of synthetic insecticides in their living environment to quickly achieve high control efficiencies.

Gel baits are the most widely used for the control of cockroaches. Cockroaches attracted by palatable formulations will consume the bait and therefore ingest the insecticidal active ingredient, which eventually kills the insect. The use of a gel containing a stable active ingredient allows the horizontal transfer of this insecticide from one individual insect to another; the cockroaches being necrophagous, means that individual insects killed by the treatment are consumed by other individuals of the colony who then ingest the active ingredient in turn. This point is essential so that the placing of a few bait points allows control of the entire colony of cockroaches.

There are several families of active ingredients exhibiting this transfer characteristic from one individual to another that are to date found in gel baits:

- Family of phenylpyrazoles: fipronil is a highly used and very effective active substance that acts on the nervous system of the insect
- Family of neonicotinoids: imidacloprid, acetamiprid and clothianidin, which act by blocking the nerve impulse in the insect
- Family of oxadiazines: indoxacarb requires bio-activation by the insect to act by blocking on its nervous system.

These 3 families present active substances which act essentially on the nervous system of the insect by mechanisms of action which are very close. Among these different active ingredients, a decrease of the effectiveness for certain species of cockroaches, or the appearance of resistance in the field (3) has been demonstrated.

It is therefore important to maintain a variety of modes of action in the control of populations of harmful cockroaches to prevent this phenomenon of loss of efficacy. In this context, having a fourth family of active substances, the pyrroles, is very important, in particular chlorfenapyr (4). This active substance acts on the energy metabolism of the insect, and therefore does not directly affect the nervous system like all other active substances present in insecticidal gels used to control cockroaches. The action of chlorfenapyr is slower, but a high level of efficacy is achieved in a long-lasting manner. Thus, with the aim of long-term management of cockroach populations at a site of infestation, it is very important to have a chlorfenapyr-based gel to prevent the adaptation phenomena of these insects. Also, chlorfenapyr has the same chemical characteristics as the other active ingredients important for cockroach controls, in particular, the horizontal transfer from one individual to another of the colony.

#### Bibliography :

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