Food and Agriculture Organization of the United Nations

How to use Biopesticides

What are Biopesticides?

Biopesticides are certain type of pesticides, which are derived from natural materials, for example, microorganisms. FAO promotes the use of biopesticides which kill only locusts and have a very little, in any, negative impact on human health and the environment. They are safe for other living beings, i.e. humans, honeybees, birds, fish, etc.

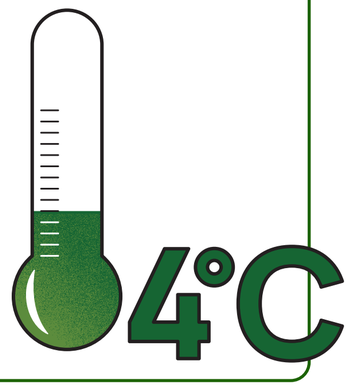
The biopesticide used to control locusts is formulated using the spores of a fungus, which is specific to locusts and grasshoppers. When the spores enter into contact with the host, they germinate, penetrate through its cuticle and the fungus develops inside the locust body until it kills the insect – a process which takes several days.
This strain of the fungus was selected for its virulence and high multiplication rate based on many years of laboratory experiments and field trials.
The same Ultra-low volume (ULV) spraying equipment currently used for conventional pesticides can be utilized for spraying biopesticide due to its specific formulation. No special protective clothing is needed for operators, beside a mask only to prevent allergy. The fungus requires six to ten days to kill the locust and therefore cannot be used when a rapid mortality is required, during locust emergencies. As a consequence, biopesticides are not a substitute of chemical pesticides during major crises. However, even during a plague, they remain essential because they are the only pesticides that can be used when locusts are in ecologically sensitive areas, for instance near water. Therefore, biopesticides play a key role both in locust preventive control strategy and during locust emergencies.

1 Storage and transportation

The spores of the fungus that is used to formulate the bio-pesticide are packed in opaque sealed 0.5 or 1-kg bags, because of the spores' sensitivity to light and humidity.

These bags must be kept in a cold-storage warehouse at temperatures of 4°C to preserve the virulence of the spores for several years. Temperatures between 10°C and 25°C can also be sufficient, but only if the biopesticide is used within two years.Biopesticides is also sensitive to thermal shocks. This means that when bags are transported to the field, they must be placed in sealed isothermal containers.
An electrical supply is needed to preserve the biopesticide at the appropriate temperature and vehicles must be equipped with isothermal containers.

Upon arrival in the field, the isothermal container must be connected to the local generator to ensure the appropriate temperature is maintained.In such way, the spores' ability to multiply and infect can be preserved for 2 to 3 months in field conditions.

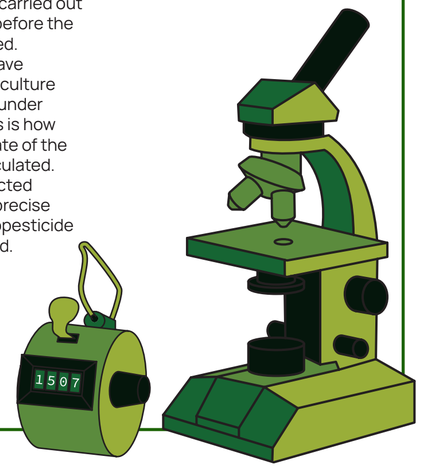


2 Assessment of the spores' viability

When being stored for lengthy periods of time, or if there are any doubts over the preservation of the cold chain, the viability of the spores must be checked before use.

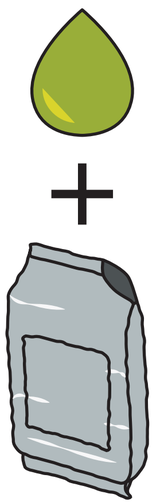
On average 1 gram is made up of up to 50 billion spores and the germination rate is of 90% after 48 hours at a temperature of 25°C.
Although the biopesticide has no negative impact on human health, those handling it are advised to use protective gloves and masks to avoid inhaling spores and developing any allergies. For the germination test, a few grams of spores are extracted and mixed with distilled water.

Then, a few drops of the resulting suspension are taken and placed in culture in a Petri dish.
This test must be carried out at least 48 hours before the biopesticide is used.
The spores that have germinated in the culture are then counted under a microscope. This is how the germination rate of the suspension is calculated.
This test is conducted to determine the precise quantity of the biopesticide that will be sprayed.



3 Preparation of the spore's suspension

The spore powder should be mixed with gasoil, mineral or vegetable oil, before spraying.
This helps the spores to stay on the cuticle of the insect.
The main goal is to prepare a homogeneous suspension so that it can be sprayed in Ultra-low volume. The preparation process must be carried out in a shaded environment because the spores are sensitive to sunlight. Operators are also encouraged to wear masks and gloves as well as protective clothing to avoid staining clothes.
As a rule, 50 grams of product (spore powder) are diluted in 1 litre of gasoil.
The bag is opened with scissors and a small amount of gasoil is poured inside.



Process.

The bag must be shaken vigorously to better mix the spores with the gasoil.
The resulting mixture is poured into a larger container of gasoil.
The same operation is repeated until the bag is fully emptied.
The mixture must be stirred with a stick frequently to stop any lumps from forming.
The next step is to pour the mixture into the sprayer tank containing the required quantity of gasoil.
Once this is completed, the right dilution for treatment has been obtained.

4 Spraying

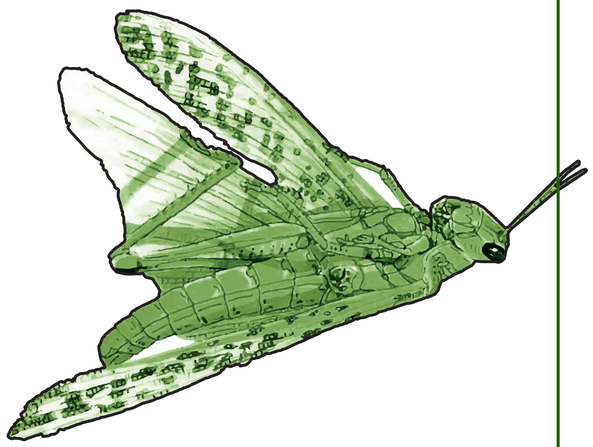
Once all the steps are completed, the mixture is ready to be used. From then on, the procedure before and during spraying is similar to that using conventional pesticides in ULV formulation.
Once control operations with the biopesticide are complete, the sprayers are rinsed in the same way as they are when chemical pesticides are sprayed.

5 Locust mortality monitoring

After the spraying, locust mortality monitoring is needed as locusts die only a few days after treatments. To evaluate the treatment efficacy, around twenty locusts need to be collected from the treated plot and placed in a cage to observe their mortality.

Every day, the dead locusts are removed and placed in a moistened Petri dish to encourage sporulation.

In the initial stages, as the fungus develops it will give the locust a pink-coloured tint and subsequently it will cover its body with mycelium. This allows verifying that the mortality has been effectively caused by the biopesticide.



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