Spraying chemicals, particularly pesticides, can have devastating effects on honey bees and their colonies. Certain pesticides, even at low concentrations can kill both honeybees and native Australian bees.

Chemicals can harm honey bees in several ways:

- **Direct Contact**: Bees can be exposed to toxic doses of insecticides when foraging on treated plants or encountering contaminated dust or spray drift. This can lead to paralysis, convulsions, and death.
- **Foraging Contamination**: Bees collect nectar and pollen from treated plants, bringing contaminated resources back to the hive. This exposure can lead to immediate poisoning, causing the death of individual bees, or sublethal effects that impair their ability to forage, navigate, or reproduce. Over time, these disruptions can weaken the entire colony, making it more vulnerable to other stressors like diseases, pests, and poor nutrition.
- **Physiological Disruptions**: Some chemicals interfere with bees' immune systems, making them more susceptible to diseases and environmental stressors.
- **Larval Exposure**: Pesticides can affect developing larvae, leading to developmental issues and reduced colony survival.
- **Spray Drift and Water Contamination**: Bees can be harmed when pesticides drift onto hives or flowering plants, or when they drink water containing pesticide residues.

To mitigate these risks, it is crucial for farmers and gardeners to adopt bee-friendly practices, such as spraying chemicals during times when bees are less active (early morning or late evening) and choosing less harmful alternatives whenever possible.

Neonicotinoids (neonics) are a class of insecticides that share a common mode of action that affects the central nervous system of insects. As the name suggests, these chemicals are similar to nicotine, and they react with the same nerve receptors in nerve junctions as nicotine does. This enables them to cause paralysis and death.
These chemicals have an advantage as insecticides because they are water-soluble and, if sprayed on the soil, plants can easily take them up. In theory, this reduces the risk of unwanted effects on beneficial insects caused by broadscale spraying and consequent spray-drift. However, their solubility means that they can enter and be stored in pollen and flower nectar, placing pollinators such as bees at risk.
Neonicotinoids in use are: Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Nitenpyram, Thiocloprid, Thiamethoxam.

Organophosphates have been widely used in the past because of their effectiveness, as they are extremely toxic neurotoxins and have high persistence in the environment. Most are now banned overseas, but products containing malathion, chlorpyrifos, dichlorvos and diazinon are commercially available in Australia – mostly as dusts, and powders to control lawn beetles, grubs, slaters, termites and ants. Some are in fruit fly traps or pest strips which don't carry quite so much risk, since they are not sprays which can disperse. However, because of their persistence, residues can be picked up by bees. Despite most products containing organophosphates being now discontinued, some still lurk in garden sheds and garages.

Pyrethrins are a family of products, some natural (Pyrethrin) and others synthetic(Pyrethroids), the latter are particularly toxic to bees. Pyrethrins include permethrin, cypermethrin, bifenthrin, phenothrin and deltamethrin. Many of us think that products containing pyrethrin or something that sounds similar, are natural and, therefore, safe. But this is not the case. They affect the nervous system by changing activity of nerve sodium channels. If using these products, avoid spraying during the day when bees are active and wait until bee-attracting flowers are no longer present. Since pyrethrins are not persistent in the environment, the effects of residues wane after about one week.

Fipronil also affects bees' nervous systems. When a bee ingests fipronil, it disrupts its central nervous system by changing the activity of the chloride channels, leading to hyperexcitation, paralysis, and eventual death. Even trace doses can be lethal and accumulate in the bees' tissues faster than it can be eliminated, causing impaired drone and queen fertility potentially leading to colony collapse.

Sulfoxaflor causes honeybee foragers to struggle to maintain a straight trajectory while moving, which affects their ability to navigate and forage. Wild bee species exhibit varying sensitivity to sulfoxaflor, with some species being more vulnerable than others. Its effects can persist long after initial exposure, with it remaining in pollen and nectar for days, increasing the risk of exposure for pollinators.

The above is not an exhaustive list as there are many other pesticides available for use in horticultural and agricultural industries which contain ingredients which are toxic for bees.

Symptoms of hive poisoning:

If your beehive has been poisoned, you might notice several alarming signs. Here are some key indicators:

- **Large numbers of dead bees** outside the hive, often in a concentrated pile.
- **Spinning or skipping bees** near the hive entrance.
- **Bees exhibiting unusual behaviour**, such as trembling, paralysis, or disorientation and abnormal buzzing sounds.
- **Increased aggression** towards other bees or humans
- **A sudden drop in foragers**, meaning fewer bees returning to the hive, leading to decreased food collection.
- **Bees with extended proboscis (tongue)**, which is a common symptom of pesticide poisoning.
- **Less brood** in the hive**.**
- **Dead bees inside the hive**, particularly on the bottom board.
- **Malformed or deformed** wings and body parts
- **Unusual coloration or discoloration** on the body

What to do if a hive has been poisoned:

Many poisoned hives never recover, but in most cases it is a simple numbers game. The bigger your colony is, the better it's chance of survival. Once pesticides knock out the field bees, the population will be drastically reduced. A hive with a low population is now at risk for a number of other problems because it will not have the necessary workforce needed to complete daily tasks.
To help the bees recover you could do the following:

- Consider removing frames that are full of dead larvae
- Remove dead bees on the bottom board to prevent any secondary bacterial infections
- Ensure there are enough food stores as there will be little or no foragers and feed them if required
- Check for the presence of a queen as she may have been damaged or killed by the pesticide exposure
- If you need to requeen, wait several weeks after the poisoning to ensure she has the highest chance of survival
- Reduce the front entrance to protect the hive from predators

A hive poisoning can devastate our hives, which is why it is so important that we educate the broader community about the real danger it can pose to our bees. Bees play a vital role in pollination, so it is crucial to promptly identify and address any poisoning incidents to protect the health and well-being of these important insects. By monitoring for signs of poisoning and taking necessary actions, we can help safeguard the bee population. Understanding the symptoms and being able to identify poisoned bees is essential for promoting bee conservation and protecting our ecosystems.

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