


Mode of Action

Video Dialogue - Part One

Herbicides and Insecticides

1. Pesticides are chemicals used to control a pest. There are many types of pesticides. Herbicides kill plants, disinfectants remove germs, fungicides kill fungi, insecticides kill insects, and repellants repel pests. Many other pesticides control other arthropods, birds, fish, mammals, bacteria and viruses.
2. This video will focus on the most commonly used pesticides (Herbicide, Insecticides, Fungicides and Bactericides), and some of their basic mode of action.
3. Mode of action is the way a pesticide exerts a toxic effect on the target plant, animal or microorganism.
4. Pesticide mode of action can be divided into two categories: systemic, and contact.
5. Systemic involves the pesticide penetrating the plant or animal and translocating within its systems with the intent to kill the leaves and root system or protect it from bacteria, viruses or other pests.
6. Contact pesticides do not penetrate the host while controlling the pests. It acts as a barrier or repellant in a plant, or by killing any green tissue present.
7. Broad Spectrum pesticides can kill or harm a wide variety of organisms, both beneficial and harmful pests, and then there are those that target a specific trait in a pest.
8. Herbicides are pesticides used to control or kill unwanted plants. There are close to 5,000 herbicides registered for use in the United States all with various mode of actions and formulations.
9. In this video, we will cover five groups of herbicides. These are auxins. (enzyme blockers, photosynthetic inhibitors, amino acid and cell growth inhibitors).
10. Growth regulators are commonly referred to as synthetic auxins. These chemicals mimic natural plant hor-



mones and interrupt plant cell growth in newly forming stems and leaves. They affect protein production and normal cell division, leading to malformed growth.

11. Synthetic auxins also kill plants by causing the cells in the tissues that carry water and nutrients to divide and grow without stopping. This is often called “growing itself to death,” which is seen by one side of the stem being longer than the other.

12. Sulfonylurea, phenyl pyrazoline, and imidazolinone are examples of ALS inhibitors or enzyme blockers. They are chemicals that block the normal function of an enzyme called acetolactate synthase or ALS. This enzyme is essential in amino acid or protein synthesis. Without proteins, plants starve to death. Enzyme blockers kill a wide range of plants including broadleaf weeds, nutsedges, and grasses.

13. ACCase inhibitors mainly kill grasses. This enzyme helps the formation of lipids or fats in the roots of grass plants. Without lipids, susceptible weeds die.

14. Photosynthetic inhibitors such as Bipyridinium and triazine are chemicals that interfere with photosynthesis, a plants natural ability to make food, and disrupt plant growth, ultimately leading to death.

15. There are also amino acid synthesis inhibitors, shoot and root growth inhibitors and PPO inhibitors.

16. Several herbicides fall into these groups including glyphosate, aceto-chlor, and trifluralin. These herbicides stop or interrupt cell growth and division.

17. Pigment inhibitors or “bleachers,” are herbicides that cause the tissue of a plant to turn white after treatment. Examples include oxazolidinone, isoxazole) and triketone. They interrupt the chlorophyll production in the plant turning the plant tissue white and interrupting photosynthesis. The photosynthesis system can be easily damaged by sunlight without carotenoids.

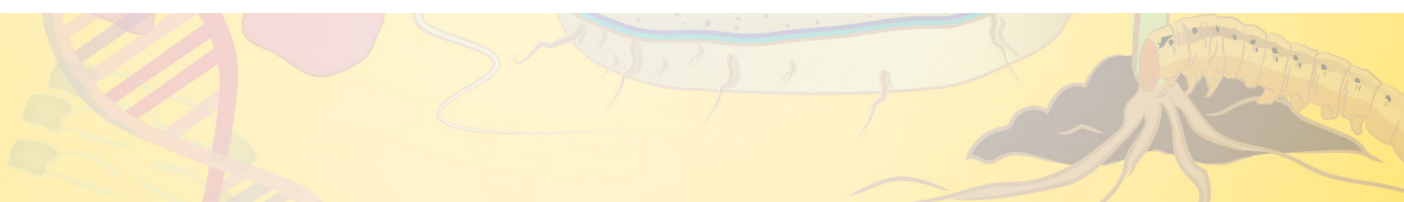
18. Insecticides control insects and other arthropods.

19. Nerve and muscle poisons in insecticides disrupt, inhibit, block, terminate or activate various channels, enzymes and receptors within the pests. Examples include carbamates, organophosphates, pyrethroids, pyrethrins, fipronil, chlordane, DDT, and neonicotinoids.

20. This results in a range of symptoms such as paralysis, hyper excitation, system shutdowns and overly stimulated muscle contraction.

21. Midgut poisons, are poisons that attack the guts of insects via protein toxins leading to unbalanced ions, or salts and other minerals, and septicemia, or blood poisoning. Examples include BT toxins such as *Bacillus thuringiensis* and *Bacillus sphaericus*.

22. Insect growth regulators inhibit the normal life cycle of insects by copying one of these hormones, directly interrupting cuticle development, or loss in fat building. These would make insects die from staying in the im-





mature life stage indefinitely.

23. Respirators can be inhibitors of mitochondrial ATP synthase, Uncouplers of oxidative phosphorylation via disruption of the proton gradient or Mitochondrial complex electron transport inhibitors.

24. These insecticides stop the insect from functioning by reducing the energy output that controls the cellular processes. Examples of this are muscle weakness, breathing issues, visual issues and loss of muscle coordination.

25. Other unknown or non-specific target insecticides are known to affect less well-described target-sites or functions, or to act non-specifically on multiple targets.