1.Basics on Pesticides

Topic 1d

Mode of Action

FACT SHEET

1. Basics on Pesticides

Topic 1d: Mode of Action

Pesticides kill or disrupt a pest's functions. This is called the **mode of action**. In other words: the mode of action is the way the pesticide works.

Why is it important to know the mode of action of a pesticide?
The mode of action plays a very important role in selecting pesticides for a specific pest. The mode of action:

- Tells the operator if the pesticide is suitable for application to the targeted pest. By selecting the correct mode of action, the applicator will get the best results when applying the pesticide.
- Protects the pesticide against resistance. One of the main reasons for increased resistance is the application of the incorrect pesticide to a pest. By taking the mode of action into consideration, the possibility of applying an incorrect pesticide is reduced.

The different types of mode of action
Below are the different modes of action:

- **Broad spectrum versus narrow spectrum:**
  - Broad spectrum pesticide controls a wide range of pests.
  - Narrow spectrum pesticide controls only certain specific pests.
- **Short-term control versus residual:**
  - Short-term effect controls the pests quickly after application but has limited or no control in the period following the application.
  - Residual effect has a longer period of control after the application.
- **Contact versus systemic:**
  - Contact pesticide requires only that the pests come in contact with the pesticide for control.
  - Systemic pesticide requires that the pests ingest the pesticide for control. The pesticide is usually on or in the plant, and the pest ingests the pesticide when it feeds on the plant.
- **Life-stage affected pesticides:**
  - These pesticides only affect a certain part of a pest's life cycle. They are also called Insect Growth Regulators.
- **Selective or non-selective (applicable on weed control):**

- Selective pesticide controls only a certain type of pest.
- Non-selective affects all the pests present.

- **Control through translocation (applicable on weed control):**
  - The pesticide moves from the point of application to the point of action. It simply enters the plant, goes into the system, and disrupts the plant's internal processes, killing it.

Main types of pesticides linked to modes of action

The table below shows the most commonly used pesticides and their modes of action.

Type of pesticide	Main mode of action
Insecticides	Short term or residual: Usually insecticides used in the pest control industry. **Or:** Contact or systemic: Usually crop protection insecticides. **Or:** Life-stage affected: Specialist insecticides used in the agricultural as well as pest control industries. **Or:** A combination of the modes of action listed above.
Fungicides	Narrow or broad spectrum. Control mostly by contact but systemic fungicide also exists.
Herbicides	Selective (grasses only or broadleaf weeds only). **Or:** Non-selective action (kills every growing plant). Translocation through plant.
Miticides	Short term or residual: Usually insecticides used in the pest control industry. **Or:** Contact or systemic: Usually crop protection insecticides. **Or:** Life-stage affected: Specialist insecticides used in the agricultural as well as pest control industries. **Or:** A combination of the modes of action listed above.
Nematicides	Contact (soil fumigants).
Molluscicides	Ingest the pesticide (usually as bait).
Rodenticides	Ingest the pesticide (usually as bait).

Why are there different types of modes of action for the same type of pesticide?

There are a variety of different pest species that fall under the same broad type of pest. For example, different insect species must be controlled in different ways. Because of this, insecticides come with different modes of action in order to control different species of insects.

INSTRUCTIONS

1. Basics on Pesticides

Topic 1d: Mode of Action

Materials needed:

- ☑ Flip-sheet board with flip-sheets
- ☑ Markers (1 black, 1 blue, 1 green, 1 red)
- ☑ Colored cards
- ☑ 2 different pesticide labels with a clear mode of action statement on it

Time needed:

1 hour

Preparations:

- ☑ Flip-sheet with the heading *Mode of action*
- ☑ Colored card with the following words: *Insecticides, Fungicides, Herbicides, Miticides*
- ☑ Colored card with the following words: *Short term (2x), Residua (2x), Contact (3x), Systemic (3x), Life stage affected (2x), Narrow Spectrum, Broad spectrum, Selective, Non-selective and Translocation*

Set up

Attention: Tell participants that so far we have seen different types of pesticides formulations and different types of pesticides. However, there is another way to categorize pesticides, which is by mode of action.

Title: Tell participants the title while showing the flip-sheet with the title: *Mode of Action.*

Credibility: Explain your experience in pesticides.

Objectives: To explain what mode of action is and its importance.

Benefits: The mode of action determines the selection of pesticides. When you are aware of the different modes of action, you can better advise your customers.

Direction: During this session, we will not discuss recommendations of pesticides for specific crops. We will focus on the mode of action in general.

Delivery

Explanation, **D**emonstration, **E**xercise, and **G**uidance:

1. Ask the participants what the **mode of action** is. Guide them to an answer containing the following: The mode of action is the way a pesticide works to control a pest.
2. Divide the participants into two groups. Hand each group a pesticide label. Ask them to identify the mode of action on the label. Let them read the mode of action aloud.
3. Tell them that we will look now into the **differences** between modes of action. Divide the participants into five groups. Give each group the following cards:
   - Group 1: *Short Term* and *Residual*.
   - Group 2: *Contact* and *Systemic.*
   - Group 3: *Narrow Spectrum* and *Broad Spectrum*.
   - Group 4: *Selective* and *Non-Selective*.
   - Group 5: *Life-Stage Affected* and *Translocation*.

   Ask each group to explain the difference between the two cards. Let them write the results on a flip-sheet. They have to keep the colored cards.
4. Discuss the results. Let every group paste its flip-sheet one by one on the wall. They have to keep the colored cards. Read what is written and discuss with the group. Add words to the flip-sheet if necessary. Make sure the following is discussed:

   - **Broad spectrum versus narrow spectrum:**
     - Broad spectrum pesticide controls a wide range of pests.
     - Narrow spectrum pesticide controls only certain specific pests.
   - **Short-term control versus residual:**
     - Short-term effect controls the pests quickly after application but has limited or no control in the period following the application.
     - Residual effect has a longer period of control after the application.
   - **Contact versus systemic:**
     - Contact pesticide requires only that the pests come in contact with the pesticide for control.
     - Systemic pesticide requires that the pests ingest the pesticide for control. The pesticide is usually on or in the plant, and the pest ingests the pesticide when it feeds on the plant.

- **Life-stage affected pesticides:**
  - These pesticides only affect a certain part of a pest's life cycle. They are also called Insect Growth Regulators.
- **Selective or non selective (applicable on weed control):**
  - Selective pesticide controls only a certain type of pest.
  - Non-selective affects all the pests present.

5. Tell participants that there is one other mode of action which is called **control through translocation**. Ask if anyone can explain what this means. Control through translocation means that the pesticide moves from the point of application to the point of action. It simply enters the plant, goes into the system, and disrupts the plant's internal processes, killing it.
6. Tell them that we will now **link** the modes of action to the main **types of pesticides**.
7. Put the *Insecticides* colored card on the wall. Ask the groups to select the colored cards in their possession that best describe the mode of action of **insecticides**. Let them paste the cards below the *Insecticide* colored card. Guide them to: short term, residual, contact, systemic, and life-stage affected. Replace the cards that were pasted with new colored cards so that every group will keep the same colored cards.
8. Put the *Fungicides* colored card on the wall. Ask the groups to select the colored cards in their possession that best describe the mode of action of **fungicides**. Let them paste the cards below the *Fungicides* colored card. Guide them to: narrow spectrum, broad spectrum, contact, and systemic.
9. Put the *Herbicides* colored card on the wall. Ask the groups to select the colored cards in their possession that best describe the mode of action of **herbicides**. Let them paste the cards below the *Herbicides* colored card. Guide them to: selective, non-selective, and translocation
10. Put the *Miticides* colored card on the wall. Ask the groups to select the colored cards in their possession that best describe the mode of action of **miticides**. Let them paste the cards below the *Miticides* colored card. Guide them to a selection of: short term, residual, contact, systemic, and life-stage affected.
11. Tell them that there are three other types of pesticides not covered by this exercise:
    - **Nematicides**: Mode of action by contact by using soil fumigants.
    - **Molluscicides**: Mode of action by ingesting as bait.
    - **Rodenticides**: Mode of action by ingesting as bait.
12. Ask the participants **why** different modes of action exist for the same type of pesticide. Guide them to the following answer: There are a variety of different pest species that fall under the same broad type of pest. For example, different insect species must be controlled in different ways. Because of this, insecticides come with different modes of action in order to control different species of insects.

Finish

Summary: Give a summary by defining mode of action and mention the difference between broad spectrum versus narrow spectrum, short-term control versus residual, contact versus systemic, life-stage affected pesticides, selective or non-selective, and control through translocation.

Questions: Ask if anyone has a question or comment.

Evaluation: Ask them what mode of action is and to explain broad spectrum versus narrow spectrum, short-term control versus residual, contact versus systemic, life-stage affected pesticides, selective or non-selective, and control through translocation. Ask them why are there different types of modes of action for the same type of pesticide such as insecticides.

Next step: In another session we will link the different types and categories of pesticides to crops for pesticide recommendations for crops.

Distribute the **fact sheet** to all participants.