IRAC IRM Guidelines

Rotating Seed Treated, Soil, and Foliar Applied Insecticides Using Treatment Windows

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Insecticide Resistance Action Committee

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IRM Guidelines for Rotating Seed Treated, Soil, and Foliar Applied Insecticides

The application of an insecticide to the soil[1], either as a seed treatment or as a direct application[2], is designed to either control soil borne insect pests or provide systemic control of pests above the ground. The general principles of resistance management apply to seed and soil treatments as with foliar applied insecticides, however there are some additional factors that should be considered. There are limited insecticide modes of action available for use either as soil or seed treatments. Therefore, the judicious use of the available modes of action is essential for sustainable control of the insect pests targeted by these applications.

Control of Soil Insect Pests

Soil and seed treatments to control soil-borne insect pests with few generations/year (rootworms, wireworms, grubs, cutworms) are usually applied at the time of sowing or seedling transplant. Despite only one application per growing season the risk of resistance development remains due to the potential for repeated use of the same mode of action in sequential crop plantings. To reduce the risk of resistance development it is recommended that, wherever possible, insecticides with different modes of action be used in sequentially planted crops. In addition, rotation to other crops that are not hosts to the same insect species will reduce both pest pressure and the risk of insecticide resistance development.

Control of Above Ground/Foliar Feeding Insect Pests

Soil borne insect pests that have an adult stage living above ground (e.g., *Diabrotica spp.*) may also be controlled through targeting the adult stage. Scouting for insects and application of a foliar insecticide with a different mode of action and at economic thresholds may help to reduce the risk of resistance.

Above ground insects controlled by seed or soil applied insecticides through root uptake systemic activity is a common and convenient way to manage pests either during the early stages of plant growth or throughout the growing season. To supplement insect control during the crop cycle, foliar or soil applied insecticides may be used.

Ideally, following seed or at-plant soil treatments, alternate subsequent soil and foliar applications with different mode of action insecticides within a defined rotation window[3] to reduce the risk of resistance development.

****See notes on the following slide and later slides for more detailed information with an example of a recommended MoA window rotation.**

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IRM Guidelines for Rotating Seed Treated, Soil, and Foliar Applied Insecticides (Contd.)

Transplant Treatment

Soil treatment or transplant seedlings drenched in nursery production systems is a common practice to control soil and foliar feeding pests by providing plant protection in the early stages of growth. Growers should determine if their purchased seedlings have been pre-treated with insecticides and avoid using insecticides with the same mode of action in the next insecticide treatment window to reduce the risk of resistance development.

Notes:

1. *Soil or another growing medium.*
2. *Including seed treatments, soil drench, in-furrow soil, chemigation, drip irrigation, hydroponic, seedling dip, seedling tray, transplant water, hill drench at planting, surface band at planting, and soil shank injection.*
3. *A window is defined by the length of an insect generation, or if unknown, the period of residual activity provided by a single or sequential applications of products with the same mode of action within an approximate 30-day period.*

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Guidelines for Insecticide Applications Following Same Mode of Action Seed or Soil Treatment

- IRAC IRM WINDOW STRATEGY: The MoA rotation recommendation for products following seed and soil treatments adheres to the long-standing IRAC resistance management strategy based on rotating windows with different MoA products. IRM MoA rotation recommendations do not change based on method of application. They are driven by MoA, product residual, application/rotation window cycles, and treatment thresholds.
- STRONGLY RECOMMENDED: Rotate a different MoA product directly after a prior seed, soil, or foliar application.
- RECOMMENDED: A foliar or soil application with the same MoA following seed, soil, or foliar treatments within the same approximate 30-day window is allowed if pest reinfestation occurs and product residual of combined applications of same MoA products does not exceed the approximate "window" time period. Consult with the product manufacturer or other experts to understand the expected soil or seed treatment residual of products at labeled rates per crop.
- FOLIAR PEST CONTROL FOLLOWING SEED TREATMENT: The approximate 30-day rotation window begins at planting of treated seed. Avoid making foliar applications with the same MoA as the seed treatment beyond 15-20 days after crop emergence to prevent extended residual of any MoA product beyond the approximate 30-day treatment window.
- EXAMPLE: In the corn foliar feeding lepidopteran pest scenario below, assume a seed treatment or soil application was made at planting in Window 1. If pest reinfestation triggers the action threshold, a subsequent same MoA foliar or soil insecticide product is allowed if the combined residual activity does not surpass the approximate 30-day window.
- BE ALERT! Consult product label and local experts for information on residual activity since product residual from seed, soil, and seedling drench applications can persist depending on soil moisture, susceptibility of insect species, and product rate.

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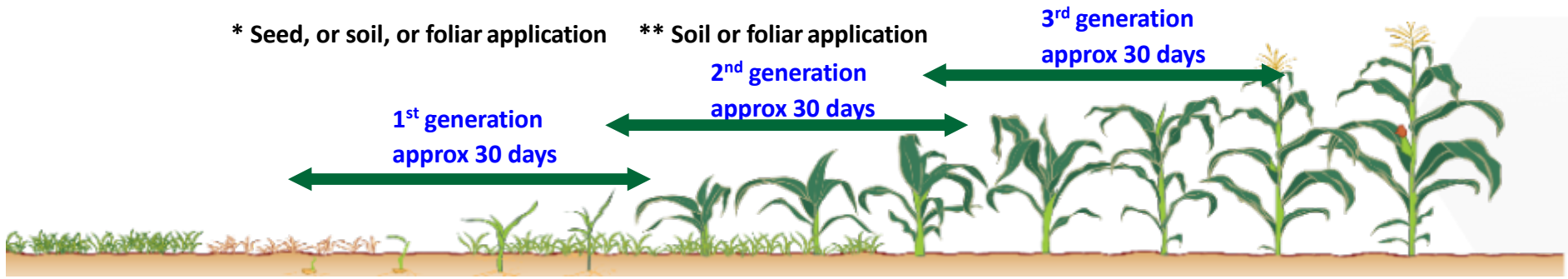
Example of Insecticide Rotation: Seed/Soil Applications Followed by Foliar or Soil Applications

	WINDOW 1*	WINDOW 2**	WINDOW 3
Strongly Recommended ✓✓	1 → 2	3 → 4	If spray is justified, do not apply same MoA used in Window 2
Recommended ✓	1 → 1	2 + 3 → 3	
NOT Recommended ✗	1 → 1	1 → 1	



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