Issue 999

K-STATE Research and Extension

Extension Agronomy

eUpdate

04/11/2024

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Pre-emergence herbicides for soybeans

Preemergence herbicides are the foundation of any excellent weed control program in soybeans. Using multiple effective residual herbicides is important to broaden the spectrum of controlled weeds, ensure herbicide activation in various environments, and guard against herbicide resistance. The basic "recipe" to control key weeds in soybeans is a Group 15 herbicide + a Group 14 herbicide + metribuzin or a Group 2 herbicide. Herbicides in each of these groups will be discussed below. Additional information can be found in the *2024 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland* (SRP 1162) at: https://bookstore.ksre.ksu.edu/pubs/SRP1183.pdf

Group 15 herbicides. Seedlings absorb these herbicides as they germinate and prevent the production of fatty acids needed for plant growth. The herbicides commonly used in soybeans are acetochlor (Warrant, others), dimethenamid-P (Outlook, others), pyroxasulfone (Zidua, others), and S-metolachlor (Dual, others). They control most annual grasses and small-seeded broadleaf weeds. These herbicides are very important across our crop rotations, so it is especially important to manage resistance by applying them in combination with other effective herbicides.

Group 14 herbicides. These herbicides inhibit an enzyme needed to make chlorophyll. The key residual herbicides in this group are flumioxazin (Valor, others) and sulfentrazone (Spartan, others). These herbicides contribute very little grass control to the mix but provide excellent control of pigweeds and morninglories. Group 14 herbicides can cause crop injury if seedlings are exposed to the herbicide due to poor furrow closure or rain splash.

Metribuzin. Metribuzin (Dimetric, others) is a Group 5 herbicide that inhibits photosynthesis. It provides good to excellent control of pigweeds and some large-seeded broadleaf weeds. However, it can cause crop injury, specifically if soybeans emerge slowly. However, soybean tolerance to metribuzin has generally increased across the industry. Recent research conducted in Kansas and 14 other states suggests that metribuzin rates up to 16 fl oz/A (0.75 lb a.i./A) can be safely used on soybeans.

Group 2 herbicides. Widespread resistance to ALS-inhibiting herbicides has reduced the usefulness of these products for pigweed control. However, products such as cloransulam (FirstRate) are still important for controlling large-seeded broadleaf weeds like cocklebur, sunflower, and velvetleaf.

Row spacing effects

Another topic that is sometimes mentioned when discussing residual herbicide applications is the interaction with row spacing. Generally speaking, residual herbicides must remain effective until the soybean canopy closes, so planting in row spacings less than 30 inches has advantages for weed control later in the season. However, the crop canopy does intercept herbicides intended for small weeds and/or the soil. Therefore, postemergence passes need to be made before the canopy reduces the ability of herbicides to reach their target. A second component of narrow row spacing is soil disturbance. Sometimes, logistics dictate that fields are sprayed ahead of seeding. More narrow row spacing will result in greater soil disturbance, which means the herbicide layer will be disrupted, and an effective herbicide concentration may not be present in the zone where weed seeds are germinating. Therefore, a general recommendation is to plant as soon as possible after spraying.

The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements.

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2. Off-target movement of herbicides with wind erosion

Spring in Kansas means the potential for high winds. The critical wind erosion period is when agricultural fields are particularly vulnerable to wind erosion due to higher wind speeds than normal and low vegetative cover on fields. When high winds are coupled with dry conditions at the soil surface, even fields with crop residue may lose soil to wind erosion. It's easy to see the dust blowing across the landscape, but it is not as simple to understand how the moving dust transports herbicides out of our fields.

After herbicides are applied, they are bound to soil particles. Herbicide molecules are adsorbed or bound by the finer fraction of soil particles (clay and organic matter). Also, the herbicide molecule's chemical properties help determine the extent of binding. Any herbicide that is bound to the soil necessarily goes along for the ride. There are three ways soil particles are moved by wind: surface creep, saltation, and suspension (Figure 1). Soil particles can become airborne with saltation or suspension. The smaller the particles, the more chance for detachment and airborne movement. Suspended soil particles form dust clouds that can travel large distances and cause visibility problems. This is the same fraction of soil that can be involved in off-target movement of herbicides.

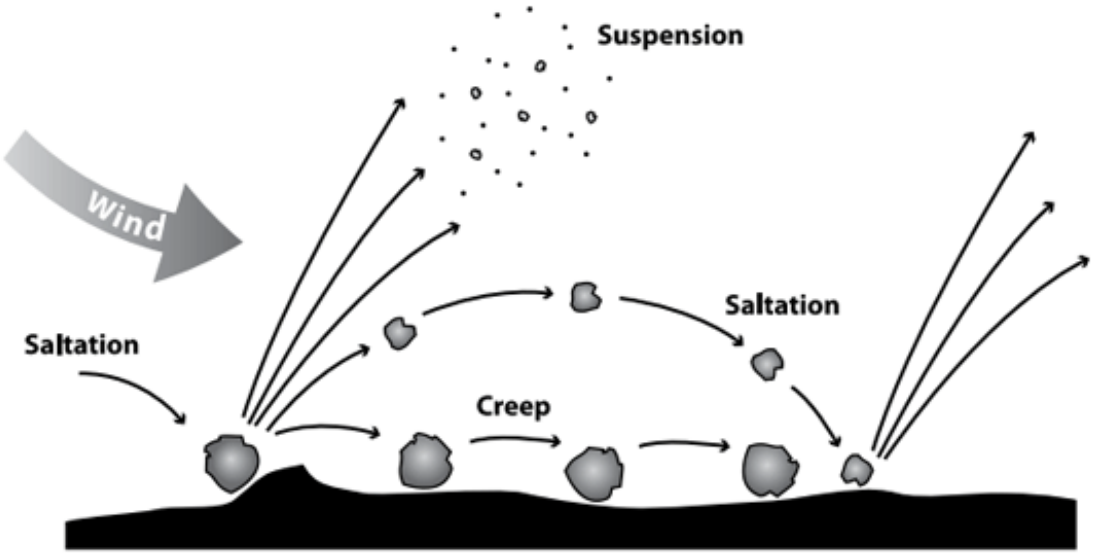

Figure 1. Soil particles can move through saltation, creep, and suspension. Graphic from KSRE publication MF2860 Principles of Wind Erosion and its Control**.**

There isn't a lot of research into the off-target movement of herbicides with wind erosion, and much of what exists is focused on the environmental fate of the herbicide. For example, how much does herbicide movement with wind-eroded soil contribute to herbicide deposition in places where it is not wanted, such as surface water bodies of susceptible crop fields? When herbicide losses have been measured as a percent of herbicide applied to the field, losses reported in the literature range from 1% of atrazine[1] to 43% of simazine applied[2]. One study conducted in Alberta, Canada, concluded that wind erosion accounted for the disappearance of approximately 30% more herbicide than fields unaffected by wind erosion[3]. The same study reported that 2,4-D and other Group 4

herbicides were present at greater concentrations in windblown sediment compared to surface soil, while the concentration of the more volatile trifluralin (Treflan and others) was less in windblown sediment. More recently, scientists in South Dakota described the importance of a high surface area to volume ratio on the amount of herbicide lost when a soil particle is subject to wind erosion[4].

What does this mean for fields affected by wind erosion? The fields in which weed control is most likely to be negatively affected by wind erosion are those that have finer-textured surface soil and were treated with a residual herbicide that has a longer half-life and/or is more tightly bound to the soil. Examples of such herbicides include atrazine, flumioxazin, sulfentrazone, S-metolachlor (Dual, others), and pyroxasulfone (Zidua, others). Herbicide persistence estimates can be found in the *2024 K-State Chemical Weed Control Guide* at https://bookstore.ksre.ksu.edu/pubs/SRP1183.pdf.

If you think you may have lost a meaningful amount of treated soil from a field, consider scouting that field more frequently. Be prepared to make the next herbicide application sooner than expected. Including a residual herbicide in the sequential application may also be more important in these situations.

References:

[1]Glotfelty et al. 1989
[2]Gaynor & MacTavish 1981
[3]Larney et al. 1999
[4]Clay et al. 2001

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3. Soybean row spacing in Kansas

There are still many questions about row spacing for soybean production. In this article, we present a summary of recent research from K-State. From 2015 to 2017, a series of six On-Farm experiments were conducted across eastern and central Kansas (Figure 1).

For the 2015-16 seasons, four on-farm studies (a collaboration between K-State, Kansas Soybean, and the United Soybean Board) were conducted, one each in Franklin County, Hutchinson, Jefferson County, and Manhattan. For the 2017 season, two additional studies (a collaboration between K-State, Kansas Soybeans, and the North Central Soybean Research Program) were conducted in Ashland Bottoms near Manhattan and Franklin County.

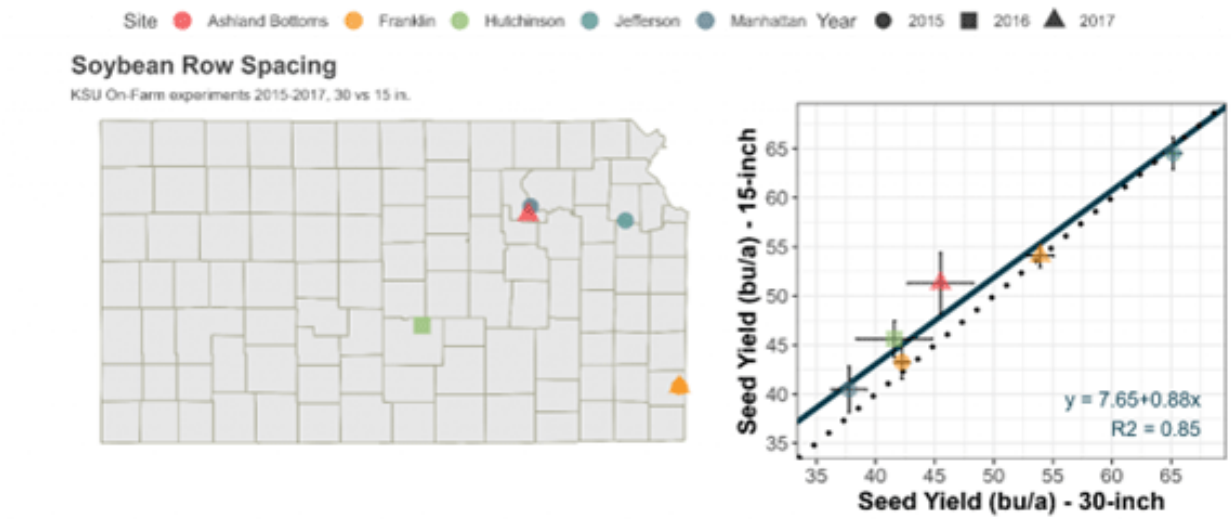

Figure 1. On-farm experiments on soybean row spacing comparing conventional (30-inch) vs. narrow rows (15-inch). Collaborators: Kansas State University, United Soybean Board, North Central Soybean Research Program.

Results summary

Compared to the conventional 30-inch row spacing, soybeans in narrow rows (15-inch or less) in these tests were likely to show equal or slightly greater yields (2-12%), particularly when the yield environment was less than 50 bushels per acre (Figure 1) (regardless of planting date, seeding rate, or maturity). Above this yield threshold level, soybeans did not show a yield response to changing the row spacing (Figure 2). Overall, the common denominator of the response to row spacing is the inconsistency, denoted by the wide error of responses and by the variability between site years.

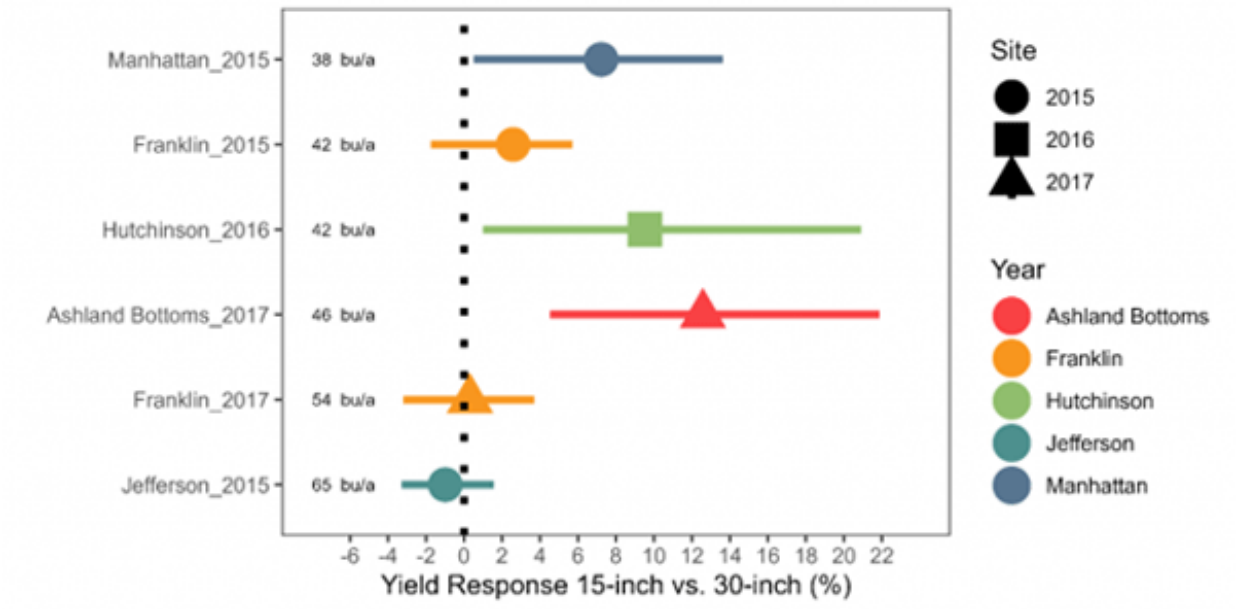

Figure 2. Observed yield response in soybeans to narrow rows (15-inch) compared to conventional spacing (30-inch). The average yield of 30-inch strips is indicated on the left side of the figure (bu/a). At the lowest-yielding site, Manhattan (2015), soybeans in 15-inch row spacing had an average of about 6% higher yields than those in 30-inch rows. In the highest yield environments, Jefferson County (2015) and Franklin County (2017), there was very little yield difference between 15- and 30-inch rows. On-Farm Experiments (2015-2017). Collaborators: Kansas State University, United Soybean Board, North Central Soybean Research Program.

Take home message

Benefits of narrow row spacing:

- Early canopy closure favors better light interception.
- Improved weed control.
- Reduced potential for soil erosion.

Disadvantages of narrow rows:

- Potential reductions in the final stand at a given seeding rate linked to equipment and within row compaction.
- In very dry years, narrow row spacing may consume limited soil water earlier in the growing season, reducing the amount of water available for the critical period around pod-setting and seed filling.
- In wet years, too narrow spacing (less than 15 inches) may allow less airflow within the canopy and favor the occurrence of certain diseases, such as white mold.

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4. The Endangered Species Act: What you need to know

The Endangered Species Act (ESA), established in 1973, protects threatened and endangered species and the critical habitats in which they live. This act requires federal agencies to ensure that any action they authorize or fund does not negatively affect any listed species or any critical habitat the organism needs to survive. For the EPA, this means they are required to assess potential risks to these species when they register or reregister a pesticide product. In 1988, the Environmental Protection Agency (EPA) established the Endangered Species Protection Program (ESPP) to meet its obligations under this Act. A lawsuit filed in 2011 alleged that the EPA violated ESA when it registered or reevaluated certain pesticide active ingredients, which is now driving some changes that will affect Kansas producers.

The expected changes are being outlined in the EPA's herbicide, insecticide, fungicide, and rodenticide strategies, which have not been finalized yet. The strategies aim to minimize the exposure of protected species to pesticides. Many of the new risk mitigation measures outlined in the strategies will apply to all pesticides, but some will be specific to a particular site, product, or application timing.

Because the strategies have not been finalized, there is still a lot of uncertainty, but we know pesticide labels will change. Changes will include additional runoff, erosion, and spray drift reduction measures for many products. In addition, some applications will be affected by Pesticide Use Limitation Areas (PULAs), which will have additional restrictions beyond those listed on the product label. Applicators will need to read Endangered Species Protection Bulletins to determine if a PULA will affect an application.

ESP Bulletins

The Endangered Species Protection Bulletin will identify the species of concern and the pesticide active ingredient that may affect it. It will also provide a description of protection measures necessary to protect the species and a county-level map showing the affected geographic areas.

If the pesticide label directs you to the website "Bulletins Live! Two" or the toll-free number, you are required to follow the pesticide use limitations found in the Bulletin for your location, the pesticide active ingredient, and the application month (Figure 1). You can obtain Bulletins at the website: https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins or through the toll-free number 844-477-3813. Bulletins should be obtained no more than six months ahead of your application. It is recommended that applicators keep a record of the Bulletins they obtain as part of their application records. Remember, these bulletins will be required for all pesticides, not only restricted-use products.

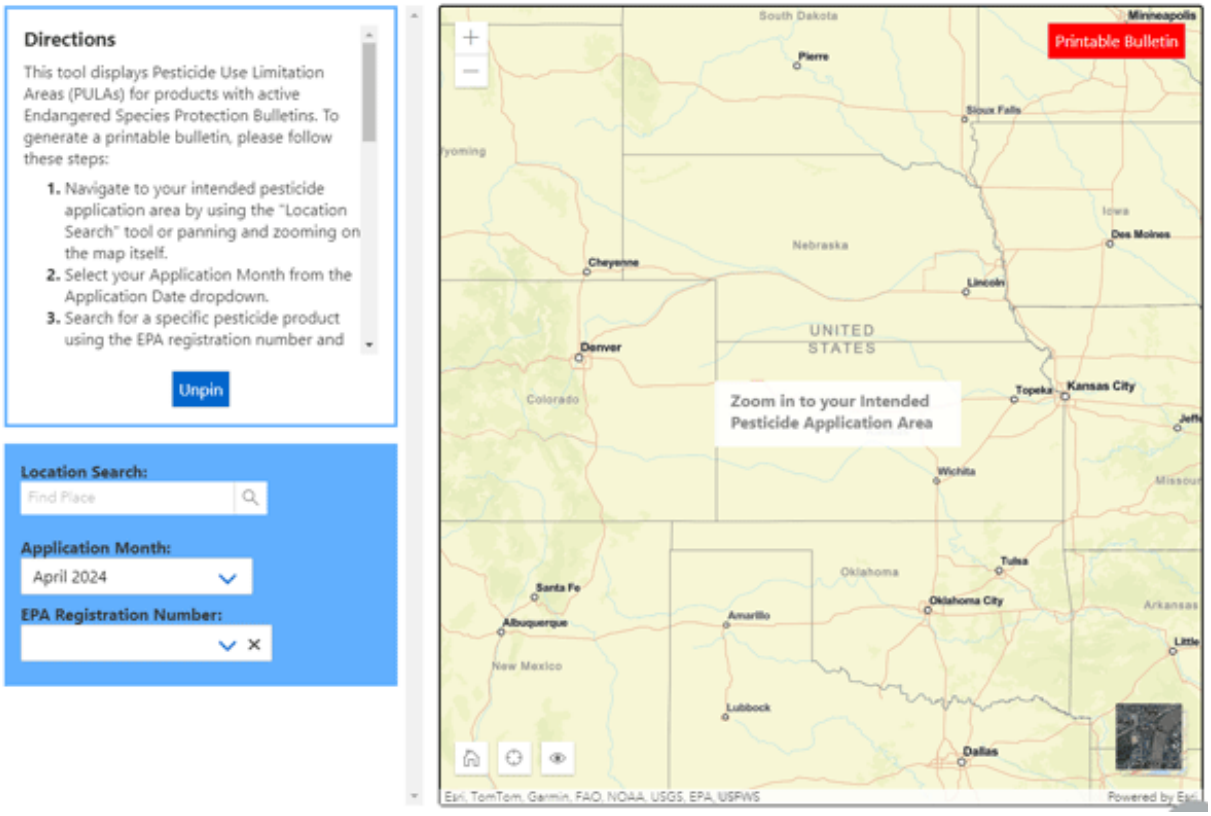

Figure 1. Screenshot of the tool displaying Pesticide Use Limitation Areas (PULAs) for products with active Endangered Species Protection Bulletins.

As an applicator or producer, now is the time to familiarize yourself with the "Bulletin's Live! Two" website and how to search, use, and save bulletins. It is important to know the upcoming changes and existing resources that can help you navigate and understand how to comply.

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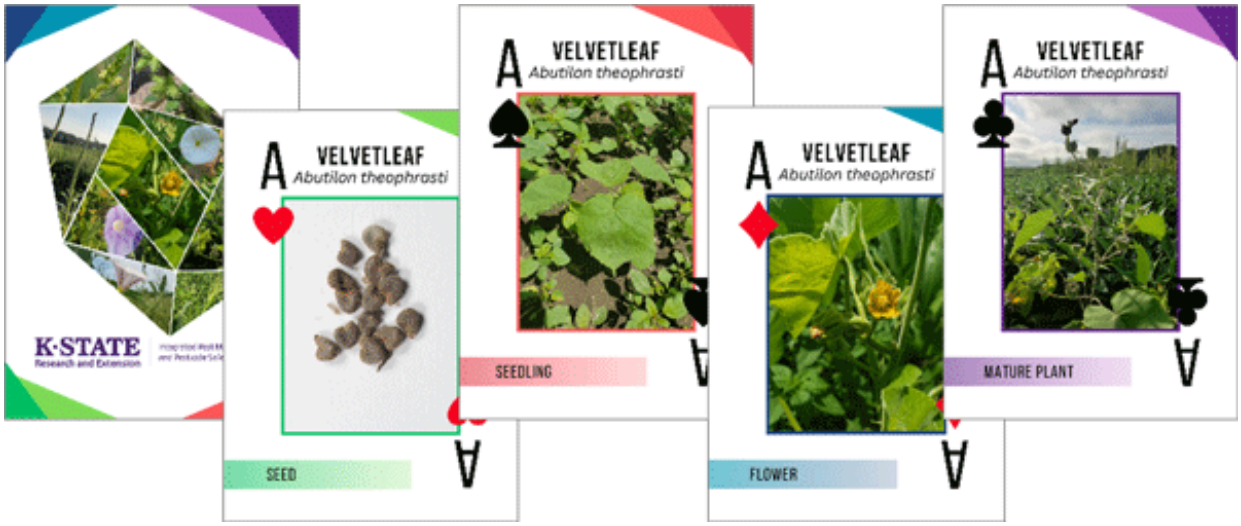
5. Integrated Pest Management: New resource to help identify weeds in Kansas

Agronomists, farmers, extension agents, and agriculture students now have a new resource created by the Kansas State University Integrated Pest Management (IPM) team that is available to help them identify 13 common Kansas weeds.

Frannie Miller, pesticide safety and IPM coordinator, and Sarah Lancaster, agronomy extension weed specialist, came up with the idea of designing a playing card deck after the previous IPM card deck, which was such a success. The card deck provides an innovative resource to teach identification skills in an interactive manner and a way to see the different growth stages of the plant.

Each card suit in the deck visually represents the seed, seedling, flower, and mature plant for each featured weed common in Kansas agriculture production. The booklet provides a description of each weed featured in the card deck.

Card decks cost $10 each and may be ordered online at https://commerce.cashnet.com/IPMKSU. Select IPM Card Decks, then Weed Identification Card Deck, and fill out the requested information. Get yours while they last!



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6. Several K-State publications on insect pest management updated for 2024

Several K-State Research and Extension publications related to insect management in Kansas were recently updated and are available to the public.

These publications were prepared to help producers manage insect populations using the best available methods proven practical under Kansas conditions. They are revised annually and intended for use during the current calendar year. The user should know that pesticide label directions and restrictions are subject to change, and some may have changed since the publication date.

Full versions of each fact sheet are available online, with links provided below.

Alfalfa Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF809.pdf

Corn Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF810.pdf

Cotton Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF2674.pdf

Sorghum Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF742.pdf

Soybean Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF743.pdf

Sunflower Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF814.pdf

Wheat Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/MF745.pdf

The economics of control should be considered in any pest management decision. Because costs vary greatly over time and are influenced by factors beyond the scope of this publication, product cost is not a consideration for including or omitting specific insecticide products in these recommendations. Growers should compare product price, safety, and availability when making treatment decisions. Growers also need to consider the impacts of insecticides on non-target organisms like pollinators and natural enemies. Rotating insecticide groups can help combat insecticide resistance issues by leveraging different modes of action.

The user bears ultimate responsibility for correct pesticide use. For proper use, always read label directions carefully before applying pesticides. Remember that illegal contamination of the treated crop or commodity can occur if pesticides are misused. K-State entomologists assume no responsibility for product performance, personal injury, property damage, or other types of loss resulting from the purchase, handling, or use of the pesticides listed.

More information on pests covered in these publications is available at:

www.entomology.k-state.edu/extension/insect-information/crop-pests/

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