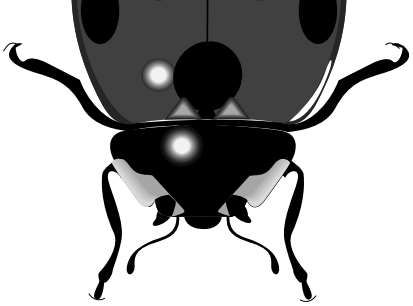

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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Executive editor: Kevin Steffey, Extension Entomologist

Available on the Web at http://www.ag.uiuc.edu/cespubs/pest/
For subscription information, phone 217.244.5166, or e-mail acesnews@uiuc.edu

In This Issue

Other States' Newsletters

Information about pest management is available from many sources; you may already have created bookmarks for the best sites on the Web. In fact, from time to time, authors of articles in the *Bulletin* refer to articles in other midwestern states' newsletters that are available on the Web. So, as a service to you, we offer the URLs for newsletters published throughout the north-central states. (Although some of the following Web sites focus solely on insects, most are multidisciplinary.) Some of the URLs direct you to an archive, from which you can click on the year of interest. These URLs to other states' newsletters may come in handy, especially if you want to obtain multiple perspectives about pest situations and pest management issues.

- *Pest & Crop Newsletter* (Purdue University)—http://www.entm.purdue.edu/Entomology/ext/targets/newslett.htm
- *Integrated Crop Management* (Iowa State University)—http://www.ipm.iastate.edu/ipm/icm
- *Kansas Insect Newsletter* (Kansas State University)—http://www.oznet.ksu.edu/dp_entm/extension/KIN.htm
- *Kentucky Pest News* (University of Kentucky)—http://www.uky.edu/Agriculture/kpn/kpnhome.htm
- *Field Crop Advisory Team Alert Newsletter* (Michigan State University)—http://www.msue.msu.edu/ipm/fieldCAT.htm
- *Integrated Pest and Crop Management* (University of Missouri)—http://ipm.missouri.edu/ipcm
- *Crop Watch* (University of Nebraska)—http://cropwatch.unl.edu
- *Crop and Pest Report* (North Dakota State University)—http://www.ag.ndsu.nodak.edu/aginfo/entomology/ndsucpr/
- *CORN: Crop Observation and Recommendation Network* (Ohio State University)—http://corn.osu.edu
- *Extension Entomology Mail* (South Dakota State University)—http://www.abs.sdstate.edu/plantsci/ext/ent/entpubs/SEE_Mail.htm
- *Wisconsin Crop Manager* (University of Wisconsin)—http://ipcm.wisc.edu/wcm

I hope these sites contribute to a broader knowledge of pest management situations and issues throughout the Midwest.—*Kevin Steffey*

INSECTS

Correction: Lorsban 15G for Wireworm Control

The insecticide Lorsban 15G was incorrectly designated as a restricted use insecticide in Table 1 in last week's issue (no. 1, March 22, 2002) of the *Bulletin*. The error also appears in Table 2 (page 15, Wireworms) of Chapter

1 of the *2002 Illinois Agricultural Pest Management Handbook*. Lorsban 15G is *not* a restricted use insecticide; misplaced asterisks (*) in both tables are inaccurate. I regret the error.—*Kevin Steffey*

Moth Captures in Southern Illinois

As I reported in last week's *Bulletin* (issue no. 1, March 22, 2002), we are preparing "The Hines Report" for access on the Web. Weekly reports from Ron Hines, senior research specialist at the Dixon Springs Agricultural Center, will keep you up to date regarding captures of moths in traps in four locations in southern Illinois (Massac County, two sites in Pope County, and Pulaski County). However, until the site is ready, we'll have to offer Ron's observations "manually."

Several adult black cutworms have been captured in traps in Massac and Pulaski counties since the traps were established in mid-March. Six black cutworm moths were captured in the trap in Massac County during March 18 to 20. Nine black cutworm moths were captured in the trap in Pulaski County during March 16 to 20. More importantly, "intense captures" (nine or more moths captured over a 1- to 2-day period) were recorded from the Massac County trap on March 30 and 31 (three moths captured on March 30, six moths captured on March 31). During the same two evenings, the trap in Pulaski County captured five black cutworm moths.

We can begin to predict the first signs of cutting of corn seedlings by black cutworm larvae (accumulation of 300 heat units [base 50ºF]) after an intense capture. However, Bob Scott, the Illinois State Water Survey scientist who provides our heat-unit accumulation information, is out of the country for a couple of weeks. Consequently, we are on our own for the time being. (If you want to keep apprised of weather data around the state, visit Bob's Web site, *Water & Atmospheric Resources Monitoring* at http://www.sws.uiuc.edu/warm.) Obviously the current cool temperatures will not allow for rapid accumulation of heat units, so insect development will be slow. Nevertheless, these early intense captures should be marked as an early warning.

Most of us have not forgotten the armyworm outbreak of 2001. I have stated many times since then that we would keep an eye on armyworm moth flights in 2002. Well, one armyworm moth was captured in the Pulaski County trap on March 22. Obviously one armyworm is not a herald for an outbreak, but we want to keep you posted.—*Kevin Steffey*

Concern About White Grubs Carries into 2002

During the past few years, white grubs have vied with wireworms for the top spot among secondary insect pests of corn. And as the 2002 season begins, concern about white grub problems continues.

For years we entomologists focused primarily on "true" white grubs (i.e., white grubs in the genus *Phyllophaga* with three-year life cycles). Although these white grubs can cause significant damage, evidence suggests that many white grub problems are not caused by *Phyllophaga* grubs. Hosts for the adults of these grubs are ash, elm, poplar, and willow trees, and more than one study has shown that the risk of infestation of *Phyllophaga* grubs is greatest in fields near adult food sources. Consequently, infestations of *Phyllophaga* species probably are not widespread.

So, our attention has focused more on annual white grubs in recent years. All annual white grubs, of which there are many species, have one generation per year. The species that are found most commonly in corn in Illinois are the southern masked chafer, *Cyclocephala lurida*, and the Japanese beetle, *Popillia japonica*. According to an article written by Larry Bledsoe, an entomologist at Purdue University, in the *Proceedings of the 2002 Crop Protection Technology Conference*, southern masked chafer grubs rarely cause economic injury to either corn or soybeans. Therefore, it's likely that much of the grub damage to corn that has occurred in Illinois in recent years has been caused by Japanese beetle grubs. Many observers have verified this statement.

Life cycles and injury. Japanese beetle adults lay eggs in the soil in mid- to late summer. Larvae hatch and feed through the fall, then descend in the soil to escape cold winter temperatures. The grubs move back toward the soil surface in the spring and feed on organic matter. However, they also feed on corn roots, if available, especially if organic matter is limited. When they finish feeding, the grubs pupate, and adults emerge in early summer.

May or June beetles, the adults of "true" white grubs, also lay eggs in mid- to late summer. The larvae hatch and molt once before winter dormancy. They, too, descend in the soil to avoid cold soil temperatures. In the spring, the grubs move toward the soil surface to feed on plant roots, including roots of both corn and soybeans. They continue to feed throughout the summer. After they pass the second winter deep in the soil, they again ascend the following spring to feed on plant roots. This is when most "true" white grub problems are noticed because the larvae are fully grown and consume more root tissue. When they finish feeding, the larvae pupate, and adults emerge in midsummer.

Both types of white grubs chew off the fine hairs on the roots; injured roots do not take up water and phosphorus very well. Consequently, aboveground symptoms of white grub injury includes wilting and purpling of the stem (phosphorous deficiency). Severely infested fields often suffer stand loss when injured plants die. Early-planted corn is more vulnerable to white grub damage because the insects feed early in the spring.

Anticipating white grub problems. It is difficult to anticipate white grub problems. As I stated previously, "true" white grub problems occur most frequently in fields near adult food sources. However, we have not detected a consistent pattern for problems caused by Japanese beetle grubs. Both types of grubs can be found in the soil in late summer, but very few people look for them. Consequently, one of the few ways to detect white grubs is to watch for them during tillage operations. Any type of soil tillage usually brings some grubs to the soil surface. In fact, the presence of lots of birds following a tillage operation usually is a clear indication that grubs are present. The birds feast on the grubs lying on top of the soil.

Identification. If you find grubs in a field, it is very important to determine the type of grub present. *Phyllophaga* grubs and Japanese beetle grubs can cause damage to corn; it's unlikely that *Cyclocephala* grubs will cause economic damage. To identify white grubs, you need to examine the raster pattern—the arrangement of small hairs and spines on the underside of the last abdominal segment (Figure 1). Different species of white grubs have different raster patterns.

The Japanese beetle grub has an arrangement of hairs that form overlapping V-shaped patterns (Figure 2a). These lines of hairs form a V that usually is distinct in the center of the pattern. The *Cyclocephala* grub has no distinct pattern of hairs on its raster (Figure 2b). The *Phyllophaga* grub has hairs in the center arranged in nearly parallel rows, resembling an open zipper (Figure 2c).

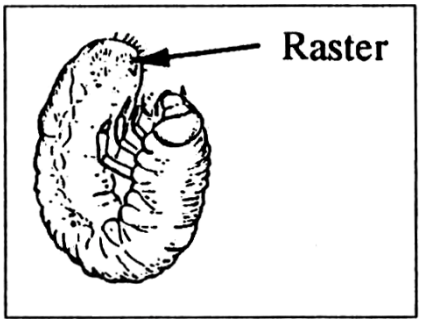

Figure 1. Location of raster on a white grub. (Illustration modified from the 2000 Corn and Soybean Field Guide, *Publication ID-179, Purdue University Cooperative Extension Service, West Lafayette, Indiana.)*

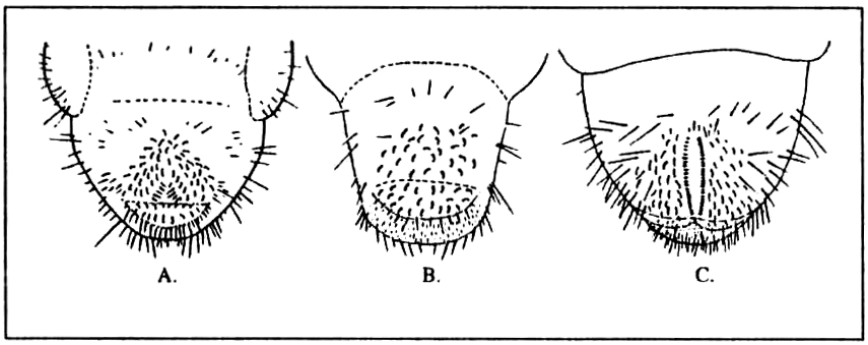

Figure 2. White grub raster patterns: (a) Japanese beetle, (b) Cyclocephala grub, and (c) Phyllophaga grub. (Grub illustration modified from the 2000 Corn and Soybean Field Guide, *Publication ID-179, Purdue University Cooperative Extension Service, West Lafayette, Indiana.)*

Insecticides for control of white grubs. If you find either Japanese beetle grubs or *Phyllophaga* grubs, application of a soil insecticide or seed treatment might be justified. This is especially true if corn will be planted early. Insecticides registered for control of white grubs are presented in Table 1. Please follow all label precautions and restrictions.—*Kevin Steffey*

Slugs, Anyone?

Not being able to wait for corn to be planted in his area, Matt Montgomery, Sangamon/Menard Extension unit educator in crop systems, has already been out looking for critters lurking in fields that will be planted to crops. In a long-term no-till field in Sangamon County, Matt discovered lots of slugs. We usually don't get overly concerned about slugs in Illinois, but the mild winter and recent wet weather may have set us up for some early-season problems. At least it's worth some attention.

According to the ESA's *Handbook of Corn Insects* (published in 1999), slugs overwinter as both eggs and adults, and their survival is dependent on the severity of winter conditions (i.e., they survive better when winter conditions are mild). Slugs are particularly problematic in no-till situations; their population densities increase when residues are abundant on undisturbed soil surfaces. Crop injury is most severe in the spring when growing conditions are cool and wet. Injury is particularly bad when seed furrows do not close completely, allowing slugs to injure both seeds and seedlings.

If spring weather remains wet and cool, we'll have to watch for slugs as the seedlings grow. You'll know slugs when you see them—they're shiny and slimy, ranging from gray to pale cream with a light mottled pattern. They are capable of causing stand loss if infestations are heavy.

There's really no reason to do anything to try to prevent slug damage, but no-tillers may be wise to be prepared. Deadline Bullets (a toxic bait with metaldehyde as the active ingredient) can be applied to field crops (cereal grains, corn, legumes) to control slugs.—*Kevin Steffey*

The Alfalfa Weevil Report

A few weeks ago during the latter part of our mild winter, most of us would have guessed that alfalfa weevils would have been active by now. However, the recent cold temperatures

Table 1. Soil insecticides and seed treatments suggested for control of white grubs in corn.

Product	*Amount of product*	*Placement*
*Aztec 2.1G	6.7 oz per 1,000 feet of row	Band, furrow
*Aztec 4.67G (SmartBox only)	3 oz per 1,000 feet of row	Band, furrow
*Capture 2EC	0.3 oz per 1,000 feet of row	Band
*Counter CR	6 oz per 1,000 feet of row	Band, furrow
*Force 3G	4 to 5 oz per 1,000 feet of row	Furrow
*Fortress 2.5G	6 oz per 1,000 feet of row	Furrow
*Fortress 5G (SmartBox only)	3 oz per 1,000 feet of row	Furrow
*Lorsban 4E	4 pt per acre	Preplant incorporated
Lorsban 15G	12 oz per 1,000 feet of row	Furrow
Prescribe	See product label	Seed treatment
ProShield with Force ST	See product label	Seed treatment
*Regent 4SC	0.24 oz per 1,000 feet of row	Furrow
*Thimet 20G	6 oz per 1,000 feet of row	Band

* Use restricted to certified applicators.

obviously have slowed down the onset of alfalfa weevil activity. Good thing, too. We will not be able to publish maps of actual and projected degree-day accumulations for two weeks while Bob Scott, Illinois State Water Survey, is out of the country. Therefore, I encourage you to keep track of temperatures locally to get a rough estimate of when to begin looking for alfalfa weevil larvae. (As I indicated in the "moth capture" article, if you want to keep apprised of weather data around the state, visit Bob's Web site, *Water & Atmospheric Resources Monitoring*, at http://www.sws.uiuc.edu/warm.)

I have heard through the grapevine that some producers in southern and central Kentucky are already battling alfalfa weevils, so it's only a matter of time before activity begins in southern Illinois. John Shaw, director of the Illinois Insect Management and Insecticide Efficacy Program, found a couple of active adults in a field in Champaign County on April 2. He observed overwintering eggs (dark orange to brown) in the stems but found no spring-deposited eggs (bright yellow).

As you begin to scout alfalfa fields for alfalfa weevils, look first in areas of fields that might warm up early, such as south-facing slopes and areas of fields with lighter soils. After 200 to 250 degree-days have accumulated from January 1, you should be able to find small, first-instar weevils in the folded terminal leaves. These small, yellowish larvae with black heads feed on the leaves, resulting in observable pinholes. This injury is not economic because the larvae are too small to cause significant defoliation. However, by the time alfalfa weevils grow into third instars, they begin to cause more economic damage by skeletonizing the leaves. At this stage of development, alfalfa weevil larvae are bright green with a distinct white stripe along the center of the back.

If you are scouting for alfalfa weevils and symptoms of the injury they cause, let us know when you encounter them. It's possible that we could experience some heavy infestations this year, and we want to keep everyone alert.—*Kevin Steffey*

Insecticides for Alfalfa and Grass: EPA's Interpretation

The United States Environmental Protection Agency (EPA) recently released an interpretation about the use of insecticides on mixed stands of alfalfa and grasses. Their interest in this issue pertains to some of the illegal applications of some insecticides in 2001 during the armyworm outbreak. Related to this issue, EPA also has questioned some published Extension recommendations in some states. EPA's interpretation is timely because the possibility for insecticide applications for control of early-season insects in alfalfa and grass will be on us soon.

Following is the verbatim text received (March 28, 2002) by the American Association of Pesticide Safety Educators from Jack Neylan, chief of the agriculture branch at EPA's Office of Enforcement and Compliance Assistance.

Crop Definitions With Respect to Pesticide Labeling

EPA Response to SFIREG Issue Paper and Inquiry from State of Vermont

Issues

1. *Label interpretation issue:* In the summer of 2001 the Vermont Department of Agriculture and several other Region I states became involved in investigating possible misuse of lambda cyhalothrin and other insecticides for army worm control on pastures. These investigations brought to light a number of questions regarding the applicability of label terms to the sites where applications had been made. For example, insecticides were used on alfalfa, for which they were labeled, and on grasses, for which they were not. A problem arises because there is a substantial amount of mixed stand alfalfa grown in this region,

which may include alfalfa, clover and grasses. When Vermont asked registrants how they interpreted their labels when the terms alfalfa or alfalfa hay were used, responses were received ranging from "alfalfa means 100% alfalfa" to "anything over 51% alfalfa" to "if it is managed as alfalfa then it is alfalfa".

Acting through the State FIFRA Issues Research and Evaluation Group (SFIREG), the Region I states submitted an issue paper to EPA requesting clarification on how mixed stand crops should be accounted for in the registration process, and guidance for the states to assist with label interpretation.

2. *Inappropriate recommendations on mixed stands.* An example of the need to clarify the interpretation of what a label authorizes in the case of mixed stand crops arose when the State of Vermont found a publication issued by a university agricultural extension service that recommended the use of several insecticides for use against the alfalfa weevil provided that the stand was judged to be 51% or more alfalfa. Most of the insecticides being recommended were registered for alfalfa, but not for grasses. Vermont requested an Agency assessment of those recommendations.

EPA Response

The Office of Pesticide Programs (OPP) and the Office of Enforcement and Compliance Assurance (OECA) have reached the following conclusions, and plan the following actions, in relation to these issues.

1. *Each component of a pasture crop does need to have a tolerance and be identified on the label as a use site.* Thus, application of a product registered for alfalfa only to a mixed stand of alfalfa/clover/grass would be a use inconsistent with the label. This has enforcement implications for EPA's state regulatory partners. As with the misuse cases in 2001 involving Warrior, Lorsban and other insecticides on pastures, the Agency expects that in the event a state agency discovers that a mixed stand crop has been illegally treated, they will take appropriate measures to keep any potentially affected food or feed commodities out of the channels of trade until it is determined that no violative residues will occur.

Next steps: Through its Regional Offices and the communications networks of the Association of American Pesticide Control Officials (AAPCO), SFIREG, and the American Association of Pesticide Safety Educators (AAPSE), the Agency will disseminate this response paper throughout the regulatory and pesticide educational communities.

2. *Many current products are not appropriately labeled.* The Agency recognizes that only a few products registered only for alfalfa currently include the appropriate label instruction: "Apply only to fields planted to pure stands of alfalfa."

Next steps: EPA plans to notify and require registrants of products labeled for use on alfalfa to clarify their labels by incorporating the above limitation when there is only an alfalfa tolerance. At the same time EPA will encourage them to petition for a crop group tolerance for grasses that would cover all the forage grasses.

3. *Inappropriate recommendations about treatment of mixed stand crops have probably been issued from various sources.* OPP was able to locate a number of publications from various parts of the country containing recommendations for alfalfa that would lead to pesticide misuse, similar to the ones cited above. However, there are insecticides that have tolerances on alfalfa/clover/grass that may be effective against the alfalfa weevil namely, carbaryl, methoxychlor, malathion, methomyl, and methyl parathion.

Next steps: The Agency will continue to work with EPA Regional Offices, AAPCO and especially AAPSE, to disseminate information about this issue to extension service personnel and others who provide pesticide use advice to the agricultural community. It is also likely that alfalfa is not the only crop affected by this problem, and further cooperation between EPA, State regulators and educators, and the registrant community will be necessary to fully clarify and resolve these concerns.

If insects are causing injury to alfalfa, clover and/or grass hay this year and you are trying to determine which insecticide to use, please (here's that tried-and-true cliché) *read the label!* Let's try to avoid some of the difficulties with illegal insecticide applications that have occurred in other states.—*Kevin Steffey*

FIFRA Section 2(ee) Recommendations for Insecticides

Section 2(ee) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) allows for uses of a pesticide that are not inconsistent with its labeling. For example, a pesticide can be applied against any target pest not specified on the label if the application is to the crop, animal, or site specified on the label. Consequently, some companies issue Section 2(ee) recommendations for products to control pests in crops for which the products are already registered. These recommendations allow companies to offer quick "updates" before the federal label is amended.

DuPont has issued a Section 2(ee) recommendation for Asana XL for control of soybean aphid in soybean in the states of Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota, and Wisconsin. The rate of application is 5.8 to 9.6 ounces per acre. Restrictions: do not feed or graze livestock on treated fields; do not apply more than 0.2 pound of active ingredient per acre per season; do not apply within 21 days of harvest. In insecticide efficacy trials throughout the Midwest, Asana has worked as

well as other pyrethroids for control of soybean aphids.

Syngenta has issued a Section 2(ee) recommendation for Warrior for suppression and/or control of wireworm, cutworm spp., seedcorn maggot, white grub spp., western corn rootworm, and northern corn rootworm in corn in Colorado, Illinois, Indiana, Kentucky, Missouri, Kansas, Nebraska, Minnesota, South Dakota, Wisconsin, Michigan, Pennsylvania, Delaware, and Iowa only. The rates of application are 1.92 ounces per acre for wireworms; 3.2 ounces per acre for cutworm species and seedcorn maggot; and 3.84 ounces per acre for white grub species, western corn rootworm, and northern corn rootworm. Warrior can be applied at planting as an in-furrow or T-band treatment. Refer to the federal label for restrictions for use.

The word "suppression" for the 2(ee) recommendation for Warrior applies to cutworms, white grubs, and corn rootworms. We are not excited about the use of this term and urge caution with any product labeled for suppression of an insect pest. Results from insecticide efficacy trials have shown that Warrior is not effective for controlling corn rootworms.—*Kevin Steffey*

PLANT DISEASES

Soybean Seed Treatments and Control of Seed and Seedling Diseases

Numerous questions come in each year from Illinois growers concerning soybean seed treatments. Common questions often relate to which diseases and pathogens are controlled by seed treatments, which conditions favor these diseases and suggest that seed treatments would be beneficial, and which seed treatments are available and effective. This article will provide information on seed treatments and address these questions.

Seed treatments can protect against fungal and fungal-like pathogens that attack seeds and seedlings. Seed can be rotted, seedlings can be killed (damping-off), plant stands may be reduced, and yields can be significantly reduced by several different pathogens. Most of the pathogens that cause these problems are soilborne and are in the soil before the seed is planted. Common examples of these are *Pythium*, *Phytophthora*, *Rhizoctonia*, and *Fusarium*. Some of the pathogens that infect and damage seeds and seedlings can originate from low-quality, infected seed. Examples are the fungi *Colletotrichum* (causes anthracnose of soybean) and *Phomopsis* (causes Phomopsis seed decay).

Seed treatments will often provide a benefit under common spring field conditions. The seed and seedling diseases are typically most severe when soil is cool and wet during or after planting, when soybeans are planted early (for example, before May 1), when low seeding rates are used, under no-till conditions, and in low-lying fields that are frequently wet. Any of these conditions could warrant the use of seed treatments.

Particular pathogens tend to infect under different conditions. The most common and destructive seed and seedling pathogens in Illinois are *Pythium*, *Phytophthora sojae*, and *Rhizoctonia*. *Fusarium* can also be common. *Pythium* and *Phytophthora* are water-loving fungal-like organisms. Some species of *Pythium* can infect soybean and corn, but *Phytophthora* only infects soybean. *Pythium* and *Phytophthora* infect most readily in very wet to saturated soil conditions, whereas *Rhizoctonia* prefers moist but not saturated soils. These pathogens also differ in their favored temperatures for infection. Many species of *Pythium* prefer cool soil (50–60ºF), although some species prefer warmer conditions. *Phytophthora* prefers slightly warmer soils (60–76ºF), and *Rhizoctonia* is most active in warm soils over 74ºF. Thus, the first pathogen that often causes problems after planting is *Pythium*. The soft-rot, tan symptoms on roots and stems caused by *Pythium* and *Phytophthora* are very similar and cannot be distinguished without laboratory testing, while the reddish-brown, often sunken, lesions caused by *Rhizoctonia* are easier to recognize. The symptoms associated with Fusarium damping-off are light to dark brown lesions on roots. Many soybean varieties are available with high levels of resistance to *Phytophthora* (Rps genes 1a, 1c, and 1K); however, varieties are not available with high levels of resistance to *Pythium*, *Fusarium*, or *Rhizoctonia*.

Not all seed treatments are equally effective against these different seed and seed-rotting pathogens. In simple terms, there are two groups of fungicides to consider for control of these pathogens. One group is highly effective against the water mold pathogens *Pythium* and *Phytophthora*, and the other group is most effective against the other fungal pathogens. The systemic compounds Allegiance-FL, Apron-FL, and ApronXL are most effective for control of *Pythium* and *Phytophthora*, whereas Rival, Maxim-4FS, captan and several other products protect against *Rhizoctonia* and other pathogens. Azoxystrobin is a new systemic fungicidal seed treatment that recently came on the market and should be widely available soon for control of *Rhizoctonia*. For full-spectrum control of different pathogens, some of these products are often applied together. For example, Rival and Allegiance are often applied together, carboxin is combined with PCNB and metalaxyl, and the product ApronMaxx RTA is a mixture of ApronXL and Maxim.

A partial list of fungicides for control of seed and seedling rot diseases of soybean is shown in Table 2. These fungicides are listed here for basic information only. All of them can be effective, but they are not all equally effective under different conditions and against different pathogens, as noted previously. Additional information can be found in the *Illinois Agricultural Pest Management Handbook*, which is available for purchase from

University of Illinois Extension. Mention of trade names does not imply endorsement of these products by the University of Illinois, nor does it suggest that other products are not equally effective. Consult dealers and chemical companies for the latest information on these and other seed treatment products. Always read and follow the current product label before using a pesticide. The U.S. Federal Seed Act requires that containers with treated seeds should be labeled with the following information: "This seed has been treated with (common chemical names of active ingredients) and fungicide(s). Do not use for food, feed, or oil purposes." If there are concerns about the effects of fungicidal seed treatments on rhizobial N-fixing nodulation, the manufacturer of the seed treatment product should be contacted. Although seed treatments generally have minimal or no impact on nodulation, specific formulations and recommendations have been prepared for some products to minimize any effect of the product on nodulation.

The bottom line is whether soybean seed treatments provide significant benefits. Seed treatments will often result in increased emergence, plant stand, and yield. The stand increases often will not correlate with increased yield because soybean plants can compensate for lower stand counts by increasing numbers of branches and pods per plant. In several studies, seed treatments have resulted in yield increases of around 10%. Benefits from the use of seed treatments will vary depending in large part on weather conditions for 2 to 3 weeks after planting. In summary, many effective seed treatment fungicides are available for soybeans, and they can often reduce the damage that frequently occurs in Illinois due to seed and seedling diseases.—*Dean Malvick*

Table 2. Partial list of fungicides for seed rots and damping-off of soybean.

Fungicide common name	*Fungicide trade name*
azoxystrobin	Protégé (available as SoyGard)
captan	many
carboxin	Vitavax
fludioxonil	Maxim 4FS
metalaxyl	Allegiance-FL and Apron-FL
mefanoxam	ApronXL-LS
PCNB	many
thiram	many
thiabendazole	TBZ

WEEDS

Burndown Considerations for 2002

The decreased use of soil residual herbicides in soybean, coupled with several recent "mild" winters, has caused some changes in the weed spectrum across much of Illinois. One change that is very noticeable at this time of year is the amount of weed vegetation present in no-till fields. Compared with 10 years ago, the amount of existing vegetation to be dealt with prior to planting is often more dense and comprised of species not familiar to everyone. When air and soil temperatures begin to increase, expect these weeds to grow rapidly.

Much of this existing vegetation consists of winter annual weed species, such as chickweed, henbit, and purple deadnettle. These species generally emerge in the fall and overwinter but sometimes (depending on weather and soil moisture conditions) emerge in the early months of the calendar year. Some early-emerging summer annual species, such as prostrate knotweed, kochia, common lambsquarters, and giant ragweed, will soon make their presence known as well. This "mat" of vegetation can cause significant problems with planting operations and crop establishment if not properly controlled. In most situations, producers should plan to control existing vegetation prior to planting no-till corn or soybeans.

2,4-D is frequently used as a burndown tank mix prior to corn or soybean planting. The ester formulation is usually preferred over the amine formulation since the waiting period between application and planting is generally less for an ester formulation. The labels of many 2,4-D ester formulations (3.8 pounds acid equivalent per gallon) allow applications of up to 1 pint per acre seven days prior to soybean planting; increasing the rate to more than 1 pint increases the waiting interval to 30 days. Keep in mind that some 2,4-D ester formulation labels also specify a waiting interval between application and corn planting (for example, 7 days for up to 1 pint, 14 days for rates between 1 and 2 pints). In addition to waiting intervals, labels sometimes also indicate that tillage operations should not be performed for at least 7 days after application and that the seed furrow must be completely closed during the planting operation or severe crop injury may result. Factors that increase the likelihood of the 2,4-D coming in direct contact with the crop seed increase the probability of severe crop injury.

Several soil-applied herbicides used in corn and soybeans have both soil and foliar activity. The foliar activity can

provide some control of small annual weeds. In corn, products such as atrazine and Balance PRO, or premixes containing these herbicides, can provide control of small weeds. In soybeans, products such as metribuzin (Sencor, Canopy, Boundary, Axiom, and Domain), Canopy XL, Authority, Valor, Extreme, and Backdraft SL all have foliar activity and can be applied prior to planting.

Keep in mind that most of these herbicides work best on *small* annual weeds, especially when applied with a crop oil concentrate or liquid nitrogen solution (consult the respective product label for additive recommendations). If existing vegetation is larger than 2 to 3 inches, adding another herbicide to the tank can often improve burndown activity. Gramoxone Max and glyphosate have foliar activity, but all lack any soil residual activity. These herbicides are often tank-mixed with corn or soybean preplant herbicides to improve control of existing vegetation.

Cool temperatures can slow the activity of many burndown herbicides, and translocated herbicides are often more slow-acting than contact herbicides under these conditions. For example, glyphosate is effective for control of common chickweed, but symptoms of activity can take many days to develop during periods of cool air temperatures. Contact herbicides may not be as slow to act as translocated herbicides under cool conditions. When the forecast calls for several days or nights of cool air temperatures, burndown of existing vegetation may be faster with a contact herbicide compared to a translocated herbicide.

Table 3 is reproduced from the *2002 Illinois Agricultural Pest Management Handbook*. The table includes weed control ratings for several corn and soybean herbicides used to burn down existing vegetation prior to planting.—*Aaron Hager and Christy Sprague*

Corn and Soybean Herbicide Premixes

Herbicide premixes frequently offer several advantages to the producer; however, keeping track of premix components and their ratios can sometimes be difficult. For the past several years, we have printed a table of corn herbicide premixes, as well as a table of soybean herbicide premixes, in the *Bulletin*; this year is no exception. Tables 4 and 5 list most of the commercially available corn and soybean herbicide premixes, respectively. The application rates listed in the tables are meant to be used as a reference; for some of these herbicides the application rates will vary depending on soil texture, organic matter, weed species and size, and so on. Always consult the respective herbicide label for appropriate application rates.

But what if you are interested in an application rate different from that listed for a particular herbicide? With the information presented in these tables, it's relatively simple to do the calculations for your rate of choice. We'll do an example calculation to make it easier to understand.

We'll work through an example with a dry premix formulation, Canopy XL 56.3DG. According to Table 5, 1 pound of Canopy XL 56.3DG consists of 0.469 pound of sulfentrazone active ingredient (a.i.) and 0.094 pound of chlorimuron a.i. However, instead of a use rate of 6.8 ounces, you want to know how much active ingredient of each component is contained in a 4-ounce use rate.

Converting 4 ounces to pounds gives us 0.25 pound of product applied. Next, we calculate how much sulfentrazone and chlorimuron a.i. are applied in 0.25 pound per acre of Canopy XL 56.3DG:

$$\frac{0.25 \text{ lb product}}{\text{acre}} \times \frac{0.469 \text{ lb ai sulfentrazone}}{\text{lb product}} = 0.117 \text{ lb ai}$$

$$\frac{0.25 \text{ lb product}}{\text{acre}} \times \frac{0.094 \text{ lb ai chlorimuron}}{\text{lb product}} = .023 \text{ lb ai}$$

Finally, we can also determine product equivalents based on these active ingredient amounts:

$$\frac{0.117 \text{ lb ai sulfentrazone}}{\text{acre}} \times \frac{\text{lb Authority}}{0.75 \text{ lb ai}} \times \frac{16 \text{ ounces}}{\text{lb}} = 2.49 \text{ ounces Authority 75 DF}$$

$$\frac{0.023 \text{ lb ai chlorimuron}}{\text{acre}} \times \frac{\text{lb Classic}}{0.25 \text{ lb ai}} \times \frac{16 \text{ ounces}}{\text{lb}} = 1.47 \text{ ounces Classic 25DF}$$

—Aaron Hager and Christy Sprague

A Correction from Issue 1 of the *Pest Management and Crop Development Bulletin*

In last week's *Bulletin* article "New Herbicides and Label Changes for 2002," there was an error in the rate ratio for the components of the new formulation of Backdraft SL. Backdraft SL 1.35L (imazaquin + glyphosate) at the 2.5 quart per acre application rate delivers 2.14 ounces of Scepter 70DG and *1.47 pints* per acre of Roundup Original. This correction also needs to be made in Table 4 of Chapter 2, "Weed Control for Corn, Soybeans, and Sorghum" in the *2002 Illinois Agricultural Pest Management Handbook*.—*Christy Sprague and Aaron Hager*

REGIONAL REPORTS

Extension center educators, unit educators, and unit assistants in northern, west-central, east-central, and southern Illinois prepare regional reports to provide more localized insight into pest situations and crop conditions in Illinois. The reports will keep you up to date on situations in field and forage crops as they develop throughout the season. The regions have been defined broadly to include the agricultural statistics districts as designated by the Illinois Agricultural Statistics Service, with slight modifications:

- North (Northwest and Northeast districts, plus Stark and Marshall counties)
- West central (West and West Southwest districts, and Peoria, Woodford, Tazewell, Mason, Menard, and Logan counties from the Central district)
- East central (East and East Southeast districts [except Marion, Clay, Richland, and Lawrence counties], McLean, DeWitt, and Macon counties from the Central district)
- South (Southwest and Southeast districts, and Marion, Clay, Richland, and Lawrence counties from the East Southeast district)

We hope these reports will provide additional benefits for staying current as the season progresses.

Northern Illinois

Fertilizer application and tillage work have occurred minimally in scattered locations throughout the area during the last few weeks. Also, producers have taken advantage of the field conditions by seeding oats and alfalfa. However, the snow/rain that was received March 31 and April 1 will slow fieldwork, possibly for the rest of the week.

Several Extension educators have black cutworm moth traps scattered throughout the area. We intend to report any "intense" captures in northern Illinois in future issues of the *Bulletin*.

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Table 3. Control ratings for herbicides to control existing vegetation in no-till corn and soybean.

		Winter annual grasses					Winter annual broadleaves				Summer annuals							Perennials			
Herbicide	Crop[a]	barley, little	bluegrass, annual	brome, downy	ryegrass, annual	rye or wheat cover	chickweed, common	henbit/purple deadnettle	horseweed (marestail)	mustards	prickly lettuce	foxtail, giant	fleabane, daisy or annual	lambsquarters, common	ragweed, common	ragweed, giant	smartweed, Pennsylvania	alfalfa	clover, red	dandelion, common	vetch, hairy
Balance PRO	C	—	—	6	—	5	**8**	6	7	**8**	**8**	**8**	—	**8**	**8**	6	**8**	0	0	6	0
Balance PRO + atrazine	C	—	**8**	7	6	6	**9**	**8**	**9**	**8**	**9**	**8**	7	**9**	**9**	**9**	**9**	4	6	6	7
2,4-D ester[b]	C&S	0	0	0	0	0	5	5	**8**	**9**	**8**	0	6	**9**	**9**	**8**	7	6	**8**	**8**	**9**
Clarity, Banvel[c]	C&S	0	0	0	0	0	**9**	7	7	7	**9**	0	**8**	**9**	**9**	**9**	**9**	**8**	**9**	7	**9**
2,4-D + Clarity or Banvel[b,c]	C&S	0	0	0	0	0	**8**	6	**8**	**9**	**9**	0	**8**	**9**	**9**	**9**	**8**	**8**	**9**	**8**	**9**
2,4-D + glyphosate[b]	C&S	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	6	**9**	**9**	**9**	**8**	6	**8**	**8**	**8**
glyphosate[d]	C&S	**9**	**9**	**9**	**9**	**8**	**9**	7	7	**8**	7	**9**	5	**8**	7	**8**	7	5	6	5	6
glyphosate[e]	C&S	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**8**	**9**	6	**9**	**9**	**9**	**8**	6	7	7	7
Field Master	C	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**9**	**9**	7	**9**	**9**	**8**	**9**	6	7	7	4
Gramoxone Max	C&S	7	**9**	7	7	6	**9**	**8**	6	7	6	**8**	5	**8**	**8**	7	6	3	6	4	7
Gramoxone Max + atrazine	C	**9**	**9**	**8**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**9**	7	**9**	**9**	**9**	**9**	4	7	6	**8**
atrazine	C	**9**	**9**	7	6	6	**9**	**9**	**8**	**9**	**9**	7	7	**9**	**9**	**9**	**9**	4	6	4	7
Marksman	C	**9**	**9**	**8**	5	5	**9**	**9**	**9**	**9**	**9**	5	6	**9**	**9**	**9**	**9**	**8**	**9**	7	**9**
Sencor	C&S	**8**	—	7	5	4	**9**	**8**	6	**8**	**8**	5	—	7	7	6	**8**	3	5	6	5
Canopy	S	7	—	3	7	—	**8**	**8**	**8**	**9**	**9**	5	—	**9**	**9**	**8**	**9**	4	5	7	5
Canopy XL	S	4	4	—	6	—	7	**8**	**8**	**9**	**9**	6	—	**9**	**9**	**8**	**9**	3	4	6	6
Authority	S	4	—	—	—	0	—	6	0	—	—	6	—	**8**	5	5	7	3	0	0	0
Authority + 2,4-D[b]	S	4	—	—	—	0	—	6	**8**	**9**	**8**	6	—	**9**	**9**	**8**	7	6	**8**	**8**	**9**
Valor	S	—	—	—	0	—	**9**	7	0	**8**	0	0	—	**8**	5	5	0	0	0	0	0
Extreme	S	**9**	**9**	**9**	**9**	**9**	**9**	**8**+	7+	**9**	7+	**9**	—	**9**	**9**	**9**	**9**	6	7	7	7
Backdraft SL	S	**9**	**9**	**9**	**9**	**9**	**9**	**9**	7+	**9**	**8**	**9**	—	**9**	**9**	**9**	**8**	6	7	7	7

9 = excellent, **8** = good, 7 = fair, 6 = poor, <5 = unsatisfactory, — = no information available

[a] Labeled for burndown applications in corn (C) or soybean (S)

[b]Soybean herbicide applications require a 7-day interval between planting and application for 1 pt or less and a 30-day interval for applications of 1 to 2 pt or more.

[c]Soybean herbicide applications require a 14-day interval between planting and application for 8 fl oz or less and a 28-day interval for applications of 8 to 16 fl oz or more.

[d]Glyphosate rate 0.375 lb a.e.

[e]Glyphosate rate 0.75 lb a.e.

Table 4. Corn herbicide premixes.

Herbicide	*Components (ai/gal or lb)*	*If you apply/acre:*	*You have applied (ai):*	*Product equivalents are:*
Accent Gold WDG 78.1WDG	clopyralid = 0.428 lb ae flumetsulam = 0.159 lb nicosulfuron = 0.054 lb rimsulfuron = 0.054 lb	3.5 oz	clopyralid = 0.094 lb ae flumetsulam = 0.035 lb nicosulfuron = 0.012 lb rimsulfuron = 0.012 lb	Stinger 3S = 4 fl oz Python 80WDG = 0.69 oz Accent 75DF = 0.25 oz rimsulfuron = 0.012 lb ai
Axiom 68DF	flufenacet = 0.544 lb metribuzin = 0.136 lb	19 oz	flufenacet = 0.646 lb metribuzin = 0.162 lb	Define 60DF = 17.23 oz Sencor 75DF = 3.45 oz
Axiom AT 75DF	flufenacet = 0.196 lb metribuzin = 0.049 lb atrazine = 0.505 lb	3 lb	flufenacet = 0.588 lb metribuzin = 0.147 lb atrazine = 1.515 lb	Define 60DF = 15.68 oz Sencor 75DF = 3.136 oz AAtrex 90DF = 1.68 lb
Basis 75WDG	rimsulfuron = 0.50 lb thifensulfuron = 0.25 lb	0.33 oz	rimsulfuron = 0.01 lb thifensulfuron = 0.005 lb	rimsulfuron = 0.01 lb ai Harmony GT 75DF = 0.11 oz
Basis Gold 89.46WDG	rimsulfuron = 0.0134 lb nicosulfuron = 0.0134 lb atrazine = 0.8678 lb	14 oz	rimsulfuron = 0.012 lb nicosulfuron = 0.012 lb atrazine = 0.759 lb	rimsulfuron = 0.012 lb ai Accent 75DF = 0.25 oz AAtrex 90DF = 0.844 lb
Bicep II Magnum 5.5L	S-metolachlor = 2.4 lb atrazine = 3.1 lb	2.1 qt	S-metolachlor = 1.26 lb atrazine = 1.63 lb	Dual II Magnum 7.64E = 1.32 pt AAtrex 4L = 3.26 pt
Bicep Lite II Magnum 6L	S-metolachlor = 3.33 lb atrazine = 2.67 lb	1.5 qt	S-metolachlor = 1.2 lb atrazine = 1.00 lb	Dual II Magnum 7.64E = 1.31 pt AAtrex 4L = 2 pt
Buctril + atrazine 3L	bromoxynil = 1.0 lb atrazine = 2.0 lb	2 pt	bromoxynil = 0.25 lb atrazine = 0.5 lb	Buctril 2E = 1 pt AAtrex 4L = 1 pt
Bullet 4CS	alachlor = 2.5 lb atrazine = 1.5 lb	4 qt	alachlor = 2.5 lb atrazine = 1.5 lb	Micro-Tech 4CS = 2.5 qt AAtrex 4L = 1.5 qt
Celebrity Plus 70WDG	diflufenzopyr = 0.17 lb ae dicamba = 0.424 lb ae nicosulfuron = 0.106 lb	4.7 oz	diflufenzopyr = 0.049 lb ae dicamba = 0.125 lb ae nicosulfuron = 0.031 lb	diflufenzopyr = 0.049 lb ae Clarity 4S = 3.98 fl oz Accent 75DF = 0.66 oz
Degree Xtra 4.04CS	acetochlor = 2.7 lb atrazine = 1.34 lb	3 qt	acetochlor = 2.025 lb atrazine = 1.00 lb	Degree 3.8CS = 2.13 qt AAtrex 4L = 1 qt
Distinct 70WDG	diflufenzopyr = 0.20 lb ae dicamba = 0.50 lb ae	6 oz	diflufenzopyr = 0.075 lb ae dicamba = 0.188 lb ae	diflufenzopyr = 0.075 lb ae Clarity 4S = 6 fl oz
DoublePlay 7E	acetochlor = 1.4 lb EPTC = 5.6 lb	5 pt	acetochlor = 0.875 lb EPTC = 3.5 lb	Surpass 6.4E = 1.1 pt Eradicane 6.7E = 4.2 pt
Epic 58WDG	flufenacet = 0.48 lb isoxaflutole = 0.10 lb	12 oz	flufenacet = 0.36 lb isoxaflutole = 0.075 lb	Define 60DF = 9.6 oz Balance 75WDG = 1.6 oz
Exceed 57WDG	prosulfuron = 0.285 lb primisulfuron = 0.285 lb	1 oz	prosulfuron = 0.018 lb primisulfuron = 0.018 lb	Peak 57WDG = 0.5 oz Beacon 75WDG = 0.38 oz
Field Master 4.06S	acetochlor = 2.0 lb atrazine = 1.5 lb glyphosate = 0.56 lb ae	4 qt	acetochlor = 2.0 lb atrazine = 1.5 lb glyphosate = 0.56 lb ae	Harness 7E = 2.29 pt AAtrex 4L = 3 pt Roundup Ultra 3L = 1.5 pt
FulTime 4CS	acetochlor = 2.4 lb atrazine = 1.6 lb	4 qt	acetochlor = 2.4 lb atrazine = 1.6 lb	TopNotch 3.2CS = 3 qt AAtrex 4L = 1.6 qt
Guardsman Max 5L	dimethenamid-P = 1.7 lb atrazine = 3.3 lb	4 pt	dimethenamid-P = 0.85 lb atrazine = 1.65 lb	Outlook 6EC = 18.1 fl oz AAtrex 4L = 3.3 pt

Table 4. Corn herbicide premixes. (cont.)

Harness Xtra 6L	acetochlor = 4.3 lb atrazine = 1.7 lb	2 qt	acetochlor = 2.15 lb atrazine = 0.85 lb	Harness 7E = 2.46 pt AAtrex 4L = 1.7 pt
Harness Xtra 5.6L	acetochlor = 3.1 lb atrazine = 2.5 lb	2.5 qt	acetochlor = 1.94 lb atrazine = 1.56 lb	Harness 7E = 2.21 pt AAtrex 4L = 3.13 pt
Hornet WDG 68.5WDG	clopyralid = 0.50 lb ae flumetsulam = 0.185 lb	3 oz	clopyralid = 0.094 lb ae flumetsulam = 0.035 lb	Stinger 3S = 4 fl oz Python 80WDG = 0.69 oz
Laddok S-12 5L	bentazon = 2.5 lb atrazine = 2.5 lb	1.67 pt	bentazon = 0.52 lb atrazine = 0.52 lb	Basagran 4S = 1 pt AAtrex 4L = 1 pt
Liberty ATZ 4.3SC	glufosinate = 1 lb atrazine = 3.3 lb	40 fl oz	glufosinate = 0.313 lb atrazine = 1.03 lb	Liberty 1.67L = 24 fl oz AAtrex 4L = 2.06 pt
Lightning 70DG	imazethapyr = 0.525 lb imazapyr = 0.175 lb	1.28 oz	imazethapyr = 0.042 lb imazapyr = 0.014 lb	Pursuit 70DG = 0.96 oz Arsenal 2AS = 0.896 fl oz
Marksman 3.2L	dicamba = 1.1 lb ae atrazine = 2.1 lb	3 pt	dicamba = 0.4125 lb ae atrazine = 0.7875 lb	Banvel 4S = 0.825 pt AAtrex 4L = 1.56 pt
NorthStar 47.4WDG	primisulfuron = 0.075 lb dicamba = 0.399 lb ae	5 oz	primisulfuron = 0.023 lb dicamba = 0.125 lb ae	Beacon 75WDG = 0.50 oz Banvel 4S = 4 fluid oz
ReadyMaster ATZ 4SC	atrazine = 2 lb glyphosate = 1.5 lb ae	2 qt	atrazine = 1 lb glyphosate = 0.75 lb ae	AAtrex 4L = 2 pt Roundup 3L = 2 pt
Shotgun 3.25F	atrazine = 2.25 lb 2,4-D = 1 lb ae	2 pt	atrazine = 0.56 lb 2,4-D = 0.25 lb ae	AAtrex 4L = 1.13 pt Salvo 5E = 0.4 pt
Spirit 57WDG	prosulfuron = 0.142 lb primisulfuron = 0.428 lb	1 oz	prosulfuron = 0.009 lb primisulfuron = 0.027 lb	Peak 57WDG = 0.25 oz Beacon 75WDG = 0.57 oz
Steadfast 75WDG	nicosulfuron = 0.5 lb rimsulfuron = 0.25 lb	0.75 oz	nicosulfuron = 0.023 lb rimsulfruon = 0.012 lb	Accent 75DF = 0.5 oz rimsulfuron = 0.012 lb ai
Yukon 67.5WDG	halosulfuron = 0.125 lb dicamba = 0.50 lb ae	4 oz	halosulfuron = 0.03 lb dicamba = 0.125 lb ae	Permit 75WSG = 0.67 oz Banvel 4S = 4 fluid oz

Table 5. Soybean herbicide premixes.

Herbicide	*Components (ai/gal or lb)*	*If you apply/acre:*	*You have applied (ai):*	*Product equivalents are:*
Axiom 68DF	flufenacet = 0.544 lb metribuzin = 0.136 lb	13 oz	flufenacet = 0.442 lb metribuzin = 0.111 lb	Define 60DF = 11.78 oz Sencor 75DF = 2.36 oz
Backdraft 1.35L	imazaquin = 0.15 lb glyphosate = 0.884 lb ae	2.5 qt	imazaquin = 0.094 lb glyphosate = 0.553 lb ae	Scepter 70DG = 2.14 oz Roundup 3L = 1.47 pt
Boundary 7.8EC	S-metolachlor = 6.3 lb metribuzin = 1.5 lb	2 pt	S-metolachlor = 1.57 lb metribuzin = 0.375 lb	Dual Magnum 7.62E = 1.65 pt Sencor 75DF = 8 oz
Canopy 75DG	chlorimuron = 0.107 lb metribuzin = 0.643 lb	6 oz	chlorimuron = 0.039 lb metribuzin = 0.24 lb	Classic 25DF = 2.56 oz Sencor 75DF = 5.14 oz
Canopy XL 56.3DG	sulfentrazone = 0.469 lb chlorimuron = 0.094 lb	6.8 oz	sulfentrazone = 0.199 lb chlorimuron = 0.04 lb	Authority 75DF = 4.25 oz Classic 25DF = 2.56 oz
Command Xtra B&G Co-Pak	clomazone 3 lb sulfentrazone = 4 lb	25.6 + 9.6 fl oz	clomazone = 0.6 lb sulfentrazone = 0.3 lb	Command 3ME = 1.6 pt Authority 75DF = 6.4 oz
Conclude Xact B&G Co-Pak	bentazon = 2.67 lb acifluorfen = 1.33 lb sethoxydim = 2 lb	1.5 + 1.5 pt	bentazon = 0.5 lb acifluorfen = 0.25 lb sethoxydim = 0.375 lb	Basagran 4S = 1 pt Blazer 2S = 1 pt Poast 1.5E = 2 pt
Domain 60DF	flufenacet = 0.24 lb metribuzin = 0.36 lb	10 oz	flufenacet = 0.15 lb metribuzin = 0.225 lb	Define 60DF = 4 oz Sencor 75DF = 4.8 oz
Extreme 2.17L	imazethapyr = 0.17 lb glyphosate = 1.473 lb ae	3 pt	imazethapyr =0.063 lb glyphosate = 0.552 lb ae	Pursuit 2AS = 4 fl oz Roundup 3L = 1.47 pt
Fusion 2.56EC	fluazifop = 2 lb fenoxaprop = 0.56 lb	8 fl oz	fluazifop = 0.125 lb fenoxaprop = 0.035 lb	Fusilade DX 2E = 8 fl oz Puma 1EC = 4.48 fl oz
Gauntlet Co-Pak	sulfentrazone = 0.75 lb cloransulam = 0.84 lb	5.33 oz + 0.6 oz	sulfentrazone = 0.25 lb cloransulam = 0.031 lb	Authority 75DF = 5.33 oz FirstRate 84WDG = 0.6 oz
Pursuit Plus 2.9EC	imazethapyr = 0.2 lb pendimethalin = 2.7 lb	2.5 pt	imazethapyr = 0.063 lb pendimethalin = 0.84 lb	Pursuit 2AS = 4 fl oz Prowl 3.3EC = 2 pt
Rezult B&G Co-Pak	bentazon = 5 lb sethoxydim = 1 lb	3.2 pt	bentazon = 1.0 lb sethoxydim = 0.20 lb	Basagran 4S = 2 pt Poast Plus 1E = 1.6 pt
Squadron 2.33EC	imazaquin = 0.33 lb pendimethalin = 2 lb	3 pt	imazaquin = 0.124 lb pendimethalin = 0.75 lb	Scepter 70DG = 2.83 oz Prowl 3.3EC = 1.82 pt
Stellar 3.1E	lactofen = 2.4 lb flumiclorac = 0.7 lb	5 fl oz	lactofen = 0.094 lb flumiclorac = 0.027 lb	Cobra 2E = 6 fl oz Resource 0.86E = 4 fl oz
Storm 4S	bentazon = 2.67 lb acifluorfen = 1.33 lb	1.5 pt	bentazon = 0.5 lb acifluorfen = 0.25 lb	Basagran 4S = 1 pt Blazer 2S = 1 pt
Synchrony STS 42DF	chlorimuron = 0.318 lb thifensulfuron = 0.102 lb	0.5 oz	chlorimuron = 0.001 lb thifensulfuron = 0.003 lb	Classic 25DF = 0.64 oz Harmony GT 75DF = 0.068 oz

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