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MINNESOTA EXTENSION SERVICE

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IN THIS ISSUE

PAGE

ALFALFA	19
ALFALFA WEEVIL	19
CORN	20
CORN HYBRID MATURITY RECOMMENDATIONS FOR LATE PLANTING	20
VEGETABLE CROPS	20
BIORATIONAL, BT CONTROL OPTIONS FOR INSECT PESTS OF VEGETABLE CROPS	20
COLE CROPS	21
ASPARAGUS	21
SWEET CORN & EUROPEAN CORN BORER CONTROL	21
POTATO & COLORADO POTATO BEETLE CONTROL	21
MISCELLANEOUS	22
WHERE TO ORDER SWEEP NETS	22
ATRAZINE—SURFACE AND GROUND WATER PROTECTION REQUIREMENTS	22
DIAL U	23

ALFALFA

ALFALFA WEEVIL—Where are the weevils? They appear to have survived the winter nicely and are presently out feeding (sunning) and maturing their eggs. With the current warm temperatures, they should start laying eggs this week. As in most years, weevil infestations will vary from field to field; consequently, all fields should be checked for weevil (larval) activity prior to the first harvest, and on the regrowth. One recent estimate of population density (provided by Dr. Kathy Flanders), illustrates the correlation between larval numbers last fall, and adult numbers this spring.

Rosemount (Dakota Co.): Fall '92 = 100 larvae/100 sweeps;
Spring '93 = 7 Adults/100 sweeps.
Hokah (Houston Co.): Fall '92 = 15 larvae/100 sweeps;
Spring '93 = 1.5 Adults/100 sweeps.

Degree-day (°D) estimates for larval development for several locations are shown in **Table 1** on page 20. Scouting should begin at 300 °D, focusing on the south-facing sides of fields. However, weevil numbers (1st-2nd instar larvae) are usually not

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contact Extension Plant Pathology at 612-625-6290

ALFALFA/Continued

consistently abundant until 400 °D. See also Table 2 on weevil development during our most recent outbreak year of 1989 as a benchmark for comparison.

Table 1. Alfalfa Weevil Degree-Days (>48°F threshold) for selected Minnesota locations

Alexandria - 183	Olivia - 174
Calendonia - 181	Rochester - 184
Cambridge - 194	Rosemount - 230
Faribault - 181	St. Cloud - 195
Hutchinson - 184	St. Paul - 236
Mankato - 216	Waseca - 184
Morris - 180	

Table 2. Alfalfa Weevil Infestations and °D accumulations for 1989, Rosemount, MN.

Sample Date	°Ds	#Larvae per 40 sweeps
May 7	193	0.7
15	284	0.8
22	409	11.9
27	490	121.0
29	521	97.0
31	543	51.0
June 5	620	550.0
11	720	724.0

-Bill Hutchison
Extension Entomologist

CORN

CORN HYBRID MATURITY RECOMMENDATIONS FOR LATE PLANTING

The table below gives the corn hybrid maturity we recommend to be "full-season" for various planting dates and locations in Minnesota. We believe full season hybrids can be planted until May 20 and expect they should reach maturity before the first killing frost. This assumes that normal temperatures occur and the first frost occurs close to the average frost date.

Minnesota relative maturity ratings for "full-season" corn hybrids for May and June planting dates.

Zone	For planting dates of:				
	Prior to May 20	May 21-25	May 26-June 1	June 2-10	June 11-20
Central	95-100	90	85	80	—
South central	100-105	95	90	85	75
Southern	105-110	100	95	90	80

Hybrids with lower ratings than given in the table would be considered mid-season or early hybrids for each planting date. Those hybrids would reach maturity earlier and have more calendar time to field dry.

D.R. Hicks
Extension Agronomist

VEGETABLE CROPS

BIORATIONAL, Bt CONTROL OPTIONS FOR INSECT PESTS OF VEGETABLE CROPS—One of the more realistic alternatives to conventional insecticides, is *Bacillus thuringiensis*, a bacterium that has specific toxic activity on the larval stages of many insect pests. For example, for lepidopteran (moth, butterfly) caterpillars, *Bacillus thuringiensis* var. *kurstaki* (Btk) is an active material, effective on imported cabbageworm, and cabbage looper on cole crops, and European corn borer on sweet corn. *Bacillus thuringiensis* var. *tenebrionis* (Btt) can be an effective product for Colorado potato beetle control on potato. (*B. thuringiensis* var. *israelensis* (Bti) is used to control mosquitoes and larvae of other flies.) Bt kills its host by binding to the gut wall of the insect, following ingestion. After the gut wall breaks down, the insect dies from general septicemia as bacteria proliferate throughout the blood stream. In contrast to conventional insecticides, the insect may not die for 2-4 days; however, they will usually stop feeding within 4-6 hr. For more detailed information on BT products, refer to *Alternatives in Insect Management - Biological & Biorational Approaches* (AG-BU-5854), available at County Extension Of-

fices or the EDS Distribution Center, St. Paul Campus (612-625-8173).

With many new Bt formulations on the market, several studies have been conducted during the past few years to evaluate their effectiveness on selected vegetable pests. Based on these results, we have summarized suggested rates for the following insect pests on cabbage, broccoli, sweet corn and potato. However, with nearly all of these pest/crop situations, however, we still advocate a balanced, integrated pest management (IPM) approach. That is, for some pests such as European corn borer on silking sweet corn, I would still recommend a conventional insecticide for the first spray at late-tassel or early silk, then followed by 2-3 BT applications prior to harvest. For cole crops, BT can be rotated with insecticides; e.g., use BT early when imported cabbageworm is dominant, then switch to an insecticide as cabbage looper buildup. Finally, when possible, to minimize resistance in local populations, rotate BT products (e.g., Javelin and MVP); diamondback moth populations have developed resistance to BT in Hawaii and Florida, when treated 10-12 times

(weekly). For all recommendations, please refer to the 1993 *Commercial Vegetable Production Guide* (AG-BU-1880); see April 16th *Plant Pest Newsletter* for order form.

The following rates are based on research done under a variety of environmental conditions. Prior to use, however, always check the label carefully.

Cole crops (cabbage, broccoli, cauliflower):

for: Imported cabbageworm, cabbage looper and diamond-back moth

Dipel 2X (Abbott Laboratories)	1 lb Product/Ac
Javelin WG (Sandoz Corp.)	1.5 lb Product/Ac
MVP (Mycogen Corp.)	2.5 qt. Product/Ac*
Agree (Ciba Plant Prot.)	2.0 lb Product/Ac**

* Not always consistent for cabbage looper control.

** Use early in the season under light pressure; or only for imported cabbageworm.

Although not tested in Minnesota, the following products are also labelled for cole crops and have performed comparatively well in Wisconsin (Dr. Jeff Wyman, University of Wisconsin) or were just registered for the 1993 season.

Biobit WP (Dupont)	1-2 lb Product/Ac
Biobit FC (Dupont)	2-3.5 pt Product/Ac
Xentari WDG (Abbott Labs.)	0.5-1 lb Product/Ac

Guidelines: for all products, use a spreader-sticker (such as Bond or Plyac) to help the Bt material adhere to the waxy surface of cole crop leaves; this is also useful for conventional insecticides. Note: these rates are at the high end of the rate range, which is necessary for consistent control; use lower rates only under low pest pressure situations (e.g., early season). In all cases, monitor the crop closely (1-2 times/week) to check for insect activity, and apply Bt products only when young larvae are present (< 1/4 inch). Treatment is not necessary until 30-40% of the plants are infested with one or more larvae per plant (this is easier than counting individual larvae and sorting out species). Also, cabbage and broccoli in the pre-heading stage, can tolerate up to 25 and 40% defoliation, respectively, without a yield loss, indicating that early-season treatments can be minimized. One advantage of the specificity of Bt, is that it has virtually no detrimental effects on beneficial insects and spiders. However, for the same reason, Bt is not active on aphids. Therefore, high aphid populations on young plants may require an insecticide treatment.

Asparagus—Common asparagus beetles are actively laying eggs at the St. Paul Campus. Plots; beetle activity should now be common throughout the southern half of the state. Refer to the 1993 *Commercial Vegetable Production Guide* (AG-BU-1880) for thresholds and control suggestions.

Sweet corn & European corn borer control—There are two instances where Bts fit into an IPM program for ECB in sweet corn. The first is for infestations in whorl-stage corn (typically first-generation ECB in southern Minnesota). Considerable work has been done with Dipel 10G (granular formulation) on field corn (Dr. Ken Ostlie, University of Minnesota), which is transferable to sweet corn. Recent research has shown that several sweet

corn hybrids can tolerate up to a 50% whorl-stage infestation, before significant numbers of ECB larvae are able to survive to infest ears at harvest. Although several Bt products, including liquid formulations can be used for first-generation, Dipel 10G and MVP granules are still the preferred choice until further research can be done with liquid formulations. For whorl-stage corn, during most years, only one application will be necessary.

For control of ECB during late tassel (and silk) to harvest, two Bt formulations (Dipel ES and MVP) have looked promising for processing sweet corn (applied by helicopter)—either applied as a tank-mix with a low rate of permethrin (Pounce 3.2E or Ambush 2E), or applied alone, after a first (late-tassel) application of permethrin. Ground application trials (more typical for fresh-market), however, have not been as consistent. However, to use Bts for silk to harvest protection, it is recommended that the first spray be a conventional insecticide (e.g., permethrin); then follow this treatment with 2-3 Bt sprays (apply at 5-day intervals). During most years (with typical ECB pressure in Minnesota), this strategy should provide necessary ear protection. For Dipel ES, use 2-2.5 pts product/acre; for MVP, use 2.5 qts product/acre. A low rate of permethrin is considered 0.05 lb AI/ac (2 fl oz of Pounce 3.2E, or 3.2 fl oz of Ambush 2E). The best way to develop a more bio-intensive approach is to integrate additional control tactics. Refer to the 1993 *Vegetable Guide* for a ranking of the tolerance of 41 sweet corn hybrids to ECB damage (provided by Dr. Dave Davis, Horticultural Science).

Although corn earworm larvae are also susceptible to Bt, control of this pest is more difficult, and has not been reliable for fresh-market sweet corn. Corn earworm, however, it is usually only a concern for late-planted or late-maturing hybrids (beginning the last week of August; southern Minnesota). Permethrin applied for corn earworm control will also kill ECB larvae. Do not use PennCap-M for corn earworm control. Do not use Asana XL for ECB control, although Asana XL is effective for corn earworm.

Potato & Colorado potato beetle control—The single strain of Bt which has consistently good to excellent activity against especially Colorado potato beetle larvae is *Bt tenebrionis*. It is sold commercially as M-One M-Trak (Mycogen) and Novodor (Movo-Nordisk), among others. The dosage is from 4 to 6 pints of formulation per acre. It is most effective against first stage larvae so timing of application to coincide with early egg hatch is essential. If the season is cool so CPB egg hatch is slow one may use an effective insecticide on the earliest hatching larvae and follow with the higher dosage of product as the 2nd application.

These are comparatively expensive biologicals and growers with resistance to phosphates, carbamates and pyrethroids in their CPB populations will have to plant ahead so they have the Bt on hand.

We should use Bt just as judiciously (as little as possible to get the job done) as we did the synthetic insecticides.

The bottom line for the 1993 season will be what products are actually available at local dealers/distributors, and their comparative prices. Dipel formulations (Abbott Labs.) are the most widely available Bt products. Others such as Javelin, Biobit and M-Trak may also be available, or can often be ordered by your dealer/distributor if there is sufficient demand. Check with your local dealer for details; if they do not carry a product of interest, contact one of us (W.D. Hutchison, 612-624-1767).

Bill Hutchison & Dave Noetzel
Extension Entomologists

MISCELLANEOUS

WHERE TO ORDER SWEEP NETS—For general sampling purposes in field crops, including alfalfa, you will want to use a "heavy duty" sweep net with thick muslin cloth. For small insects such as the potato leafhopper, it is essential that the net consist of a thick cloth. Nylon mesh, or other inexpensive mesh nets usually have mesh sizes too large for potato leafhopper, allowing the leafhoppers to escape before they get counted. In addition to potato leafhopper, sweep nets are also necessary for monitoring plant bugs. They are also very useful for obtaining an initial estimate of alfalfa weevil (larvae or adults) activity and beneficial insects such as lady beetles.

Two sources of nets, in different price ranges are listed below:

1. Pest Management Supply Co.
P.O. Box 938
Amherst, MA 01004
1-800-272-7672
(413-253-3747)

#20006001 - 15" net; muslin; birch handle - \$13.95
#20007001 - 15" net; muslin, sailcloth net; birch handle - \$19.95
#20003001 - 15" net; muslin; aluminum handle - \$22.95

2. Ward's Natural Science Estab.
1-800-962-2660

#10 W 0560 - 15"x28" net; muslin; aluminum handle - \$27.00

3. To order a good replacement net for the Ward's sweep net, try Pest Mgmt. supply or,

Bio-Quip Products
1-213-324-0620

#7215HS - 15x28" net; reinforced with the Dacron sail-cloth around the top (probably similar to the bag used on the \$19.95 sweep net from Pest Management Supply Co. (above).

Contact these companies for current prices. For more information about using a sweep net, contact your county extension educator or,

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ATRAZINE-SURFACE AND GROUND WATER PROTECTION REQUIREMENTS—Atrazine application restrictions to protect water resources were discussed in the last issue (PPST04). Set-backs for sink holes were erroneously listed as 66 ft., but are in fact 50 ft. A slightly modified version of a summary table of atrazine set-back requirements compiled by the Minnesota SCS follows which may clarify some set-back issues. For those in southeast Minnesota with sloping land truncated with streams and with sink holes on the ridges, it will be a challenge to use atrazine and not violate set-back requirements. Remember, these set-backs are required for any rate of atrazine use, including the low rates used in postemergence broadleaf tank mixes.

Atrazine Set-Back Requirements

Feature	No Set-Back	50 Ft Set-Back	66 Ft Set-Back	200 Ft Set-Back	50-150 Ft Set-Back (Minn. Water Well Code)
Ephemeral Gullies within the field, drainage ditches not considered intermittent or perennial streams by USGS	Generally exempt				
Drainage wells, Sink holes		no mixing/loading no application Vegetation required			
Non-HEL Fields Streams, Gullies, Ephemeral Gullies that leave the field. Drainage ditches appearing as intermittent or perennial streams on USGS maps.		no mixing/loading	no application no vegetation required		
HEL Fields Streams, Gullies, Ephemeral Gullies that leave the field. Drainage ditches appearing as intermittent or perennial streams on USGS maps.		no mixing/loading	no application, vegetation required		
Lake, Some ponds, Reservoir Non-HEL and HEL Fields	(Ponds-A)	no mixing/loading	(Ponds-B)	no application, no vegetation required (Ponds-C)	
Wells		no application			No mixing/loading
Tile inlets		no mixing/loading if outlet within 50 ft of well	no application if outlet within 66 ft of intermittent or perennial stream	no application if outlet within 200 ft of lake, some ponds, reservoirs or drainage ditch considered as a stream	

Ponds-A Ponds that are wholly contained on your property, are **not** used for drinking water, and do **not** discharge into a discernable channel.

Ponds-B Ponds that are wholly contained on your property, are **not** used for drinking water, but **do** discharge to a discernable channel.

Ponds-C Ponds that **do** cross property lines or **are** used for drinking water.

*Well mixing and loading set-backs under Minnesota Water Well Code.

150 ft. - if mixing/loading > 25 gal. concentrate or 100 lbs. dry, and **no** impermeable mixing/loading and storage safeguards in place.

100 ft. - if mixing/loading > 25 gal. concentrate or 100 lbs. dry, and impermeable mixing/loading and storage safeguards **are** in place.

50 ft. - if mixing/loading > 25 gal concentrate or 100 lbs. dry, and impermeable mixing/loading and storage safeguards **are** in place **with a permanent roof.**

Roger L. Becker
Extension Agronomist

<p>COUNTY AGENTS: PLEASE ALERT MASTER GARDENERS TO THE FOLLOWING</p>
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Warmer weather has accelerated growth of flowering trees and shrubs.....and weeds, too! Pre-emergent herbicide can be applied any day now, in the Twin Cities area and further south. Try to target weedy areas rather than spread it throughout the entire lawn, unless the entire lawn has had a problem with annual weeds. Remember, if there's any grass seed planted, you've got to use pre-emergent containing siduron or Tupersan. Others will prevent bluegrass seed from sprouting, right along with weed seeds.

"Austree" ads are resulting in calls to Dial U again this year. Sellers claim "Austree" is a wonderful, fast-growing tree for Minnesota windbreaks, but you have to read carefully to determine that "Austree" is a fancy name for a hybrid willow. Willow is not a tree that is commonly suggested for most soils and situations here.

There are many clones of Austree, none of which has yet proven totally hardy in Minnesota. In some areas they've experienced tip die-back for six inches or so; in other areas, they've died after one or two years' growth. In addition, we've not had a particularly cold or severe winter here since they were first introduced several years ago.

Some perennials may be divided in spring, just as they begin new growth. Hosta lilies, daylilies, chrysanthemums, and daisies are among those that may be carefully divided at this time. It's best to wait till late summer to divide iris and peonies, though.

Birch leafminer prediction—We anticipate the first birch leafminer mines in the Twin Cities some time next week (the week of May 17). Because of a change in the data base, Forecaster, a computer program using degree-day temperatures, has not been readily available with first birch leafminer mine estimates. It has only been run once; based on data through May 2, the prediction is for May 26. However, the recent warm weather has brought events closer to normal. Regardless of what the computer or your calendar says, be sure to check your birch to be sure that leafminers are present and before making pest management decisions. See AG-FS-6134, *Birch Leafminers*.

Ground-nesting bees—We have received a number of questions about large numbers of 'swarming wasps or bees with many holes that they enter'. From these descriptions, the insects sound like ground-nesting andrenid bees. These bees prefer to nest in the ground in sunny, dry sites, especially south-facing slopes. People see a 'swarm' because andrenid bees live gregariously, i.e. in adjacent, individual, nonsocial nests. Fortunately, these bees are very docile and stings are very uncommon. Discourage these bees by keeping areas where they nest moist. Because they prefer dry sites, they are likely to move away on their own. Carbaryl (Sevin) can provide temporary chemical control if desired.

American dog ticks, also known commonly as wood ticks, are prevalent this year. They seem to be more common during wet, cool springs. American dog ticks are usually not seen after June because the adults which are more easily seen than the immature stages are present April through June then die. American dog ticks do not transmit Lyme disease and are nuisances to people more than anything else.

To protect yourself when outside in tick-infested areas, wear long-sleeved shirts and pants; tuck pants into socks for additional protection. Walk in the middle of trails and avoid nearby grassy areas. Apply DEET to your clothing and/or skin to repel ticks. Or you can apply permethrin (Permanone) to clothing, allowing it to dry before wearing the clothes; do not apply permethrin to skin.

Around the home, keep grass and other plants short. You can use an appropriate insecticide, such as carbaryl (Sevin) or chlorpyrifos, to temporarily reduce high numbers of ticks.

Deer ticks, vectors of Lyme disease, are also present this spring. If there are any doubts about the identification of ticks, submit specimens to the Dial-U Office. See AG-FO-1013, *Minnesota ticks and their control*.

White pine blister rust—Right now white pine blister rust is abundant and easily identified. Look for brown flagging (small to large branches with brown needles). The swollen portion of the line between the healthy and diseased tissue erupts with white blisters containing orange spores. Resin commonly flows from these infected areas.

The orange spores are windblown to alternate hosts; native gooseberries and currants (*Ribes* sp.). Lesions form on the underside of leaves. These structures release spores which are capable of infecting white pine in late summer/early autumn. The infection typically takes 3-6 years to reach the white blister stage.

What to do? Check your white pine closely for flagging and remove all cankered (diseased or dead) areas. Do not plant currants and gooseberry species (*Ribes* sp.) which are susceptible as they serve to perpetuate the disease. All native currants and European black currant, *Ribes nigrum*, are extremely susceptible. Cultivated currant varieties are less susceptible. [Master gardeners and county staff should refer to the *Brief on White Pine Blister Rust* for further information].

Deer browsing—The growing deer and human populations are forcing deer to look to residential landscapes for food. Young, tender plants are preferred to older, tougher ones. If deer are abundant in your area, landscape with plants that deer dislike. A good way to find out which species deer prefer or avoid is to talk with neighbors. Species preference often changes from one area to another. In general, deer dislike plants with thorns, Balsam fir, Anthony Waterer spirea, honeysuckle, lilac, nannyberry viburnum, potentilla, and Ural Falsespirea.

DIAL U/Continued

Small gardens can be enclosed with a 4 ft. high fence. Large gardens or yards will require a 6 ft. high wire fence angled out 30 degrees from the yard. High voltage, low impedance fencing has also had some success, especially when baited with peanut butter.

A recent study showed that repellents such as Deer Away, Hinder, and Thiram were between 40% and 50% effective. These taste repellents won't protect any plant growth occurring since the last application and some may cause a phytotoxic response.

Other common calls include broad-leaf weed control (you can get rid of lots of dandelions with a good dandelion digger), pruning trees and shrubs, choosing plants for the landscape, fertilizing lawns and landscape plants, carpenter ants, Rhizosphaera needlecast and Cytospora canker on spruce, cedar apple rust control, turf diseases including powdery mildew, rabbits, and squirrels.

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