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EC88-1509 Field Crop Insect Management Guide for Nebraska Corn and Sorghum

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Nebraska Cooperative Extension Service EC 88-1509

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FIELD CROP INSECT MANAGEMENT GUIDE FOR NEBRASKA
CORN AND SORGHUM

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Insect management suggestions in this circular are based on University of Nebraska test results, data from surrounding states, USDA recommendations, previous experience, and label registrations. These suggestions are designed to guide Nebraska farmers when they select an insect management program. NebGuides and other publications containing additional information on insect identification, damage, and life cycles are referenced under insect headings and are available by mail order (Write - Bulletins, 104 ACB, University of Nebraska-Lincoln, NE 68583-0918) or from local Cooperative Extension Service Offices.

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There are several approaches to the management of insect pests in Nebraska. These include the use of cultural practices, resistant varieties, biological control, and/or insecticides. Before making a treatment decision, all appropriate management strategies should be considered. If insecticide use is indicated, consideration should be given to efficacy against the target pest or pest combination, label restrictions, formulation of the pesticide, cost, safety to non-target species (including humans), environmental conditions at the time of application, and other factors.

THE USER IS RESPONSIBLE FOR THE EFFECTS OF PESTICIDE RESIDUES ON CROPS AND LIVESTOCK, AS WELL AS PESTICIDE DRIFT AND CONTAMINATION. This publication does not supersede label information. Always read and carefully follow the instructions on the container label. For current information, contact your local Cooperative Extension Service Office.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

The use of trade names in this circular is not an endorsement by the Nebraska Cooperative Extension Service.

TOXICITY OF INSECTICIDES

(NebGuides G85-758, G84-715, G79-460, G79-472, G79-473, G79-479)

All insecticides are poisonous and must be used with caution. Always store them in their original containers out of the reach of children, unauthorized personnel, and livestock. Skull and crossbones and the words Danger/Poison appear in red on the label of highly toxic materials and require special handling. Liquid formulations of these products are recommended only for use by commercial applicators. Granular formulations of these chemicals can be applied safely and effectively when proper precautions are followed as indicated on the label. Moderate and low toxicity pesticides are marked with the signal words Warning and Caution, respectively.

<R> RESTRICTED USE <R>

Several insecticides listed in this circular are classified RESTRICTED USE by the Environmental Protection Agency. These compounds are marked with a <R>. Pesticides may be classified as Restricted Use based on their persistence, toxicity, or potential environmental hazards. To use these products, EPA certification is required. A valid certification card must be presented to your dealer when purchasing these chemicals. Your local Cooperative Extension office will have a listing of the dates and locations where certification training can be obtained. Remember that the status of a formulation can change at any time. When purchasing a pesticide, be certain to ask the dealer if the attached label is up to date.

WHO TO CALL

The following telephone numbers are provided for your use in case of emergency:

Poison Center - Children's Memorial Hospital (Omaha)	(800) 642-9999 (In Nebraska) (800) 228-9515 (Out-of-State)
CHEMTREC - Pesticide Emergency Network	(800) 424-9300
EPA - Environmental Protection Agency	
Lincoln, NE	(402) 471-5080
Kansas City, KS	(913) 236-2800
Nebraska Department of Environmental Control (DEC)	(402) 471-2186
Nebraska State Patrol	(402) 471-2406
Nebraska Department of Agriculture - Bureau of Plant Industry	(402) 471-2341
Nebraska Natural Resources Commission	(402) 471-2081

IMPORTANT

Subscribe to the Insect, Plant Disease, and Weed Science Newsletter for the latest pest management recommendations, changes in pesticide registrations, and updates on the current status of insect pests. Full details and an order blank are given on the last page of this circular.

MANAGEMENT DECISION GUIDELINES/ECONOMIC THRESHOLDS

Economic thresholds are flexible guidelines. They indicate the level of insect abundance or damage that can be tolerated before management actions should be taken. THEY ARE NOT HARD RULES THAT APPLY TO EVERY SITUATION. Used conscientiously, they should be helpful in making management decisions. Many variables can affect your decision including insect abundance, anticipated value of the crop, relative

effectiveness of controls, and pesticide plus application costs. Timing and accuracy of application, as well as the effects of weather, also determine the ultimate degree of control.

CHEMIGATION

The term "chemigation" refers to the injection and application of chemicals through irrigation systems. Proper equipment needs, procedures for calibration and other instructions for application through center pivot systems are provided in NebGuides - G84-703, Applying Insecticides Through Center Pivots, and G73-43, Anti-Pollution Devices for Applying Chemicals Through Irrigation Systems. The Nebraska Chemigation Act took effect January 1, 1987. This legislation requires that the applicator attend a training session and pass a written examination for CERTIFICATION as defined in the State Law. Among additional requirements is the provision that a PERMIT must be issued for the injection site verifying that all necessary anti-pollution equipment is installed and working properly. Injection site inspections will be performed by staff of the appropriate Natural Resources District. Copies of the law, rules, and regulations concerning chemigation are available from the Nebraska Department of Environmental Control, 301 Centennial Mall South, P.O. Box 94877, Lincoln, NE 68509-4877. In some cases, supplemental rules and regulations have been issued by individual Natural Resources Districts. These rules and regulations are available at the respective NRD offices.

ENDANGERED SPECIES ACT

Rules and regulations are pending concerning the impact of pesticides on endangered plant and animal species (e.g., Blowout Penstemon, Piping Plover, and Interior Least Tern) in certain areas of Nebraska. BEFORE applying any pesticide, refer to the Pesticide Use Bulletin For Protection of Endangered Species for the county you are working in that is available from your local pesticide dealer, Cooperative Extension Service office, or the Environmental Protection Agency.

INSECT PREVENTION AND CONTROL IN FARM-STORED GRAIN
(EC88-1534 and NebGuide 86-790)

Properly managed stored grain should have few insect problems during the first year of storage in Nebraska. If grain is to be stored for more than one year, additional effort is required to maintain quality. All bins should be inspected regularly for moisture content, temperature, mold development, and insect pests. Push a sharp pointed stick or rod into the grain to see if hard, compacted areas are developing. Check grain temperature at several locations. Moisture content should also be monitored, even if the grain was dry when binned. Collect several grain samples with a grain probe. Screen the samples and look for evidence of insects. Take samples from the surface and as deep as possible into the grain. Turn on the aeration fan for a few minutes and smell the air. Does it smell normal or does it have a spoiled or musty odor? In addition to following sound sanitation practices using good aeration management and making regular inspections, insecticides and/or fumigation may be needed. For more detailed information on insect management and a listing of currently recommended bin sprays, grain protectants, and fumigants, see EC88-1534, "Pest Management of Farm-Stored Grain," available at your local Cooperative Extension Service office.

SEED TREATMENTS

Damage to corn, sorghum, soybean and other seed by soil-dwelling, seed-feeding insects is often enhanced by prolonged periods of cool, moist weather after planting or other conditions which delay germination. In Nebraska, the major seed-feeding insects are wireworms, seedcorn maggots and seedcorn beetles. Once planted, little can be done to protect seed from these insects. Probably the most effective way of reducing injury by seed-feeding insects is through the use of an approved planter-box seed treatment containing diazinon and/or lindane prior to planting. These treatments are recommended for all corn, sorghum, and soybeans in Nebraska. In fields that have a history of serious seed-feeding insect problems or in situations where stands have been seriously reduced and replanting is the only feasible recourse, a seed treatment plus an in-furrow application with an approved soil insecticide should be considered. NOTE: Agricultural seed is often treated with an insecticide such as malathion or methoxychlor to protect against damage from stored grain pests. These treatments will not provide protection against seed-feeding soil insects.

INSECTICIDE PERFORMANCE

When pest problems exist or are anticipated, select an appropriate management strategy. If pesticides are indicated:

1) Select the proper insecticide/miticide.
2) Read, understand, and follow label directions.
3) Calibrate application equipment for each use.
4) Document application rates and keep accurate records.
5) Leave untreated check strips.
6) Continue scouting on a regular basis to determine pest abundance and also to evaluate product performance.

Insecticides can provide less than satisfactory control for a variety of reasons, including: 1) unusually high insect infestations, 2) inaccurate calibration, 3) improper placement and incorporation, 4) poor timing, 5) inappropriate product selection (low toxicity to target pest), 6) high soil or water pH, 7) pest resistance to insecticide, 8) enhanced microbial breakdown, 9) weather factors (excess rain, wind, drought, temperature), and 10) other environmental conditions.

If you suspect a problem with insecticide performance:

1) Compare treated areas of field to untreated check strips.
2) Reread product label for warranties, guarantees, and claims.
3) Consult an Extension agent or other pest management specialist and, if appropriate, contact your pesticide dealer and/or pesticide company representative as soon as possible.
4) Be prepared to document suspected loss.

When one product fails in a field while another product provides control, the manufacturer may have a responsibility to the grower. This could include replacement of the product, and/or compensation for lost yield.

INSECT PESTS IN CONSERVATION TILLAGE SYSTEMS

Modifications of the crop environment in conservation tillage systems could alter the relative importance of Nebraska's more traditional insect pests and possibly create conditions where incidental organisms achieve pest status. Cooler soil temperatures and slower drying in reduced tillage fields may delay planting in the spring and slow seed germination, leaving seeds and young plants susceptible to soil insects for longer periods. Improper placement and incorporation of soil insecticides may create additional problems where crop residues are heavy. Elimination of deep plowing and the resulting increased surface debris may permit certain insects to overwinter in greater numbers. While the use of reduced tillage raises some questions regarding pest control, anticipated problems should not be a barrier to the development of new techniques. It is highly unlikely that insects will be damaging in all fields, and the beneficial effects of conservation tillage appear to outweigh insect control considerations.

PROTECT BEES

Honeybees collect nectar and/or pollen wherever they can, including field crops such as corn, sorghum, soybeans and alfalfa. If bee colonies are nearby or bees are foraging in fields that are sprayed during flowering (pollen-shed stage for corn and sorghum), they may be killed in substantial numbers. To avoid injury to important pollinators, try to observe the following precautions: 1) treat only if insect pests reach economic levels; 2) if possible, do not treat crops that are in bloom; 3) never directly spray honeybee colonies; 4) check the crop for heavy concentrations of flowering weeds and avoid spraying these areas; 5) treat only those parts of fields that have significant pest infestations; 6) when possible, select an insecticide that has a lower toxicity to bees; 7) make applications very early in the morning or later in the evening when bees are not actively foraging; and 8) properly dispose of unused pesticides. In many cases, beekeepers will relocate bees from areas to be treated if given sufficient prior notice.

SPRAYED BY MISTAKE?

Gardens, particularly plantings of sweet corn, are often placed in or adjacent to crop fields that may be sprayed with an insecticide. The produce is safe to eat IF THE INSECTICIDE IS REGISTERED FOR USE ON THE VEGETABLE OR FRUIT AND THE SPECIFIED WAITING PERIOD HAS ELAPSED. We do not recommend using vegetables or fruit that have been treated with a pesticide which is not labeled for that vegetable or fruit. The following are some preharvest intervals (waiting periods). Check appropriate labels for any others. If you have questions regarding accidental applications, determine the specific pesticide formulation used, the application rate, and time of spraying. Then, by checking the pesticide label, an informed decision can be made concerning use of the crop.

Minimum Number of Days Between Application and Harvest For Some Selected Crops

Insecticide	Tomatoes	Peppers	Sweet Corn	Cucumbers	Cabbage	Leaf Lettuce	Green Beans	Apple
Ambush 2E	NR	3	1	NR	1	1	NR	***
Asana 1.9 EC	1	7	1	3	3	NR	NR	21
Counter 15G	NR	NR	30	NR	NR	NR	NR	NR
Cygon 400	7	0	NR	3	3	14	0	28
Diazinon AG500	1	5	0	7	7	10	7	NR
Diazinon 14G	**	**	**	**	**	**	**	NR
Dipel 2X	0	0	0	0	0	0	0	0
Di-Syston 8EC	30	NR	NR	NR	42	60	60	NR
Di-Syston 15G	30	NR	40	NR	14	NR	NR	NR
Dyfonate 4EC	*	*	*	NR	*	NR	*	NR
Dyfonate 20G	NR	NR	30	NR	*	NR	NR	NR
Furadan 4F	NR	NR	7	NR	NR	NR	NR	NR
Furadan 15G	NR	NR	**	NR	NR	NR	NR	NR
Imidan 50WP	NR	NR	14	NR	NR	NR	NR	7
Lannate 1.8L	1	3	0	1-3	1	NR	1-3	8
Lorsban 4E	NR	NR	35	NR	*	NR	NR	NR
Malathion EC	1-5	3	5	1	7	14	1	3
Metasystox-R	NR	**	7-21	**	7	NR	21	NR
Nudrin 1.8L	1	3	0	1-3	1	7-10	1-3	8
Parathion 8E (ethyl)	10	15	12	15	10	21	15	14
Penncap-M	15	NR	3	NR	21	NR	15	14
Pounce 3.2EC	NR	3	1	NR	1	1	NR	***
Pydrin 2.4EC	1	7	1	3	3	NR	3	21
Sevin 80S	0	0	0	0	3	14	0	1
Thimet 20G	NR	NR	*	NR	NR	NR	*60	NR

NR = Not Registered
* = At or prior to planting time application only
** = Registered, preharvest interval not indicated on label
*** = Do not apply after petal fall

SOME SUGGESTED FIELD RE-ENTRY PERIODS

Re-entry periods may be listed on the label. FOLLOW LABEL DIRECTIONS AND DO NOT ENTER FIELDS AFTER TREATMENT UNTIL THE RE-ENTRY PERIOD HAS PASSED.

Ambush 2E - When spray is dry
Asana 1.9EC - When spray is dry
Comite 6.5EC - When spray is dry
Counter 15G - 7 days (foliar)
- After dust settled (soil)
Cygon 400 - 4 days
Diazinon AG500 - When spray is dry
Diazinon 14G - After dust settled

Guthion 50WP - 24 hrs
Imidan 50WP - When spray is dry
Lannate 1.8L, 90S
- When spray is dry
Larvin 3.2F - When spray is dry
Lorsban 4E - 24 hrs
15G - None stated on label
Malathion EC - When spray is dry

Dipel 10G, ES - When spray is dry or dust settles
Di-Syston 8EC, 15G - 24 hrs
Dyfonate 20G - 24 hrs (foliar)
- After dust settled (soil)
4EC - 24 hrs
Dylox 80S - When spray is dry
EPN 5EC - 24 hrs
Furadan 15G - None stated on label
4F - 24 hrs (limited activity in fields)
- 14 days (prolonged activity in fields)

Metasystox-R 2E - 48 hrs
Nudrin 1.8L, 90S
- When spray is dry
Parathion (ethyl and methyl) - 48 hrs
Pay-Off 2.5EC - When spray is dry
Penncap-M - When spray is dry
Pounce 3.2EC - When spray is dry
Pydrin 2.4EC - When spray is dry
Sevin, all formulations
- When spray is dry
Thimet 20G - 7 days (foliar)
- After dust settled (soil)

CONTAINER DISPOSAL

Proper disposal of insecticide containers is very important. Serious accidents have occurred when "empty" containers have not been disposed of safely. Suggested methods of disposal are:

Paper Bags: Be certain that all contents have been emptied into applicators or tanks. Burn paper containers in open fields where: 1) regard is given to wind direction in relation to people, domestic animals, and water supplies; 2) where such burning is not in violation of Federal, State or local ordinances; and 3) provisions are made to avoid contamination of surface water.

Metal, Glass, or Plastic Containers: Thoroughly rinse containers at least 3 times with water and dump rinse material into tanks to be used with regular applications. Recycle 5 gallon or larger metal drums where possible after complete rinsing. Containers that cannot be recycled should be punctured, crushed, and buried in a landfill or 24 inches below the soil surface in a location that will not result in contamination of water, crops, man, or animals.

ABBREVIATIONS

AI/A	- Active Ingredient Per Acre	Form.	- Formulation	LS	- Liquid Solution
E	- Emulsifiable	G	- Granular	oz	- Ounce
EC	- Emulsifiable Concentrate	L	- Liquid	S	- Soluble
ES	- Emulsifiable Suspension	lb	- Pound	SP	- Soluble Powder
F	- Flowable	LC	- Liquid Concentrate	WP	- Wettable Powder

CORN INSECTS BELOW GROUND

CORN ROOTWORM LARVAE

(NebGuides G87-839, G82-597, G76-283, G86-774, and RP 98)

Damage by corn rootworm larvae is most likely to occur in continuous corn fields. If counts indicate more than 3 beetles per 4 plants (this is an average of 0.75 beetles per plant, or 18,000 beetles per acre based on a plant population of 24,000 plants per acre) on any scouting date during the egg-laying period, a soil insecticide should be considered as a precautionary measure the next spring. Beetle thresholds will vary depending on plant population (see NebGuide G86-774). Data from regular field scouting are essential if this prediction is to work effectively. Corn should be scouted from mid-July through early September to have a high degree of confidence in the prediction. PLAN TO USE A SOIL INSECTICIDE IN CONTINUOUS CORN IF YOU DO NOT HAVE SCOUTING DATA FROM THE PREVIOUS SEASON FOR THE FULL BEETLE ACTIVITY PERIOD.

First year corn is unlikely to benefit from soil insecticide applications in most situations. CROP ROTATION IS AT LEAST 90 PERCENT EFFECTIVE in protecting fields from corn rootworms. We recommend treatment of first year corn be considered only if corn follows weedy soybeans, oat stubble, soybean fields heavily infested with volunteer corn, or following pasture or sod. In a very small percentage of

fields following soybeans or other rotations, Northern Corn Rootworm (NCR) larvae may damage first year corn. This is because a certain percentage of the NCR eggs may hatch two years after being laid -- a phenomenon referred to as EXTENDED DIAPAUSE. Presently, these fields cannot be identified with certainty. In most cases, we feel that preventive treatment with a soil insecticide is unnecessary, even in these situations.

The effectiveness of soil insecticides can be reduced if the soil remains dry after application, excessive rainfall occurs, soils are highly alkaline, or if insecticides are applied at planting time on early planted corn. Control is more reliable if an insecticide is applied at cultivation time in late May or early June, especially if corn was planted before May 15. Cultivation treatment is particularly desirable if soil is alkaline (high pH accelerates decomposition of some insecticides) or if the field has developed a history of control failures when insecticides have been applied at planting.

Many failures to control rootworms can be traced to poor calibration of granular applicators. In many cases, amounts used are below those recommended on the label. REMEMBER THAT LABEL RECOMMENDATIONS ARE BASED ON 40-INCH ROW SPACINGS. If corn is planted in rows narrower than 40 inches, there are more linear feet of row per acre, which requires more insecticide per acre to obtain the proper rate. By calibrating applicators to deliver the suggested amount of granules per 1,000 feet of row, the amount per acre will be correct regardless of row spacing. Refer to the following table when calibrating insecticide applicators and when planning purchases.

Table I. Amounts (in Pounds) of Four Soil Insecticide Formulations Needed Per Acre at Various Row Spacings To Obtain Correct Rate Per 1,000 Feet of Row.

Type of Formulation	Recommended amount formulated insecticide per 1,000 feet of row	Pounds of formulated insecticide needed to cover one acre					
		40 in. Rows	38 in. Rows	36 in. Rows	34 in. Rows	32 in. Rows	30 in. Rows
10% granules	12.24 oz	10.0	10.5	11.1	11.8	12.5	13.3
14% granules	8.75 oz	7.2	7.5	7.9	8.4	8.9	9.5
15% granules	8.16 oz	6.7	7.0	7.4	7.8	8.3	8.9
20% granules	6.12 oz	5.0	5.3	5.6	5.9	6.2	6.7

Soil conditions and type of planting equipment can greatly affect the placement of soil insecticides, which is an important factor in rootworm control. Soil insecticides are more effective if covered with soil during application. Granules or liquids remaining on the surface may rapidly break down which can result in poor control. Also, leaving insecticide on the soil surface may increase the chances of environmental contamination and the poisoning of nontarget organisms. Fertilizer in combination with a soil insecticide must be applied in bands on both sides of the seed furrow at seed level. Certain insecticides (Thimet 20G, Dyfonate 20G, Mocap 15G, Broot 15GX and liquid formulations) should not be allowed to enter the seed furrow, or stand reduction may occur. If soil is rough or cloddy and the furrow fails to close properly, the possibility of phytotoxicity is increased. Counter 15G, Furadan 15G and Lorsban 15G (T-Band) can be applied in the seed furrow. However, in some cases, in-furrow placement has not been as effective as a banded application of the same formulation because the treated zone is apparently too narrow to adequately protect lateral roots. Regardless of material or placement, some feeding on roots will occur when rootworm numbers are high or egg hatch is extended, so do not expect complete control.

RECOMMENDATIONS FOR REDUCTION OF CORN ROOTWORM LARVAE

A. ROTATING CORN WITH OTHER CROPS IS THE BEST CONTROL RECOMMENDATION.

B. If corn is planted prior to May 15 (this date will vary depending on rootworm egg hatch), apply one of the granular insecticides at cultivation time as early as possible, but usually not later than June 10, and cover with soil at the base of plants. If planting time application is used on early-planted corn, Broot 15GX, Counter 15G, Dyfonate 20G, Furadan 15G (if not on Furadan history fields) and Lorsban 15G are more likely to provide longer lasting control than other products. A banded treatment of a given product usually provides better root protection than an in-furrow treatment of the same material.

NOTE: Soil insecticide performance should be evaluated annually by comparing corn root ratings in treated and untreated areas. Use of the same corn rootworm soil insecticide in continuous corn over several consecutive years in the same field has generally been successful in Nebraska. In a few fields, however, poor and/or erratic control has occurred. While many of these failures can be attributed to application problems, planting dates, calibration errors, or environmental factors, some have probably resulted from this continuous use of the same soil insecticide. If problems have occurred with planting time applications, consider using a cultivation application or rotating to another crop. When there is no alternative to planting time application in continuous corn, consider the following suggestions:

1. If rootworm control has been poor after use of a carbamate insecticide (Furadan and Broot), switch to an organophosphate (Counter, Dyfonate, Lorsban, Mocap, and Thimet) the following season.

2. If poor performance has resulted after use of an organophosphate insecticide, consider switching to a carbamate or another organophosphate insecticide.

These two suggestions are offered as precautionary measures. The extent of the problem associated with continuous use of the same insecticide remains unclear. Just how many years it takes a soil to develop a problem or to "recover" is unknown.

For results of annual rootworm insecticide evaluations conducted by entomologists at the University of Nebraska-Lincoln, refer to the Insect Newsletter or contact your local Cooperative Extension Service office.

C. If planting after May 15, apply one of the granular insecticides in a 7-inch band over rows at planting and cover with soil. If corn is listed, apply at cultivation time regardless of planting date.

D. Rescue or "Last Resort" Treatment - after June 10 (or earlier depending on timing of egg hatch): Emergency treatment at lay-by time can be made by applying any of the recommended cultivation-time materials to the soil at the base of plants. Cover the insecticide with 1 to 2 inches of soil. This treatment will not kill all rootworms present because the insecticide will not thoroughly penetrate the soil. It may help reduce further root damage by establishing a barrier between the rootworms and developing roots. If applications are made by aircraft, use granules and cultivate into rows immediately. Considerable variation in degree of control has occurred where broadcast applications have not been incorporated into the soil.

RECOMMENDATIONS FOR REDUCTION OF CORN ROOTWORM LARVAE

Insecticide	Amount Formulation Per 1,000 Row Feet	Restrictions and Comments
carbofuran <R> (Furadan 15G)	8.0 oz	Field, sweet and popcorn. Planting (banded or in furrow), cultivation - over plants or basal.
<R> (Furadan 4F)	2.5 fl. oz	Field, sweet and popcorn. Suggest basal application at cultivation.

chlorpyrifos (Lorsban 15G)	8.0 oz	Field, sweet, and popcorn. Planting, cultivation over plants or basal.
(Lorsban 4E)	2.45 fl. oz	Cultivation. Basal only.
diazinon 14G	8.75 oz	Field, sweet and popcorn. Cultivation only - over plants or basal.
ethoprop <R> (Mocap 15G)	8.0 oz	Field and sweet corn. Planting, cultivation basal only.*
fonofos <R> (Dyfonate 20G)	6.0 oz	Field, sweet and popcorn. Planting, cultivation - over plants or basal. Refer to label for application instructions. T-band - Do not apply in furrow.
phorate <R> (Thimet 20G)	6.0 oz	Field and sweet corn. Planting, cultivation - over plants or basal.*
phorate + flucythrinate <R> (Aastar 15G)	8.0 oz	Field and sweet corn. Planting, cultivation - over plants or basal.*
terbufos <R> (Counter 15G)	8.0 oz	Field, sweet and popcorn. Planting (banded or in furrow), cultivation - basal or over plants.
trimethacarb (Broot 15GX)	8.0 oz	Field and popcorn. Planting*, cultivation. Do not harvest within 90 days of application.

<R> Dyfonate 4EC* is also registered but not recommended as a planting time application.

*Do not allow insecticide to enter the seed furrow, as stand reduction may occur. Dyfonate 20G can be applied as a T-band, thus, some granules may fall into seed furrow without injury.

CUTWORMS
(NebGuide G80-501 and RP 98)

Soil cutworms are most likely to damage corn following sod, pasture, alfalfa, soybeans or small grain stubble. Fields with heavy crop or weed residues or with heavy, early season weed growth also are more susceptible to cutworm infestations. Treatment is suggested when one plant out of 20 (5%) is damaged by cutworms.

Early detection is essential. If the soil surface is dry or crusted, rotary hoeing immediately before or after application may improve control. Pyrethroids (Ambush, Pay-Off, Pounce, Pydrin) should not be incorporated. Generally, cutworms are best controlled by rescue treatments applied after the plants are up and early damage signs are detected. Preventive treatments applied at or prior to planting have generally given erratic control, especially where cutworm numbers have been high.

RECOMMENDATIONS FOR CONTROL OF SOIL CUTWORMS IN CORN

chlorpyrifos (Lorsban 4E)**	1.0 lb AI/Acre
<R> esfenvalerate (Asana 1.9EC)	0.025-0.05 lb AI/Acre
<R> fenvalerate (Pydrin 2.4EC)	0.1-0.2 lb AI/Acre
<R> flucythrinate (Pay-Off 2.5EC)*	0.04-0.08 lb AI/Acre
<R> permethrin (Ambush 2E,	0.1-0.2 lb AI/Acre
Pounce 3.2EC,**	" " " "
Pounce 1.5G)	" " " "

*Do not apply by air.

**Lorsban 4E and Pounce 3.2EC may be applied through overhead sprinkler irrigation system.

OTHER REGISTERED PRODUCTS:

Rates are active ingredient per acre.

carbaryl (Sevin 20% or 5% Bait) ..... 5-10 lb form. (20%) or 40 lb form. (5%)*
carbaryl (Sevin XLR Plus, Sevin 4-Oil) ..... 2.0 lb
<R> carbofuran (Furadan 15G) ..... 1.0 lb banded or in furrow at planting (suppression)
chlorpyrifos (Lorsban 4E)..... 1.0 lb preplant broadcast and incorporated
... 0.75-1.0 lb preplant, pre-emergence in conservation tillage
(Lorsban 15G) ..... 1.0 lb banded at planting
..... 1-2.0 lb in furrow
..... 1-2.0 lb preplant broadcast
diazinon AG500 ..... 2.0 lb
<R> ethoprop (Mocap 15G) ..... 1.0 lb banded at planting
<R> fonofos (Dyfonate 20G) ..... 1.0 lb banded at planting
<R> methyl parathion (Penncap-M) ..... 1.0 lb
<R> permethrin (Ambush 2E, Pounce 3.2EC) ..... 0.1-0.2 lb broadcast from 5 days prior to planting to emergence
(Pounce 1.5G) ..... 0.1-0.2 lb
<R> phorate + flucythrinate (Aastar 15G) ..... 8 oz form. per 1,000 ft of row*
<R> terbufos (Counter 15G) .....1.0 lb banded or in furrow at planting (suppression)
trichlorfon (Dylox 80SP) ..... 1.0 lb

*formulation

WIREWORMS AND SEED DESTROYING INSECTS

(RP 98)

First year corn following small grains, pasture or sod, as well as eco-fallow and early-planted fields are most likely to be damaged by seed-feeding insects. Wireworm beetles are attracted to grasses to deposit eggs. Wireworms have long life cycles, therefore fields damaged one year are likely to be damaged in subsequent seasons. Planter box seed treatments of lindane and/or diazinon (see labels for rates and restrictions) are recommended for all corn, sorghum and soybean fields in Nebraska. Where serious wireworm problems are anticipated, we suggest an in-furrow application of soil insecticide plus a planter box seed treatment.

RECOMMENDATIONS FOR CONTROLLING HEAVY INFESTATIONS OF WIREWORMS, SEEDCORN MAGGOTS, AND SEEDCORN BEETLES IN FIELD CORN

<R> carbofuran (Furadan 15G) ..... 8.0-16.0 oz per 1,000 feet of row in seed furrow for wireworms and seed corn maggots.

<R> terbufos (Counter 15G) ..... 8.0 oz per 1,000 feet of row in seed furrow for maggots, wireworms.

OTHER REGISTERED PRODUCTS:

chlorpyrifos (Lorsban 15G) ..... 8.0 oz per 1,000 feet of row in furrow for maggot and seedcorn beetle. Use 16.0 oz per 1,000 row feet for wireworms, "T-banded" or in furrow. See label for specific instructions. Also labeled as 13.5 lb./Acre broadcast treat ment prior to planting.

(Lorsban 4E) ..... 4.0 pints preplant broadcast and incorporated.

<R> ethoprop (Mocap 15G) ..... 8.0 oz per 1,000 feet of row as a 7" band over rows. For wireworm only. Seed furrow placement will reduce stand.

<R> fonofos (Dyfonate 20G) ..... 6.0 oz per 1,000 feet of row. Banded. Seed furrow placement will reduce stand. See label for application instructions.

<R> phorate (Thimet 20G) ..... 6.0 oz per 1,000 feet of row. Banded. Seed furrow placement will reduce stand.

<R> phorate + flucythrinate (Aastar 15G) ..... 8.0 oz per 1,000 feet of row. Do not place granules in direct contact with seed.

WHITE GRUBS
(RP 98)

There is no effective way to control white grubs after fields have been planted. Soil insecticides may be useful in fields that need to be replanted because of grubs, or if large numbers of grubs are observed while preparing fields for planting corn.

Insecticide	Rate	Restrictions and Comments
chlorpyrifos (Lorsban 15G)	8.0-16.0 oz form./1,000 ft of row	In furrow or T-Band.
	13.5 lb/A	Preplant broadcast incorporated.
(Lorsban 4E)	4.0 pt./A	Preplant broadcast incorporated
fonofos <R> (Dyfonate 20G)	6.0 oz form./ 1,000 ft of row	For suppression of white grubs, T-band.
phorate <R> (Thimet 20G)	6.0 oz form./ 1,000 ft of row	7" band over row in front or behind press wheel.
phorate + flucythrinate <R> (Aastar 15G)	8.0 oz form./ 1,000 ft of row	Place granules in 6-8 inch band over the row directly behind or in front of press wheel.
terbufos <R> (Counter 15G)	8.0-16.0 oz form./1,000 ft of row	Apply in a 7 inch band at either rate, or in-furrow at planting time at lower rate only.

CORN INSECTS ABOVE GROUND

SPRAYING POLLEN-SHEDDING CORN CAN BE EXTREMELY HAZARDOUS TO BEES. COORDINATE WITH LOCAL BEEKEEPERS BEFORE APPLYING INSECTICIDES.

CORN ROOTWORM ADULTS TO PREVENT SILK CLIPPING
(NebGuides G82-613 and G87-839, RP 98)

Corn rootworm beetles occasionally interfere with pollination if there are sufficient numbers to chew silks to husks during the pollen-shedding period. Controls are indicated only when severe silk clipping is occurring at 25-50 percent pollen-shed. In an average year, few fields will need to be sprayed to prevent silk clipping. Beetles are most likely to cause a problem in late-planted or late-silking fields. Silk clipping after pollination causes no problems.

REGISTERED TO CONTROL CORN ROOTWORM ADULTS

Rates are active ingredient per acre.

	carbaryl (Sevin 80S, XLR Plus, Sevin 4-Oil)	1.0 lb
	chlorpyrifos (Lorsban 4E)	0.5-1.0 lb
	diazinon AG500	0.5 lb
	dimethoate (Cygon 400)	0.5 lb
<R>	disulfoton (Di-Syston 8EC)*	0.25 lb
<R>	EPN (4EC, 5EC)	0.5 lb
<R>	esfenvalerate (Asana 1.9EC)	0.025-0.05 lb
<R>	fenvalerate (Pydrin 2.4EC)	0.15-0.2 lb
	malathion (57EC)	1.0 lb
	malathion ULV 9.33	0.3 lb
<R>	methyl parathion (Penncap-M)	0.25-0.50 lb
<R>	parathion (ethyl or methyl)	0.25 lb
<R>	permethrin (Ambush 2E, Pounce 3.2EC)**	0.1-0.2 lb
	phosmet (Imidan 50WP)	0.5-1.0 lb

*Do not plant any food or feed crop in rotation after a field treatment with disulfoton unless it is a registered use for disulfoton.

**Use prior to ear formation - consult the label for details.

CORN ROOTWORM ADULTS TO REDUCE LARVAE THE NEXT YEAR

(NebGuides G86-774 and G87-839, RP 98)

Controlling rootworm adults (beetles) to reduce the number of larvae the next season may not be as reliable as soil insecticides because precise timing of control is essential. If this method is used, it should be under the supervision of trained pest management personnel. To have a reasonable chance of success, begin weekly scouting in early July. Control should be applied when there is an average of 3 rootworm beetles per 4 plants (0.75 beetles per plant or 18,000 beetles per acre based on a plant population of 24,000 plants per acre) and 10 percent of the females have mature eggs. Note that strict use of calendar dates in timing of treatment is not recommended since there may be as much as 3 weeks variation in optimum treatment timing from year to year. When beetle numbers first reach or exceed the above threshold, apply a longer-lasting, residual insecticide such as Sevin 4-Oil. Residual activity is reduced by overhead irrigation or rainfall after application. If beetles reinfest the field, make a second application when population levels reach one beetle per two plants. The cost of two treatments will exceed that of a single soil treatment applied at planting or first cultivation the following spring. IN CONTINUOUS CORN, IF YOU DO NOT HAVE SCOUTING DATA FROM THE PREVIOUS SEASON FOR THE FULL BEETLE ACTIVITY PERIOD, CONSIDER A SOIL INSECTICIDE APPLICATION AT CULTIVATION OR PLANTING AS A PRECAUTIONARY MEASURE. IT SHOULD BE NOTED THAT MANY FIELDS NEVER DEVELOP A ROOTWORM PROBLEM DURING A SINGLE SEASON.

CHINCH BUGS

(NebGuide G86-806, RP 98)

Preventing chinch bug damage by cultural practices is more reliable than chemical controls. If chinch bugs were a problem the previous year, do not plant corn into wheat stubble or adjacent to wheat fields. If chemical controls are necessary, apply a recommended insecticide in at least 30 gallons of water per acre. Use drop pipes from sprayer booms, so that spray is directed onto the lower stalks and soil around the plants. Broadcast sprays over plants are not effective. Sprays will not last more than 4 to 7 days. If migrations from adjacent wheat fields are heavy, retreatment may be necessary. When heavy infestations are present, chemical control may not be satisfactory.

RECOMMENDATIONS FOR CONTROL OF CHINCH BUGS IN CORN

Insecticide	Rate	Restrictions and Comments
carbaryl (Sevin 80S, XLR Plus, Sevin 4-Oil)	2.0 lb AI/A	Apply as directed spray with at least 40 gallons of water per acre.

carbofuran <R> (Furadan 15G)	8.0 oz form./ 1,000 ft of row	Apply granules in-furrow at planting.
chlorpyrifos (Lorsban 4E)	0.5-1.0 lb AI/A	Apply as directed spray with 20 to 40 gallons of water per acre, using ground equipment only. Wait 35 days for grain, 35 days for fodder, 14 days for silage.
esfenvalerate <R> (Asana 1.9EC)	0.025-0.05 lb AI/A	Apply as directed spray at base of plants. Wait 21 days before harvest.
fenvalerate <R> (Pydrin 2.4EC)	0.1-0.2 lb AI/A	Apply as directed spray at base of plants. Wait 21 days before harvest.
<R> parathion	0.75 lb AI/A	Aerial application only. Do not apply within 12 days of harvest. Apply only when chinch bugs are exposed.
phorate <R> (Thimet 20G)	6.0 oz form./ 1,00 ft of row	Apply granules at time of cultivation in a band over or at base of plants just ahead of cultivator shovels so granules are covered with soil as for corn rootworm control. One post-emergence application per season. Do not graze or cut for forage within 30 days of treatment.

EUROPEAN CORN BORER
(NebGuides G75-217, G82-613, RP 98, RP 22)

The decision to treat for European corn borer (ECB) is a complex one because of the many variables involved - weather, plant maturity, borer survival and development, anticipated corn prices, insecticide efficacy, and costs versus anticipated returns. However, enough is known about these variables to help growers make intelligent assessments as to the need for control of each of our two annual generations.

FIRST GENERATION

ECB moths prefer the tallest plants for egg laying. Therefore, expect initial concentrations of egg-laying moths in earliest planted fields and/or those fields where the corn plants are taller than corn in surrounding fields. If most fields are about the same relative height, moths may disperse evenly throughout them. Even late-planted corn can become infested if rapid growth makes fields attractive late in the borer moth flight period. Therefore, plan to scout all corn fields for ECB at least 3-4 weeks following peak moth flight. This time period will generally fall between early June and early July. Also, some varieties of corn are more susceptible than others. Ask your seedsman about locally adapted varieties that produce well and carry some resistance to the borer.

Begin routine scouting during the moth flight, egg-laying and early hatching period. To determine the need to treat for first generation borer, examine AT LEAST 25 corn whorls in each of 4 locations in each field. Note the percent of total plant whorls infested, and by unrolling several whorls and recording the number of worms present, calculate the average number of borers per infested whorl. Plug these numbers into the worksheet below. This will give you an estimate of the MAXIMUM number of borers that might survive to produce a tunnel in the plant. Remember that mortality of young borers is normally high, therefore if you make a treatment decision when most borers are very small, your scouting figures may overestimate the final borer population. Therefore, you may be better off to delay your treatment decision until just before borers leave whorls and enter stalks.

CAUTION: Borers which have left the whorl and entered the stalk cannot be controlled. If most have left the whorl, it is too late to attempt control. Be certain to sample enough plants (25 plants in 4 locations in each field IS A MINIMUM SAMPLE) at enough locations in each field to ensure that estimates are typical of the field.

To make a decision on first generation ECB treatment, the following information is needed:

1. Average percent infested whorls in the field and average number of worms per infested plant. These numbers help provide an estimate of possible maximum number of cavities per plant at the end of the first generation.

2. Cost per acre of the insecticide application.

3. Anticipated value of the grain per bushel.

4. Estimated percent control given by a particular insecticide.

EXAMPLE: An average of one borer cavity per plant is capable of causing an approximate 5% yield loss. In the example shown, from scouting you know that 50% of the plant whorls are infested with an average of 4 live worms per infested plant. Therefore, 50% x 4.0 = 2.0 worms per plant, if all worms survive. Assume 75% control and $1.75 per bu. with a yield expectation of 125 bu. per acre.

	Example Field	My Estimates
1. Yield potential for this field.	125 Bu/A	_____ Bu/A
2. Potential yield loss (2 larvae/plant x 5% = 10% loss in yield, 10% x 125 Bu = 12.5 Bu loss/A).*	12.5 Bu/A	_____ Bu/A
3. Dollar loss/A (12.5 Bu/A x $1.75 per Bu = $21.87 Loss/A).	$ 21.87	$_____
4. Preventable loss (if chemical is 75%** effective $21.87 x 75% = $16.41/A).	$ 16.41	$_____
5. Chemical ($8.00/A) and application cost ($4.00/A). (Estimate your own cost or call dealer/applicator.) TOTAL = $12/A.	$ 12.00	$_____
6. Compare preventable loss ($16.41/A) with treatment cost ($12.00): $16.41/A - $12.00/A = $4.41/A (dollars saved by treatment/A).	$ 4.41	$_____

7. IF PREVENTABLE LOSS EXCEEDS TOTAL COST OF TREATMENT, YOU MAY BENEFIT FROM AN INSECTICIDE APPLICATION FOR FIRST GENERATION CORN BORER.

*To determine the need for treatment, it is essential to obtain an estimate of the final population of borers in each field. Ideally, you should make this final population estimate and the treatment decision after egg-laying stops, the oldest borers are approaching the third stage (about half-grown), and BEFORE THE OLDEST WORMS HAVE LEFT THE WHORL. Remember that natural mortality factors, including weather (low temperatures, low relative humidity, wind, driving rain, or very dry conditions), other insects, diseases and resistance factors in the corn plant are often high, ESPECIALLY IN THE VERY EARLIEST BORER STAGES. Occasionally, such mortality may be as high as 90%. However, warm, wet and humid, mild conditions can increase survival considerably. Therefore, due to these variables, it is nearly impossible to support the use of an "average percentage of surviving borers" and plug it into the formula. As it is, the formula tells you what would happen if all the borers you observed survived to invade the stalk and complete a tunnel. The later you can delay your treatment decision without compromising on control, the more natural mortality will occur and the greater your likelihood of making a correct treatment decision.

**A reasonable expectation for insecticidal control of first generation ECB under typical field conditions is approximately 75%. Percent control can vary considerably, depending on several factors, including timing of application, product choice and application method. Research has shown that granules generally work better for 1st generation ECB than liquids with the exception of center pivot applications.

RECOMMENDATIONS FOR CONTROL OF FIRST GENERATION EUROPEAN CORN BORER

Insecticide	Rate (Form./Acre)	Restrictions and Comments
Bacillus thuringiensis (Dipel 10G)	10 lb (broadcast)	No restrictions. Field, sweet, pop & seed corn.
	5-10 lb (banded)	Apply over the row so granules fall into the whorl for banded rates.
(Dipel ES)	1.5-2.5 pt	No restrictions. May be applied through sprinkler irrigation system.*
carbofuran <R> (Furadan 15G)	6.7 lb	Do not make a foliar application if Furadan 15G was applied at more than 8 ounces per 1,000 linear feet of row at planting (6.7 lbs/acre with 40 inch row spacing) at planting. No more than two foliar applications per season. Field corn only.
chlorpyrifos (Lorsban 15G)	6.5 lb	No more than 16 oz/1,000 ft row or 13 lbs/A (two post-plant applications) per season. Field, sweet and popcorn.
(Lorsban 4E)	1.5-2.0 pt	Lorsban 4E insecticide may be applied through an overhead sprinkler irrigation system. Field, sweet and popcorn.
diazinon 14G	7.0 lb	Labeled on corn.
fonofos <R> (Dyfonate 20G)	5.0 lb	Field, sweet and popcorn.
methyl parathion <R> (Penncap-M)	2 qt	Penncap-M insecticide may be applied through an overhead sprinkler irrigation system.* Note bee hazard statement. Field and sweet corn.
permethrin <R> (Pounce 3.2EC)	4-8 oz	Pounce 3.2EC insecticide may be applied through an overhead irrigation system.* Field, sweet and popcorn.
<R> (Pounce 1.5G)	6.7-13.3 lb	Field, sweet and popcorn.
terbufos** <R> (Counter 15G)	6.7 lb	Limit to 2 applications or a single application if more than 8 oz/1,000 ft of row were used at planting. Do not enter field until 7 days post-treatment. Do not graze, harvest for grain, or cut forage within 45 days of treatment. Field corn only.

*This method of application dictates the use of specific equipment, specific application conditions, accurate calibration, and critical safety precautions (see page 3). Consult the label for complete directions prior to use.

**Supplemental label subject to change.

OTHER REGISTERED PRODUCTS:

Rates of material are active ingredient per acre.

carbaryl (Sevin XLR Plus, 80S)	1.0 lb
<R> carbofuran (Furadan 4F)	1.0 lb
<R> esfenvalerate (Asana 1.9EC)	0.04-0.05 lb
<R> fenvalerate (Pydrin 2.4EC)	0.15 lb
<R> permethrin (Ambush 2EC, 25WP, Pounce 3.2EC)	0.15 lb
<R> phorate (Thimet 20G)	1.0 lb

SECOND GENERATION

Fields that have green silks and are shedding pollen during the peak period of moth flight are the most susceptible to second generation infestation. To determine the need for second generation ECB control, begin weekly scouting when the second flight of moths appears, usually in mid-July, examining the undersides of leaves for white borer egg masses. These masses, usually found on leaves in the middle third of the plant (frequently near the midrib), normally hatch in about 5 days. Each egg develops a black spot just before hatching.

Timing of application is critical if reasonable control is to be achieved. Research indicates that favorable economic return will usually be achieved when 30-50% of the plants are infested with egg masses that are just beginning to hatch, and before corn has reached the blister stage. Best control (approximately 50-70%, depending on timing, application and product choice) is realized when application is timed at first egg hatch and young larvae are still located in the leaf axils. Larvae which have bored behind the leaf axil, into the sheath or are in or on the ear are not likely to be controlled. The best control that can be achieved will usually prevent much of the stalk and leaf sheath tunneling, but will not necessarily prevent invasion of the ear tip. This is especially true if the borer flight period is extended or a partial third generation occurs. Stalk protection is critical for the plant to fully develop the ear. While late worms that attack the ear tip do reduce grain quality, they do not reduce yields as seriously as borers that tunnel in stalks. Early harvest and selection of a corn variety that has good ear retention qualities should minimize ear drop.

As the plant approaches blister stage and beyond, potential economic benefits of an insecticide application rapidly decline. Scout fields regularly, at least once every 3-5 days, especially during the early half of the moth flight period (refer to Insect Newsletters for information regarding moth flights). Accumulating percentages of plants having egg masses is effective: 1) when the scouting information is accumulated for not more than 10 days, and 2) egg laying has started, but hatching has not yet begun. Accumulations of scouting information for more than 10 days allows the first observed eggs to hatch and migration of newly emerged larvae to silks, leaf axils and other protected areas. These larvae are difficult to control with insecticides.

Generally, liquid and granular formulations of the same insecticide are equally effective against second generation ECB larvae. However, if other insects (except spider mites) are present and/or ECB moth numbers are high, liquid formulations are preferred over granules because of their broader spectrum of activity and the added advantage of obtaining some moth control. If spider mites are present, select an insecticide that is least likely to contribute to rapid increases in mite numbers (see spider mite section).

BE ALERT FOR POSSIBLE BUILDUP OF SPIDER MITES AFTER INSECTICIDE APPLICATIONS.

RECOMMENDATIONS FOR CONTROL OF SECOND GENERATION EUROPEAN CORN BORER

Insecticide	Rate (Form./Acre)	Restrictions and Comments
Bacillus thuringiensis (Dipel 10G)	10.0 lb	No restrictions.
(Dipel ES)	1.5-2.5 pt	No restrictions. Use a minimum of 3 GPA for aerial application. May be applied through sprinkler irrigation system.*
carbofuran <R> (Furadan 15G)	6.7 lb	Do not make a foliar application if Furadan 15G was applied at more than 8 ounces per 1,000 linear feet of row at planting (6.7 lbs per acre, 40 inch row spacing). No more than two foliar applications per season. Field corn only.

<R> (Furadan 4F)	1.5-2.0 pt	Do not make a foliar application if more than 6.7 lbs of Furadan 15G or 1 quart of Furadan 4F were used per 13,000 linear feet (one acre with 40 inch row) at planting. No more than two applications per season. Do not apply within 30 days of harvest. Do not apply on seed corn prior to tasseling or rogueing. See label for field reentry information. Field corn only.
(Lorsban 4E) chlorpyrifos	1.0 qt	In addition to aerial or ground application, Lorsban 4E may be applied through an overhead sprinkler irrigation system.* Do not apply within 35 days before harvest of grain. Do not apply more than a total of 14 pints of Lorsban 4E per acre per season. Do not allow livestock to graze in treated areas, do not harvest treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not feed treated corn fodder to meat or dairy animals within 35 days after last treatment. Field, sweet and popcorn.
chlorpyrifos (Lorsban 15G)	6.5 lb	No more than 16 oz/1,000 ft row or 13 lbs/A (two post-plant applications) per season. Do not apply within 35 days before harvest of grain. Do not allow livestock to graze in treated areas nor harvest treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not feed treated corn fodder to meat or dairy animals within 35 days after last treatment. Field, sweet and popcorn.
diazinon 14G	7.0 lb	Do not feed treated fodder to dairy or beef cattle or sheep for 10 days following application. Corn may be picked immediately. Field and sweet corn.
esfenvalerate <R> (Asana 1.9EC)	2.7-3.4 oz	21 days to harvest for field corn, 1 day for sweet corn and popcorn.
fenvalerate <R> (Pydrin 2.4EC)	8.0-10.6 oz	21 days to harvest. Apply as necessary to maintain control but do not exceed 1.0 lb AI/acre per season. Field, and sweet corn.
fonofos <R> (Dyfonate 20G)	5.0 lb	Do not apply within 30 days of harvest or feed or graze livestock within 30 days of treatment. Field and sweet corn.
methyl parathion <R> (Penncap-M)	2.0 qt	In addition to conventional application, can be applied through a center pivot irrigation system. Read label relative to bee hazards prior to application.
permethrin <R> (Pounce 3.2EC)	4-8 oz	May be applied through overhead sprinkler irrigation system.* Apply prior to ear formation which develops after the completion of pollination (blister stage) and is indicated by the initiation of brown silk. Field corn and pop corn only.
<R> (Pounce 1.5G)	6.7-13.3 lb	Field corn and popcorn only.
<R> (Ambush 2E)	6.4-12.8 oz	Apply prior to ear formation which develops after the completion of pollination (blister stage) and is indicated by the initiation of brown silk. Field corn and pop corn only.
<R> (Ambush 25W)	0.4-0.8 lb	Same restrictions as Ambush 2E.

terbufos** <R> (Counter 15G)	6.7 lb	Limited to 2 applications, or a single application if more than 8 oz/1,000 feet of row were used at planting. Do not enter field until 7 days post-treatment. Do not graze, harvest for grain, cut forage within 45 days of treatment. Field corn only.

*This method of application dictates the use of specific equipment, specific application conditions, accurate calibration, and critical safety precautions (see page 3). Consult the label for complete directions prior to use.

**Supplemental label subject to change.

OTHER REGISTERED PRODUCTS:

carbaryl (Sevin XLR Plus, 80S). See label.

<R> ethyl parathion. Both generations, label states just corn. See label.

<R> ethyl parathion + EPN. See label.

<R> methomyl (Lannate L and Lannate SP). Both generations, sweet corn only. See label.

GRASSHOPPERS IN CORN
(NebGuide G86-791)

Grasshopper control is best accomplished when hoppers are small and confined to grassy or weedy margins. For infestations within corn fields, the following table can be used as a guide to evaluate the need for treatment. It is based on the estimated number of young grasshoppers per square yard. If spider mites are present, select an insecticide that is least likely to contribute to increases in mite numbers (see spider mite section).

BE ALERT FOR POSSIBLE BUILDUP OF SPIDER MITES AFTER INSECTICIDE APPLICATIONS.

Number of nymphs or adult hoppers per square yard of cropland

Classification	Field	Field Margin	Treatment Necessary?
Non-economic	0 to 2	5 to 10	Usually not
Light	3 to 7	11 to 20	Questionable (depends on hopper size, species & crop)
Moderate	8 to 14	21 to 40	Probably
Abundant	15 or more	41 or more	Yes

SPRAYING POLLINATING CORN CAN BE EXTREMELY HAZARDOUS TO BEES.
COORDINATE WITH LOCAL BEEKEEPERS BEFORE APPLYING INSECTICIDES.

REGISTERED FOR CONTROL OF GRASSHOPPERS IN NON-CROP AND WASTE AREAS
Rates are active ingredient per acre.

acephate (Orthene 75S) ..... 0.125-0.5 lb
carbaryl (Sevin 80S, XLR Plus, Sevin 4-Oil) ..... 0.5-1.5 lb
diazinon AG500 ..... 0.5-1.5 lb
<R> esfenvalerate (Asana 1.9EC) ..... 0.025-0.05 lb
<R> fenvalerate (Pydrin 2.4EC) ..... 0.05-0.1 lb
malathion ULV 9.33 ..... 8-12 fl oz form.

If grasshoppers have already invaded the corn field, refer to the table above to determine if control is needed.

RECOMMENDATIONS FOR CONTROL OF GRASSHOPPERS IN CORN

Rates are active ingredient per acre.

<R>	carbofuran (Furadan 4F)	0.25 lb
	chlorpyrifos (Lorsban 4E)	0.25-0.5 lb
	dimethoate (Cygon 400)	0.5 lb
<R>	esfenvalerate (Asana 1.9EC)	0.025-0.05 lb
<R>	fenvalerate (Pydrin 2.4EC)	0.1-0.2 lb
<R>	methyl parathion (Penncap-M)	0.5 lb

OTHER REGISTERED PRODUCTS:

Rates are active ingredient per acre.

carbaryl (Sevin 20% Bait)	5-10 lb bait/Acre
(Sevin 80S, XLR Plus, Sevin 4-Oil)	1.5 lb
diazinon AG500	0.5 lb
malathion 57EC	1.0 lb
ULV 9.33	0.6 lb
<R> parathion	0.5 lb

FLEA BEETLES

(RP 98)

These small (about 1/16 inch long), shiny black beetles are excellent jumpers. Injury is first noted as a silvery-white appearance on seedlings where beetles have gouged leaf tissues, producing a "scratched" effect. If injury is present and there are 5 or more beetles per plant (4-6 inches tall), treatment is probably justified. Fewer beetles can injure smaller plants; whereas corn over 6 inches can probably tolerate 5 beetles per plant without economic loss.

REGISTERED TO CONTROL FLEA BEETLES

Rates are active ingredient per acre unless otherwise indicated.

	carbaryl (Sevin 80S, XLR Plus)	1.0 lb
	carbofuran (Furadan 15G)	8.16 oz/1,000 row feet, banded or in seed furrow at planting
	chlorpyrifos (Lorsban 4E)	1.0 lb
	diazinon AG500	0.5 lb
<R>	esfenvalerate (Asana 1.9EC)	0.025-0.05 lb
<R>	fenvalerate (Pydrin 2.4EC)	0.1-0.2 lb
<R>	methyl parathion (Penncap-M)	0.50-0.75 lb
<R>	permethrin (Ambush 2E, 25W, Pounce 3.2EC)	0.1-0.2 lb
<R>	phorate (Thimet 20G)	6.0 oz/1,000 row ft, banded at planting
<R>	phorate + flucythrinate (Aastar 15G)	8.0 oz/1,000 row ft, banded at planting
<R>	terbufos (Counter 15G)	8.0 oz/1,000 row ft, banded or in seed furrow at planting

WESTERN BEAN CUTWORMS

(NebGuides G76-290, G82-613)

Several factors influence the decision to control this insect, including weather, corn maturity, and time of cutworm infestation. Corn is most attractive to egg laying moths during the late whorl/early tassel stages and less attractive when the corn is small or has already pollinated. An insecticide should be applied if 8 percent of the plants are infested with newly hatched larvae in tassels and/or eggs on leaves, and corn is at least 95 percent tasseled. Poor control is likely if worms have already reached the ear tips. If corn is developing late (i.e. not yet in susceptible stage) in relation to the western bean cutworm infestation, the treatment threshold should be raised, since fewer worms are likely to survive.

Many products used to control western bean cutworms have been shown to increase the risk of spider mite infestations. If spider mites are present, even in very small numbers, select an insecticide that is least likely to stimulate increases in mite reproduction (see spider mite section).

BE ALERT FOR POSSIBLE BUILDUP OF SPIDER MITES AFTER INSECTICIDE APPLICATIONS.

REGISTERED FOR CONTROL OF WESTERN BEAN CUTWORMS ON CORN

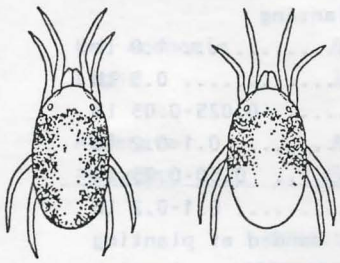
Rates are active ingredient per acre.

	carbaryl (Sevin 80S, XLR Plus, Sevin 4-Oil)	2.0 lb
<R>	carbofuran (Furadan 4F)	1.0 lb
	chlorpyrifos (Lorsban 4E)*	0.5-1.0 lb
<R>	esfenvalerate (Asana 1.9EC)	0.0125-0.025 lb
<R>	fenvalerate (Pydrin 2.4EC)	0.5-0.1 lb
<R>	methyl parathion (Penncap-M)	0.5-1.0 lb
<R>	methyl parathion + EPN	0.5 lb
<R>	permethrin (Ambush 2E, Pounce 3.2EC)	0.1-0.2 lb

*Lorsban 4E may be applied through an overhead sprinkler system. Follow label directions carefully.

SPIDER MITES
(NebGuide G75-50)

Two species of spider mites, the two-spotted spider mite (TSM) and the Banks grass mite (BGM), damage corn in Nebraska. They are similar in appearance but differ in the amount of damage they cause and their susceptibility to chemical controls. Weather and natural enemies appear to be important determining factors in spider mite abundance. Spider mites are most likely to develop economically damaging populations in fields that are moisture stressed during June and July, particularly if weather is hot and dry. Mite buildup can occur even in irrigated fields, especially if irrigation is delayed during stress periods prior to blister stage of corn. Other fields likely to develop mite problems are those that have received foliar applications of insecticides for European corn borers, western bean cutworms or other pests and fields situated next to ripening wheat or alfalfa. Watch these situations closely for rapid mite increase.



Proper mite identification is important since the TSM is much more difficult to control. The most useful characteristic for differentiating between these two species is the pattern of pigmentation spots. Generally, in older TSM females, pigmentation appears as a well-defined spot on each side of the body, ending abruptly just beyond half the length of the body (see figure). BGM females tend to have blackish-green coloration extending the full length of the body. BGM appear earlier in the season, are more likely to remain on lower leaves and are less likely to cause serious damage. TSM appear later in the season, spread rapidly over the entire plant and are more likely to exceed economic thresholds.

Before making the decision to treat for spider mites, the benefits of that application should be carefully considered. Most insecticides have a detrimental effect on spider mite natural enemies. These same chemicals, however, often vary considerably in their effects on BGM and TSM. Some products cause little mortality to either species, while others are somewhat toxic to BGM. Fewer insecticides/miticides are toxic to TSM. Since products differ in their effects on the two species, it is important to determine which species is/are present in the field before making an application. Products that have sometimes been associated with both BGM and TSM problems following their use include permethrin (Pounce, Ambush) and to a lesser extent, fenvalerate (Pydrin, which under some circumstances may even reduce BGM) and carbaryl (Sevin). Other products, including parathion, are most likely to be associated with mite buildups only when TSM is present. Parathion seems to suppress BGM but not TSM. Still other chemicals have only a slight effect on spider mites or tend to suppress them to some extent. These include Furadan, Counter and Lorsban.

RECOMMENDATIONS FOR REDUCTION OF SPIDER MITES

Spider mite control recommendations are based on many factors including the mite species present, level of infestation and growth stage of the crop.

For BGM only - Treatment is usually justified if one lower leaf is yellowing from mite damage and colonies are present up to the ear zone. In Nebraska, dimethoate (Cygon) has generally provided acceptable BGM control.

For TSM only, or TSM plus BGM - No miticide/insecticide product or combination of products has provided consistent, effective control of TSM. In many cases, chemical treatments have actually aggravated TSM problems. However, treatment may be justified when 15-20 percent of the total leaf area is covered with active TSM colonies and moderate damage is apparent. Early spot treatments with Comite may be helpful, particularly in fields that have a history of spider mite problems.

When managing either TSM or BGM infestations the following approaches should be considered: 1. Reduce moisture stress through timely irrigation; 2. Treat only the heavily infested areas of the field to allow for recolonization by predators; 3. Increased gallonage (5 gallon minimum) and multiple insecticide applications may improve the degree of mite suppression; 4. In areas where water pH is high (7-9), a buffer such as LI700 may help to extend the residual action of some pesticide products; 5. Corn that has dented is unlikely to benefit from treatment for either BGM or TSM.

REGISTERED FOR CONTROL OF SPIDER MITES ON CORN

Rates are active ingredient per acre.

<R> carbofuran (Furadan 4F)	1.0 lb
dimethoate (Cygon 400)	0.5 lb
<R> disulfoton (Di-Syston 15G)	1.0 lb
(Di-Syston 8EC)	1.0 lb
oxydemetonmethyl (Metasystox-R 2EC)	0.5 lb
<R> phorate (Thimet 20G)	1.0 lb
propargite (Comite 6.55EC)	1.6 lb
<R> terbufos (Counter 15G)*	1.0 lb

*Supplemental label subject to change.

ARMYWORMS

(NebGuides G82-613, G82-615, RP 98)

Control when migration from adjacent grassy areas, pastures or fields is sufficient to damage margin rows of corn, or when infestations are causing the loss of two lower leaves before hard dent stage. Armyworms hide under clods or debris by day and feed by night. Applications are likely to be most effective when applied in evening or early morning.

RECOMMENDATIONS FOR CONTROL OF ARMYWORMS ON CORN

Rates are active ingredient per acre.

carbaryl (Sevin 80S, XLR Plus)	1.5 lb
chlorpyrifos (Lorsban 4E)	0.5-1.0 lb
<R> ethyl parathion	0.5 lb
<R> esfenvalerate (Asana 1.9EC)	0.025-0.05 lb
<R> fenvalerate (Pydrin 2.4EC)	0.1-0.2 lb
malathion 57EC	1.25 lb
<R> methomyl (Lannate 1.8L, Nudrin 1.8L)	0.45 lb
<R> methyl parathion (Penncap-M)	0.5-0.75 lb
<R> permethrin (Ambush 2E, Pounce 3.2EC)	0.1-0.2 lb

OTHER REGISTERED PRODUCTS:

carbaryl (Sevin 20% Bait) ..... 5-10 lb/acre*
trichlorfon (Dylox 80SP) ..... 1.0 lb

*formulation/acre

SORGHUM INSECTS

CORN LEAF APHIDS AND GREENBUGS

Corn leaf aphids (CLA) rarely cause economic damage to grain sorghum grown under Nebraska conditions. Treatments applied for this insect would seldom result in a yield increase that would pay for the cost of treatment - EXCEPT in times of severe drought stress after heading.

Greenbugs (GB) are frequent pests in Nebraska sorghum. These small insects are light green, with a darker green stripe down the back. Typically they feed on the undersides of leaves on larger plants, however, greenbugs may be found in the whorls of seedling sorghum. Resistant varieties are available that provide some reduction in damage by greenbugs. On occasion, even these varieties will require insecticide treatment. Although seedling milo can be treated at planting time with soil systemics, these applications are not recommended. These treatments do not usually prevent mid-to-late season buildup, which normally peaks in late July or early August. Seedling sorghum occasionally is infested with greenbugs in late May or early June. Unless plants are threatened in the seedling stage, it may be best to withhold treatment until early July, and to spray when greenbug colonies are small. Foliar treatments applied around July 7 have given good control and have often prevented midseason damage. The application should be made when colonies are smaller than a quarter on undersides of leaves and before yellowish to reddish feeding spots have developed on the tops of the lowest leaves.

The following table summarizes greenbug treatment guidelines at various sorghum growth stages:

Seedling (0-5 leaves)	Greenbug colonies present on 10-20 percent of plants; visible yellowing or spotting on leaves.
Plants 6 inches to pre-boot	Greenbug colonies beginning to cause red or yellow leaf spotting on most plants.
Boot to heading	Treat if greenbug colonies are present on most plants, before one lower leaf has been killed, and if parasite numbers are low (less than 20 percent of GB parasitized).

These guidelines are based more on damage than on greenbug numbers, therefore, they apply to both GB resistant and susceptible grain sorghum varieties. They are not hard and fast rules. Resistant lines should tolerate greenbug damage better than susceptible lines. Older plants will tolerate more greenbugs, while small or stressed plants will generally tolerate less.

Forage sorghums, typically planted in early July following harvest of small grains, should be treated with an approved soil systemic at planting, since they run greater risk of serious GB infestation in the seedling stage. For infestations on larger plants, treatment may be justified when 25% of the lower leaves have GB colonies and are showing signs of feeding damage.

RECOMMENDATIONS FOR CONTROL OF GREENBUGS ON SORGHUM

Rates are active ingredient per acre.

chlorpyrifos (Lorsban 4E) ..... 0.25-0.5 lb
diazinon AG500 ..... 0.5 lb
dimethoate (Cygon 400) ..... 0.5 lb

<R> disulfoton (Di-Syston 15G) ..... 1.0 lb
(Di-Syston 8EC) ..... 0.5 lb
<R> fonofos (Dyfonate 4EC) ..... 1.0 lb
malathion 57EC ..... 1.0 lb
oxydemetonmethyl (Metasystox-R 2SC) ..... 0.5 lb
<R> parathion (ethyl only) ..... 0.5 lb
<R> phorate (Thimet 20G) ..... 1.0 lb

REGISTERED FOR PLANTING TIME APPLICATION
Rates are formulation per 1,000 feet of row.

<R> carbofuran (Furadan 15G) ..... 8.0 oz banded or in-furrow
<R> disulfoton (Di-Syston 15G) ..... 8.15 oz banded only
<R> phorate (Thimet 20G) ..... 6.0 oz banded only (or knifed in)
<R> terbufos (Counter 15G)* ..... 8.0-16.0 oz banded (or knifed in)
*Registered for use only on grain sorghum. Modified in-furrow rate, 6.0 oz - see label.

CAUTION: Since certain grain and forage sorghum varieties may be sensitive to organophosphate insecticides, ethyl parathion and Metasystox-R should be applied to a small area and observed for a few days prior to treatment of an entire field to determine if any crop injury will occur.

WIREWORMS, SEEDCORN MAGGOT AND SEEDCORN BEETLE

Planter box seed treatment with lindane and/or diazinon. Follow label directions for amounts and restrictions.

SOIL CUTWORMS

Soil cutworms are occasional pests of seedling sorghum. The most common species involved is the black cutworm. This pest is a greasy black or gray worm with a brown head. The cutworm may be over one inch long when feeding is completed. Black cutworms feed primarily at night and will hide under debris or in the soil during the day. Young black cutworms feed on above ground portions of plants while older cutworms cut plants at or below the soil surface.
(Lorsban 4E)

RECOMMENDATIONS FOR SOIL CUTWORM CONTROL IN SORGHUM

Insecticide	Rate	Restrictions and Comments
chlorpyrifos	0.5-1.0 lb AI/A	Apply with sufficient water for thorough coverage. Do not apply more than 3 pts of Lorsban 4E per acre per season. The treated crop is not to be used for forage, fodder, hay, or silage within 30 days after application of one pint per acre or within 60 days after application of more than one pint per acre. Do not treat sweet varieties of sorghum.

CHINCH BUGS
(NebGuide G86-806, RP 98)

Preventing chinch bug damage to sorghums by cultural practices is more reliable than chemical controls. Do not plant sorghums into wheat stubble, or adjacent to winter wheat. Chinch bugs do not feed on legumes, so soybeans are ideal alternatives for sorghum fields with high probability of chinch bugs.

Research in Nebraska and Kansas indicates that Furadan 15G applied in the seed furrow at time of planting provides the longest lasting control of chinch bugs moving into sorghums from adjacent wheat. Under high infestations, soil insecticides are not highly effective and may need to be supplemented with foliar sprays. Also, these sprays may need to be repeated during the period of migration.

RECOMMENDATIONS FOR CHINCH BUG CONTROL IN SORGHUM

Insecticide	Rate	Restrictions and Comments
		AT PLANTING
carbofuran <R> (Furadan 15G)	8.0 oz form/1,000 ft. of row	Place in furrow with seed. Should give 3 to 4 weeks protection.
		POST-EMERGENCE
carbaryl (Sevin 80S, 50W, XLR Plus)	2.0 lb AI/A	Apply as directed spray with at least 40 gallons of water per acre.
chlorpyrifos (Lorsban 4E)	0.5-1.0 AI/A	Apply as directed spray with sufficient water for thorough coverage, using ground equipment only. Do not apply more than 3 pts of Lorsban 4E per acre per season. The treated crop is not to be used for forage, fodder, hay, or silage within 30 days after treatment of 1 pt or 60 days after treatment of more than 1 pt. Do not treat sweet varieties of sorghum.
<R> ethyl parathion	0.75 lb AI/A	Aerial application only. Do not apply within 12 days of harvest. Apply only when chinch bugs are exposed.
phorate <R> (Thimet 20G)	6.0 oz form./ 1,000 ft of row	Apply over or at base of plants at cultivation and cover with oil. One application per season. Do not feed foliage before grain harvest.

1988
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