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EC87-1509 Field Crop Insect Control Guide for Nebraska Corn and Sorghum

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Nebraska Cooperative Extension Service EC 87-1509

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FIELD CROP INSECT CONTROL GUIDE FOR NEBRASKA CORN AND SORGHUM

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Insect control 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 control 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 Cooperative Extension Service Offices.

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POLICY FOR MAKING PESTICIDE SUGGESTIONS

The choice of a pesticide should not be based entirely on its cost. Several other factors need to be considered in the decision, including efficacy against the target pest or pest combination, formulation of the pesticide, label restrictions, safety to non-target species (including humans) and environmental conditions at the time of application.

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.

The use of trade names in this circular is not to be considered an endorsement by the Nebraska Cooperative Extension Service, and no discrimination is intended.

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. Liquid formulations of these products are not recommended for farmer application. However, farmers should be able to safely use granular formulations of these chemicals if they use proper precautions, as indicated on the label. Moderate and low toxicity pesticides are marked with the signal words Warning and Caution, respectively.

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.

<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 purchase and use these products, EPA certification is required. 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 chemical, be certain to ask the dealer if the attached label is up to date.

IMPORTANT

To keep updated on changes in pesticide registrations and informed of the latest developments on crop pests, subscribe to the Plant Disease, Weed, and Insect Newsletter. Full details and an order blank are given on the last page of this circular.

CONTROL DECISION GUIDELINES/ECONOMIC THRESHOLDS

Economic thresholds are flexible guidelines. They indicate the level of insect abundance that can be tolerated before control actions should be taken. THEY ARE NOT HARD RULES THAT APPLY TO EVERY SITUATION. Used conscientiously, they should be helpful in making treatment decisions. Many variables can affect your decision to treat including insect abundance, anticipated value of the crop, relative effectiveness of controls, and cost of the pesticide and its application. Timing and accuracy of application, plus 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, Revised August, 1984). The Nebraska Chemigation Act takes effect January 1, 1987. Consult your local Cooperative Extension Service office or Natural Resources District office before chemigating.

INSECT PREVENTION AND CONTROL IN FARM-STORED GRAIN

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 control and a listing of currently recommended bin sprays, grain protectants, and fumigants, see EC 84-1534, Revised April, 1986, "Pest Management of Farm-Stored Grain," available at your local Cooperative Extension Service office.

POLICY ON TREATMENT OF FIRST YEAR CORN

First year corn is unlikely to benefit from soil insecticide applications. Crop rotation is still our best recommendation for prevention of corn rootworms. The only exceptions might be first year corn following soybeans or other crops in areas where Northern Corn Rootworms (NCR) are abundant, e.g. northeast and eastern Nebraska. In a very small percentage of the fields following soybeans or other rotations, 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 soil insecticide is unnecessary, even in these situations. Insecticides are recommended where losses in yield due to insect damage are likely to exceed the costs of control. When applied as "insurance" treatments, the use of soil insecticides is wasteful and will lead to higher production costs, greater environmental risks and a shortening of the useful life of important pesticide products. 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.

PROTECT YOURSELF FROM PRODUCT FAILURES

Many reports of poor rootworm control with soil insecticides were received in 1986, primarily from Northeast Nebraska. Several factors can contribute to such a situation and a farmer must have a realistic idea of product expectations and a clear understanding of label statements and product warranties. Insecticides can fail to provide adequate control and not be at fault for a variety of reasons, including the following: 1) unusually high insect population levels, 2) microbial breakdown of the insecticide, 3) high soil pH, 4) inaccurate

calibration (resulting in underdosing), 5) poor incorporation, 6) poor placement (too narrow a band), 7) poor timing application, 8) relatively low toxicity to rootworm larvae, 9) too much rain or soil too dry (weather factors), and 10) other factors.

When one product fails in a field while another product provides control, you must ask some serious questions. The manufacturer in this instance may have a responsibility to the grower, which could include replacement of the product, and/or compensation for lost yield.

This responsibility is often settled when the farmer signs a release and accepts payment, sometimes consisting of replacement product, or a cash settlement which may be based on cost of both product replacement and yield loss.

Here's what you need to do to protect yourself:

1. Read the label and understand it. Is there a guarantee? What are the limits of the financial responsibility of the company?
2. Hold the companies to their advertising promises. Use a small amount of a competitor's product to establish a damage and yield comparison in each field you treat and/or leave an untreated check strip.
3. Calibrate your application equipment carefully and keep records of the amount of insecticide formulation you use on each field.
4. Do not agree to settle anything until after the crop is harvested, the yield calculated and you are satisfied. By settling in midseason, you have no idea of yield loss that may occur.
5. Make observations of damage in the field during the season. Take photographs during various stages of crop development, including just prior to harvest. Take regular pest counts. Examine corn roots for damage no later than mid-July (refer to NebGuide G82-597, available at your local Cooperative Extension Service office). Contact the chemical manufacturer and have a representative examine the field. Take notes on all resulting conversations and observations.
6. If you need help, contact a professional crop consultant and, if necessary, a good attorney with experience in such cases.

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. Other conservation tillage practices should result in a reduction in insect 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 do not observe manmade boundaries but will collect nectar and/or pollen wherever they can, including field crops such as corn, sorghum, soybeans and alfalfa. If bee colonies are nearby when fields 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 pests are abundant enough to justify it; 2) if possible, treat only when crops are not in bloom; 3) be certain that honeybee colonies are not directly sprayed with any insecticide; 4) check the crop for heavy concentration of blooming weeds; 5) spray only those parts of fields that have significant pest infestations; 6) if a reasonable choice is available, select an insecticide formulation that is less toxic to bees; and 7) time the application later in the evening when bees are not actively foraging.

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 treatments, 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	Broccoli	Apples
Ambush 2E	NR	3	1	NR	1	***
Counter 15G	NR	NR	30	NR	NR	NR
Cygon 400	7	0	NR	3	7	28
Diazinon AG500	1	5	0	7	5	NR
Diazinon 14G	**	**	**	**	**	NR
Dipel 2X	0	0	0	0	0	0
Di-Syston 8EC	30	NR	28	NR	14	NR
Di-Syston 15G	30	NR	40	NR	14	NR
Dyfonate 4EC	*	*	*	NR	*	NR
Dyfonate 20G	NR	NR	30	NR	*	NR
Furadan 4F	NR	NR	7	NR	NR	NR
Furadan 15G	NR	21	**	**	NR	NR
Imidan 50WP	NR	NR	14	NR	NR	7
Lannate 1.8L	1	3	0	1-3	3	8
Lorsban 4E	NR	NR	35	NR	30	NR
Malathion EC	1-5	3	5	1	3	3
Metasystox-R	NR	**	7-21	**	7	NR
Nudrin 1.8L	1	3	0	1-3	1-3	8
Parathion 8E (ethyl)	10	15	12	15	7	14
Penncap-M	15	NR	3	NR	NR	14
Pounce 3.2EC	0	3	1	NR	1	***
Pydrin 2.4EC	1	7	1	3	3	21
Sevin 80S	0	0	0	0	3	1
Thimet 20G	NR	NR	*	NR	NR	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.

Aastar 15G - 7 days
Ambush 2E - When spray is dry
Comite 6.5EC - 48 hrs
Counter 15G - 7 days
Cygon 400 - 48 hrs
Diazinon AG500 - When spray is dry
Diazinon 14G - Not stated on label
Dipel 10G, ES - 0 days
Di-Syston 8EC - 24 hrs, 15G - 7 days
Dyfonate 20G - 24 hrs
4EC - Not stated on label
Dylox 80SP - 0 days
EPN 4EC, 5EC - 24 hrs
Ethion EC - 24 hrs
ethyl parathion - 48 hrs
Furadan 4F - 14 days
15G - None stated on label
Guthion 50WP - 24 hrs
Imidan 50WP - None
Lannate 1.8L, 90SP - When spray is dry
Larvin 3.2F - When spray is dry
Lorsban 4E - 24 hrs
15G - Not stated on label
Malathion EC - 0 days
Metasystox-R - 48 hrs
methyl parathion - 48 hr
Nudrin 1.8L, 90SP - When spray is dry
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, 0 days
Thimet 20G - 7 days

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 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 following other crops may be damaged by rootworm larvae if beetles were numerous the previous season and were attracted to weedy soybeans, oat stubble with flowering weeds, or soybean fields heavily infested with volunteer corn. CROP ROTATION IS AT LEAST 90 PERCENT EFFECTIVE in protecting fields from corn rootworms. Occasionally, in northeast Nebraska, where Northern Corn Rootworms are abundant, some eggs may not hatch the season after laying, but may carry over and hatch the second season after laying. This phenomenon, referred to as EXTENDED DIAPAUSE, is discussed on page 2. This is not expected to be a factor in most fields in 1987. The situation does not justify widespread treatment of first year corn.

Effectiveness of soil insecticides is reduced if soil remains dry after application, if excessive rainfall occurs, if soils are highly alkaline, or if they 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 break down rapidly, resulting in poor control. 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 can be applied in the seed furrow, however, in-furrow placement is generally not as effective as a banded treatment of the same formulation since the treated zone is 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 base of plants. If planting time application is used on early-planted corn, Broot 15GX, Counter 15G, 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 infurrow 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 the continuous use of the same soil insecticide for several years. 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 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 broadcast applications are made by aircraft, use Furadan 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, 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.
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, 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.

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. For the most part, 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> 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 (20%) or 40 lb (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/acre

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 treatment 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 (GRUBWORMS)
(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
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
(NebGuide G82-613, 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> fenvalerate (Pydrin 2.4EC)	0.15-0.2 lb
malathion (57EC)	1.0 lb
malathion ULV 9.33	0.3 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
(NebGuide G86-774, 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 residual insecticide such as Sevin XLR Plus. 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.

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.
fenvalerate <R> (Pydrin 2.4EC)	0.1-0.2 lb	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./ 1,000 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 survivorship 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) with treatment cost ($12.00): $16.41 - $12.00 = $4.41 (dollars saved by treatment).	$ 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	No restrictions. Field, sweet, pop & seed corn.
(Dipel ES)	1.5-2.0 pt	No restrictions. May be applied through overhead 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 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 and popcorn.
<R> (Pounce 1.5G)	6.7-13.3 lb	Field corn and popcorn only.
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 2). 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> 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 stimulate increases in mite reproduction (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)	1.5-2.0 pt	No restrictions. May be applied through overhead 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. Do not reenter treated fields within 14 days of application. Field corn only.
chlorpyrifos (Lorsban 4E)	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 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.
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 2). 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. Around fields, the following table can be used as a guide to evaluate the need for treatment for cropland grasshoppers. 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 stimulate increases in mite reproduction (see spider mite section).

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

Number of nymphs or adult hoppers per square yard

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>	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>	fenvalerate (Pydrin 2.4EC)	0.15 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, Sevimol 4)	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>	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 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.

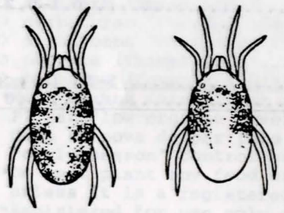
REGISTERED FOR CONTROL OF WESTERN BEAN CUTWORMS ON CORN
Rates are active ingredient per acre.

	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>	fenvalerate (Pydrin 2.4EC)	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.



BANKS GRASS MITE TWOSPOTTED SPIDER MITE

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 apply an insecticide or miticide for spider mites, the benefits of that application should be carefully weighed. Most insecticides have a detrimental effect on spider mite natural enemies. However, these same chemicals 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 flareups only when TSM is present. 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. Parathion seems to suppress BGM but not TSM.

RECOMMENDATIONS FOR REDUCTION OF SPIDER MITES

For BGM only: Treatment is usually justified if 1 lower leaf is yellowing from mite damage and colonies are present up to the ear zone. In Nebraska, dimethoate (Cygon 400) has generally provided reasonable BGM control.

For TSM only OR TSM plus BGM: No miticide/insecticide or combinations have provided consistent, effective control of TSM, and chemical treatments may actually aggravate TSM problems. However, treatment may be justified when well-developed colonies (i.e., covering 1/2 leaf) are present on 1/3-1/2 of the leaves on 50 percent of the plants. Another way of expressing this threshold is -- treat when 15-20 percent of the total leaf area is covered with active TSM colonies and moderate damage is apparent. Treat only the heavily infested areas of the field to allow for recolonization by predators. Increased gallonage and multiple applications may improve the degree of TSM suppression. Early spot treatments with propargite (Comite) may also be helpful.

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
	ethion (Ethion 4M)	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

*Do not plant any food or feed crop in rotation after a field treatment with disulfoton unless it is a registered use for disulfoton.
**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)	1.0 lb
<R>	ethyl parathion	0.5 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 bright 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 preboot	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

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

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

<R>	aldicarb (Temik 15G)*	7.5 oz in furrow only
<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)***	6.0-16.0 oz banded (or knifed in)

*With excess rainfall or irrigation, low pH (6 or lower), low temperature (less than 50° F) and low organic levels (under 1%), chemical breakdown is reduced and may cause residues to move deeper into the soil and possibly contaminate groundwater. Registered for "early season" control but not recommended.
**Do not plant any food or feed crop in rotation after a field treatment with disulfoton unless it is a registered use for disulfoton.
***Registered for use only on grain sorghum.

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.

RECOMMENDATIONS FOR SOIL CUTWORM CONTROL IN SORGHUM

Insecticide	Rate	Restrictions and Comments
chlorpyrifos (Lorsban 4E)	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 following 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 conditions of high populations, 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 per 1,000 ft. of row	Place in furrow with seed. Should give 3 to 4 weeks protection.
		POST-EMERGENCE
carbaryl (Sevin 80S, Sevimol 4, 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 soil. One application per season. Do not feed foliage before grain harvest.

REGISTERED FOR PLANTING TIME APPLICATION - BUT NOT RECOMMENDED:

<R> aldicarb (Temik 15G)* ..... 7.5 oz per 1,000 ft row

*Registered for "early season" control. With excess rainfall or irrigation, low pH (6 or lower), low temperature (less than 50° F) and low organic levels (under 1%), chemical breakdown is reduced and may cause residues to move deeper into the soil and possibly contaminate groundwater. Registered for "early season" control but not recommended.

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