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INSECT MANAGEMENT AND CONTROL ON CROPS GROWN FOR SEED

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COVER PHOTO by Jack D. Eves, formerly with the Department of Entomology, Washington State University, shows predaceous bigeyed bug feeding on lygus bug nymph.

GENERAL CAUTIONS

If any part of a seed crop is to be used for human food or livestock feed, be sure to check the insecticide label to see if such uses are permitted. The use of some insecticides will prohibit feeding. Others permit feeding only if certain instructions on application, timing, etc., are followed. When in doubt, consult your fieldman, dealer, or county agent.

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Insect Management and Control on Crops Grown for Seed

PRECAUTIONS AND MANAGEMENT SUGGESTIONS

Control measures are described for the more common pest insects normally encountered in Washington, Oregon, Idaho, and Nevada. This information is based on research by scientists of the University of Idaho, Oregon State University, Washington State University, the University of Nevada, the USDA and other agencies. There is no guarantee that the use of this information will provide satisfactory pest control and not cause plant injury or soil/plant residue problems. However, research data indicate that safe, effective control can be expected when directions for use are carefully followed and proper precautions are observed. Your County Extension Agent can provide or obtain additional information if needed.

Precautions in Using Pesticides

Pesticides are poisonous. Use only when needed and handle with care. Heed and follow all precautions on the labels.

Store pesticides where they will not contaminate food or feed, and where children and animals cannot reach them. Keep them in their original containers, tightly closed, and in a dry place.

Avoid contact with pesticides. If any is spilled on skin or clothing, wash thoroughly and change clothing immediately.

Avoid inhalation of dusts or mists.

Wash clothing each day before re-use.

Wash hands and face before eating or smoking

and immediately after completing the pesticide application. Do not smoke while applying or mixing pesticides.

If illness occurs during or shortly after application call a physician immediately.

Protect fish and wildlife. Do not apply pesticides in any manner that will contaminate lakes, streams, ponds or irrigation ditches or canals. Do not clean spray equipment or dump excess material near such bodies of water.

Dispose of pesticide containers so they do not pose a threat to man or the environment. Rinse empty containers at least three times and pour the rinse water into the spray tank. Unless containers can be returned to the manufacturer or sold to a commercial salvage firm, puncture, crush, or break them (except aerosol cans) so they cannot be used for other purposes. They can be taken to a sanitary land-fill dump or other site approved by the local health department. Small containers, such as those in the home and garden trade, can be handled by city trash disposal service. Open burning of large quantities of combustible containers is prohibited by the Environmental Protection Agency. However, small quantities not exceeding 50 pounds—or the quantity emptied in a single work day, whichever is less—may be burned in open fields **provided** the wind direction is away from population centers, humans or domestic animals, surface water supplies, and crops that are susceptible to damage. Such open burning must be consistent with local ordinances and label directions.

Pest Management

Pest management is the careful selection and application of chemical, biological, and cultural techniques to effectively and economically control pests with minimal adverse effect on the environment and emphasis on proper and safe use of pesticides. Currently, such programs usually involve integration of selective chemical treatments with parasitic and predacious insects which feed on the pest insects. These are ways to keep insecticide applications to a minimum.

1. Learn to recognize all stages of beneficial parasites and predators as well as the major pest insects which occur on your crop. Refrain from treating "bugs" and "worms" which may actually be helping to control the pest insects.
2. Carefully time sprays to most effectively reduce pest insect populations as well as to protect beneficials and ultimately reduce the number of applications required.
3. Carefully follow dosage recommendations. Overdosing usually results in a resurgence of the insect pest problem because of excessive killing of predators and parasites.
4. Apply at least 10 gallons of spray per acre by aircraft and 20 gallons with ground equipment to obtain as good coverage as possible and reduce the need for repeated applications.
5. Use the more selective chemicals which are registered for use on your crop. Do not use DDT or carbaryl (Sevin) because these insecticides stimulate spider mite outbreaks. Broad-spectrum organophosphorus materials such as parathion, malathion, azinphosmethyl (Guthion), TEPP, and mevinphos (Phosdrin) are particularly hazardous to beneficial parasites and predators.

It is difficult to maintain a reservoir of predators and parasites in the annual and biennial vegetable seed crops. Their greater value is attained in perennial legume and grass seed crops.

Pollination

Pollinating bees are essential for the production of forage legume seeds and many types of vegetable seeds. Choose your best control materials with care, noting special cautions concerning insecticide poisoning of alfalfa leaf-cutting bees and alkali bees on alfalfa, honey bees on clover, vetches, and vegetable seed crops. **Do not** use more than 1 quart of acidifier per 100 gallons of spray when applying trichlorfon (Dylox). Sprays containing larger amounts of acidifier are hazardous to bees and may have a reduced effect on lygus bugs. **Do not** mix nutrient spray powders with trichlorfon because

they may not only reduce the efficiency of the spray but also cause a physical incompatibility problem with application equipment.

Avoid the use of mixtures of insecticides, since they are more hazardous to bees than chemicals applied singly. Even essentially non-hazardous materials, such as dicofol (Kelthane), when added to insecticides, enhance the toxicity of the mixtures to bees. Carbaryl (Sevin) is the most destructive material to bees in current use. Do not use this material on bee-pollinated crops in bloom. Also take care to eliminate drift of carbaryl onto blooming weeds and adjacent fields in bloom.

Pesticide Reentry Standards

The Environmental Protection Agency has set federal regulations to protect workers entering fields treated with pesticides:

1. Unprotected persons must not be allowed in areas being treated. Workers, other than those involved in the application, must not be exposed to drift.
2. Unprotected workers must not be permitted in fields treated with the following pesticides until the indicated number of hours has elapsed.

Azinphosmethyl (Guthion) 24 hours; Carbophenothion (Trithion) 48; Demeton (Systox) 48; Dicrotophos (Bidrin) 48; Endrin 48; EPN 24; Ethion 24; Methyl parathion 48; Monocrotophos (Azodrin) 48; Oxydemeton-methyl (Meta-Systox-R) 48; Parathion 48; Phosalone (Zolone) 24.

3. Unprotected workers must not be permitted in fields treated with pesticides other than those listed above until sprays have dried or dusts have settled.
4. Workers may enter treated fields prior to the expiration of reentry intervals provided protective clothing is worn. Protective clothing consists of a hat or other suitable head covering, a long-sleeved shirt, and long-legged trousers or a coverall type of garment (all of closely woven fabric covering the body, arms and legs), shoes, and socks.
5. Appropriate and timely warnings must be given to workers who are expected to work in treated fields. Warnings may be given orally and/or by posting warning signs at the usual points of entrance to the field, and/or on bulletin boards at points where workers usually assemble.
6. Where label directions are more restrictive than the standards, the label directions take precedence.
7. It is the responsibility of the owner or lessee of the treated field to see that workers comply with the standards.
8. The standards do not apply in mosquito abatement treatments, greenhouse treatments, livestock and other animal treatments, and treatment of golf courses and similar nonagricultural areas.

Legumes

The major pests of each seed crop, those which are likely to require some type of control program each season, are marked with an asterisk.

Alfalfa Seed

Cautions. Alfalfa seed screenings or alfalfa hay cannot be fed to livestock unless special spray and dust programs are used. See your county agent for special treatments which will allow your crop to be fed to animals.

All growers should observe State Department of Agriculture Orders regulating insecticide use on alfalfa. Make evening applications to protect pollinators. Keep insecticide applications away from food or forage crops, alkali and alfalfa leafcutting bee nesting sites, and honey bee colonies.

Growers utilizing alfalfa leafcutting bees for pollination should not use toxaphene during bloom unless the leafcutter nests are removed from the field during and for several days following application. This publication recommends toxaphene only for control of cutworms, webworms, armyworms, and loopers.

Use of most dessicants and defoliants (except for petroleum oils) prohibits use of any part of the treated alfalfa for livestock feed.

*LYGUS BUGS

ACTUAL TOXICANT PER ACRE (Use only one)

Prebloom

dimethoate (Cygon or De-Fend) 0.5 lb
carbofuran (Furadan) 1 lb
methidathion (Supracide) 1 lb
Carzol 0.46-0.92 lb

During Bloom or Prebloom

trichlorfon (Dylox or Proxol) 1 lb
oxydemetonmethyl (Metasystox-R) 0.5 lb†
naled (Dibrom) 1 lb

Application and Remarks

Integrated lygus bug control program: In Washington, where the alfalfa weevil is **not** a problem in seed fields, growers have used an integrated trichlorfon-predator or oxydemetonmethyl-predator program with considerable success. During late May or early June an application of trichlorfon is applied while lygus bug nymphs are still in the first and second instars (one-half grown or less, 1/16 to 1/8 inch long). When this is done, bigeyed bugs and other predators build up earlier and faster than with a more stringent pre-bloom insecticide and help

control the lygus bugs. In practice, a grower or fieldman samples the lygus bugs and predators at regular intervals through the rest of the season. Repeat application of trichlorfon is only made when the first lygus bug nymphs reach the third instar (1/8 inch long and without wing pads). However, in areas with severe lygus bug control problems, applications should be made as soon as a hatch of small nymphs occurs. Often a second application is **not** needed until fall when adult lygus bugs fly into the seed fields from adjacent crops being harvested. The adverse effects of carbofuran (Furadan), dimethoate (Cygon or De-Fend), Carzol, and Supracide upon beneficial predators can be minimized in most cases by applying before mid-May, never later than June 1. See Washington Extension Multilith 3755 for more details on alfalfa seed pest management. For identification of beneficial predators see Washington Extension Bulletin 640. For determination of economic thresholds see Washington Extension Multilith 4026.

First Application: Apply dimethoate after the first cutting and before second growth reaches the bud stage, on warm days of late May. Be sure that no blooming weeds are present in the field at the time of application. Use at least 10 gallons of spray per acre for aerial applications.

Dimethoate **plus** toxaphene may be used to give cutworm, armyworm, looper, or webworm control (see toxaphene direction under Western Yellowstriped Armyworm—Bertha Armyworm—Alfalfa Looper, Redbacked Cutworm—Army Cutworm—Other Cutworms, and Beet Webworm).

Carbofuran is highly hazardous to bees and should be applied as a pre-bloom spray at least 14 days before bloom. This material should mainly be used by Oregon and Idaho growers who have serious alfalfa weevil problems. Killing of parasites and predators can be minimized by applying during the first half of May before some predators enter the fields. Carbofuran is usually acidified for best results (see statement about buffers on next page).

Second application: During bloom, usually when lygus bugs (adult plus nymphs) reach 1½ per straight (90°) sweep of a 15-inch net (3 per sweep in a 180° arc) but before nymphs reach third instar stage (½ grown), use trichlorfon (may cause foliage injury) or oxydemeton-

methyl (Metasystox-R). Naled (Dibrom) is **not** recommended during early season because night applications can cause severe killing of either leafcutting or alkali bees during the following day. Naled also kills the beneficial bigeyed bug and damsel bug predators. Trichlorfon and oxydemetonmethyl are the least predator-destructive material available for this program. Since trichlorfon has short residual effectiveness, make frequent population checks and repeat as needed. Do not store trichlorfon at temperatures above 100° F, since it loses its strength rapidly at high temperatures. Mix only with relatively cool spray water (80° F or less).

If there are 100 aphids per sweep, use oxydemetonmethyl or add demeton (Systox) to trichlorfon sprays and use at rate of 0.12 to 0.25 pound per acre. Use the 2 pounds per gallon formulation of demeton because it is less hazardous to bees than the 6 pounds per gallon formulation.

Additional applications: When lygus bugs reach 3 per straight (90°) sweep (6 per 180° sweep), use trichlorfon or oxydemetonmethyl. Aphid control usually is not needed at this time. Separate applications for mite control may be needed on borders or dry spots.

Late season applications: During late July and August, large numbers of lygus bug adults fly into the alfalfa fields from surrounding crops and weeds. Repeated control applications under these conditions are largely a waste of time and money, especially if buds, flowers, and newly formed pods are present. Lygus bugs tend to concentrate on this lush growth without causing serious damage to seeds which are close to maturity. Whether a field is dry or green has a considerable effect on continued damage, usually resulting in less damage in the dry situation. Since about 30 days are required for seed maturation during early season and 45 or more days after mid-August, new growth will not produce harvestable seeds.

This paragraph pertains to growers who incubate their leafcutters and are likely to have a definite reduction in bees between emergence peaks. If chemical applications appear justified, remember that alfalfa leafcutting bees are much more sensitive to chemicals after they have been in the field for 3 weeks or more. Time applications of insecticides to be 6-7 weeks after spring generation bees began activity in the field. This will coincide with the natural lull between peaks of bee emergence.

Trichlorfon buffers: Buffers that acidify alkaline spray waters increase the effectiveness of trichlorfon. Observations to date indicate that buffers do not increase the bee poisoning hazard of trichlorfon to alfalfa leafcutting bees or alkali bees. Typically, all acidifiers tested (Sorba-Spray Mg, Nutra Wet, Nu-Trex, Leaf Life, Nutra-Aid, and Tri-Fol) reduce pH values from

about 8 to 5.5 or 6 with the 1 pint per 100 gallons rate. Effectiveness is indicated by 10- to 20-day intervals between applications as compared to 5 to 10 days without acidification.

Caution. If a grower chooses to use a Sorba-Spray formulation as an acidifier for trichlorfon, he should use Sorba-Spray Mg rather than other Sorba-Spray formulations which are incompatible or less effective.

Do not apply these materials at nutrient-spray strength in mixtures with insecticides. Both the timing and dosage will be wrong and killing of bees may result. Reduced effect on lygus bugs may also occur. Do not mix nutrient spray powders with trichlorfon because they may cause a problem with plugging of sprayer equipment.

Spray additives: Various other kinds of spray additives may increase the effectiveness of insecticides on alfalfa seed crops, but these have not been tested under Pacific Northwest conditions.

***PEA APHID—ALFALFA APHID— BLUE ALFALFA APHID—SPOTTED ALFALFA APHID**

ACTUAL TOXICANT PER ACRE (Use only one)

Prebloom

disulfoton (Di-Syston) 1 lb
dimethoate (Cygon or De-Fend) 0.5 lb
parathion 0.5 lb
methyl parathion 0.5 lb‡
malathion 1.25 lb

During Bloom or Prebloom

demeton (Systox) 0.25 lb
oxydemetonmethyl (Meta-Systox-R) 0.25 lb

Application and Remarks

When malathion, diazinon, or methidathion (Supracide) are used for alfalfa weevil control, aphids will also be suppressed.

Di-Syston is applied in either aerial broadcast or side-dressed granule treatment. The use of irrigation is very helpful in increasing activity of Di-Syston. One early application usually suppresses aphids for most of the season.

Demeton appears to give better results against the pink form of the alfalfa aphid which is tolerant to dimethoate. Pea aphid is considered to be injurious when the plants are wilted and stunted and in the absence of effective parasites and predators.

Apply dimethoate after the first cutting and on warm days before alkali bees begin to emerge in your area. Be sure that no blooming weeds are present in the field at the time of application. Ground application of demeton may be re-

duced as low as 0.12 pound per acre to obtain integrated control if good numbers of predators and parasites of the aphids are present in the field. Under these conditions, only partial chemical control occurs, but natural enemies are left alive to kill the remaining aphids. Either oxydemetonmethyl or demeton plus trichlorfon are the most selective combinations available, since they are low in hazard to aphid parasites and certain predators.

Use the 2 pounds per gallon formulation of demeton because it is less hazardous to bees than the 6 pounds per gallon material.

New Aphid Problems

The **blue alfalfa aphid** is a newly introduced aphid recognized for the first time in 1975.

It has become an economic pest in Nevada, but has **not** been collected yet in the Pacific Northwest, except for a few first records in Oregon in 1977. This aphid is very similar in appearance to the pea aphid. The blue alfalfa aphid is a darker bluish green, whereas the pea aphid is a light green to yellowish green. This color difference is not apparent except in mixed populations. The most useful criterion to distinguish between the two aphids is the color of the antennae. The pea aphid's antennae are darker at the joints giving them a banded appearance, whereas the antennae of the blue alfalfa aphid are uniform in color.

The blue alfalfa aphid is a more serious pest than the pea aphid. It injects a toxin causing stunting, shortened internodes, and a yellowing and crinkling of the leaves. These symptoms may be quite apparent in heavily infested fields. The blue alfalfa aphid also produces a large quantity of honeydew.

It is a cool season aphid, starting a population build-up in May or June, and will disappear from the fields as the daily maximum temperature begins to approach 90°F.

The blue alfalfa aphid can be easily controlled with the same materials as those used for the pea aphid. Present indications are that the economic level will be somewhat lower than for the pea aphid.

The **spotted alfalfa aphid** has, in recent years, become a problem again in the Lovelock, Nevada, seed production area. It has been collected in alfalfa hay fields in the Pacific Northwest, but has **not** become a pest on seed crops in this area as yet. The spotted alfalfa aphid is smaller than the other common aphids found on alfalfa. It is pale yellow or grayish in color. There are four to six conspicuous rows of dark spots on the back with a spine emerging from each spot. The wings have smokey areas along the wing veins. None of the other aphids encountered in alfalfa will have spines on the abdomen which are visible with a hand lens.

The spotted alfalfa aphid is found most commonly on the lower side of the leaves on the lower portions of the stems, close to the ground. This aphid also produces large amounts of honeydew that supports the growth of a black sooty mold that will cover the leaves and lower portions of the stem. It injects a toxin that kills the leaves, causing them to drop and fall from the plant.

This aphid is the most serious of all aphids infesting alfalfa as prolonged infestations will kill the plant.

Spotted aphids are not readily caught in a sweep net. Evaluation of populations should be made by cutting the stems with a sharp knife, gently lifting the stem out of the foliage, inverting it, and counting the aphids on the stem and on the underside of the leaves. In seed alfalfa, treatment should be applied when populations average 20-30 aphids per stem.

TWOSPOTTED MITE

ACTUAL TOXICANT PER ACRE (Use only one)

propargite (Comite) 1.7 lb
Carzol 0.46 lb (prebloom only)
dicofol (Kelthane) 1 lb

Application and Remarks

Miticides should **not** be applied in mixtures with insecticides because this increases the hazard to pollinating bees. Use a mite control only if 25% of the leaves show damage during early season. Treatment level is about 50% of the leaves showing damage during mid-summer and treatment may **not** be justified with 75-100% showing damage after August 15. For aerial applications, apply 15 gallons mixed insecticide per acre with careful flagging and a narrow swath. In late season, control is usually not necessary. **Do not** apply a miticide because there are dried out or bleached patches in your field. Other factors can cause such damage to the plants. Only treat if there are justifiable levels of mites actually present.

ALFALFA WEEVIL

ACTUAL TOXICANT PER ACRE (Use only one)

methoxychlor 1.5 lb (at least 1 day before bloom)
methidathion (Supracide) 1 lb (at least 7 days before bloom)
carbofuran (Furadan) 0.25-1 lb (at least 14 days before bloom)
methomyl (Lannate, Nudrin) 0.9 lb (at least 7 days before bloom)
malathion 1.25 lb (at least 7 days before bloom)
diazinon 1 lb (at least 7 days before bloom)
parathion 0.5 lb (at least 7 days before bloom)

phosmet (Imidan) 1 lb (at least 7 days before bloom)

Application and Remarks

Alfalfa weevils are present in most alfalfa growing areas. Larvae are green and legless with a **black head**. Apply chemicals when first damage is seen in mid-May.

Most of these chemicals are toxic to bees and cannot be applied on bloom. **Methoxychlor is the least hazardous material that can be applied to late weevil infestations during bloom.** In Washington, alfalfa weevils have only reached economic levels in seed fields in Walla Walla County to date. Treatment is **not** justified until larval populations average 20 or more per straight sweep or 35-50% of foliage tips show damage. Taking the first cutting for hay (May 1-15, depending on locality) or other setback of crop may eliminate the need for chemical control in seed crops.

ALFALFA LOOPER

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) 1 lb+
toxaphene 3 lb (alkali bee program only)

Bacillus thuringiensis (microbial insecticide; follow manufacturer's recommendations)

Application and Remarks

Trichlorfon is the preferred material during bloom because of safety to pollinating bees. See cautions at beginning of section. Trichlorfon performance is improved by acidification of alkaline spray waters. See details under lygus bug program.

Heavy populations of alfalfa loopers are usually controlled by a granulosis virus and/or other diseases. The caterpillars become white and lumpy, break and form liquid smears when netted. However, a darker colored form (striped appearance) of the looper is apparently tolerant to the virus disease. It shows a strong preference for feeding on alfalfa flowers and outbreaks (5-10 loopers per straight sweep) required chemical control.

WESTERN YELLOWSTRIPED ARMYWORM—BERTHA ARMYWORM

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) 1 lb
naled (Dibrom) 1 lb
malathion 1.25 lb (alkali bee program only)
toxaphene 3 lb (alkali bee program only)
methomyl (Lannate) 0.23-0.45 lb

Trichlorfon is the preferred material during bloom because of safety to pollinating bees.

See cautions at beginning of section. Inspect fields carefully during late spring and early summer because no insecticides are effective against mature caterpillars. Bertha armyworms are most prevalent in late summer. Control of large armyworms is **not** practical. **For emergency control of armyworms**, methomyl at ¼ pound per acre can be applied with relative safety to bees in late evening.

Trichlorfon performance is improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

ALFALFA SEED CHALCID

Application and Remarks

No chemical control program is available for this pest. Cutting and removal of hay during May will delay its cycle and reduce populations. Destroy or burn chaff stacks and screenings by April 1. Remove volunteer and waste-area alfalfa plants, since they act as a reservoir for the pest. Cultivation and irrigation in the fall will reduce overwintering chalcid populations. Disking to bury light seeds at least 1 inch in the soil during the fall will reduce adult emergence. Field burning is ineffective for seed chalcid control. See Washington E.M. 2923.

PEA LEAF WEEVIL

ACTUAL TOXICANT PER ACRE

malathion 1 lb
methoxychlor 2.5 lb

Application and Remarks

Adult feeding in spring may kill seedlings planted with peas. This insect has seldom become a pest in young stands of alfalfa and never is a problem in established stands.

GRASSHOPPERS

ACTUAL TOXICANT PER ACRE (Use only one)

dimethoate (Cygon or De-Fend) 0.2 lb
carbofuran (Furadan) 0.12 lb
malathion 1 lb (alkali bee program **only**)
toxaphene 3 lb (alkali bee program **only**)
naled (Dibrom) 1 lb

Application and Remarks

Standard dimethoate pre-bloom spray at 0.5 pound per acre will provide good control of grasshopper nymphs present at that time. Carbofuran pre-bloom sprays also kill grasshoppers present at that time.

Where alkali bees are the main pollinator, toxaphene or water-diluted malathion sprays applied in late evening are relatively safe.

When possible, apply border treatment of malathion ULV at 8 fluid ounces per acre or toxa-

phene to prevent continued invasion of crop. Avoid drift of malathion ULV or contamination of blooming plants because **this material can continue to kill alfalfa leafcutting bees for one week after application.**

CLOVER ROOT CURCULIO

Application and Remarks

This pest has been severely damaging to alfalfa stands, especially in low, wet areas. Materials effective in its control are no longer registered.

REDBACKED CUTWORM— ARMY CUTWORM— OTHER CUTWORMS

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox) cutworm baits
toxaphene 3 lb
methoxychlor 3 lb
carbaryl (Sevin) cutworm baits

Application and Remarks

Redbacked cutworm overwinters in egg stage and usually becomes damaging by mid-May. Best results are obtained with evening applications on a warm day. Caterpillars hide in soil at base of plant during day and feed at night. Irrigate field before treating to drive larvae out of the ground. Keep a close check on fields in early spring and treat infestations while the worms are small. Mature cutworms are extremely difficult to control.

Heavy populations of redbacked cutworms which cause a considerable reduction in aerial growth during May do **not** necessarily cause a subsequent reduction in seed yield.

WESTERN FLOWER THRIPS— ONION THRIPS

Application and Remarks

Thrips rarely cause reductions in yield, even with extremely heavy populations. Damage may occur from adverse effects on the blooms which reduce pollination. Late-blooming fields are particularly susceptible.

BEET WEBWORM

ACTUAL TOXICANT PER ACRE (Use only one)

toxaphene 3 lb
trichlorfon (Dylox or Proxol) 1 lb

Application and Remarks

Apply as needed—usually not before August. Trichlorfon performance is improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

Additional materials which are registered for use on alfalfa and which may be useful under certain conditions: azinophosmethyl (Guthion),

carbaryl (Sevin), carbophenothion (Trithion), Imidan, mevinphos (Phosdrin).

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

‡Do not use microencapsulated formulation (PennCap-M) because of hazard to bees.

Red Clover Seed

Cautions. Clover for clover seed or clover hay or hay produced from seed fields cannot be fed to livestock unless special chemical spray and dust programs are used. See your county agent for special treatments which will allow your clover to be fed to animals.

All growers should observe State Department of Agriculture orders regulating insecticide use on clovers.

***CLOVER APHID**

ACTUAL TOXICANT PER ACRE (Use only one)

carbophenothion (Trithion) 1 lb
disulfoton (Di-Syston) 1 lb
oxydemetonmethyl (Meta-Systox-R) 0.5 lb
demeton (Systox) 0.5 lb

Application and Remarks

Carbophenothion must be applied 4 to 5 weeks after hay cutting—not effective if hay not cut; should be applied if there are 15 or more aphids per 10 heads during fourth week after cutting. Do **not** treat lower populations of the clover aphid, since the clover aphid parasite and various predators will keep this pest from developing. For best results, the first cutting for hay should **not** be taken earlier than June 1. If Di-Syston granules are used, apply by side dressing or broadcast treatment, followed by irrigation, soon after hay cutting.

ALFALFA LOOPER— ZEBRA CATERPILLAR—CUTWORMS

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) 1 lb†
methoxychlor 3 lb†

Application and Remarks

Cutworms are rarely numerous enough to require control.

Trichlorfon performance is improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

CLOVER SEED MIDGE

Application and Remarks

Primarily a pest of red clover grown in western Oregon and Washington. Not a pest in Idaho. No satisfactory chemical control.

BEET WEBWORM

Application and Remarks

Use trichlorfon (Dylox or Proxol) as suggested under alfalfa seed.

***CLOVER SEED CHALCID**

Application and Remarks

No chemical control. Remove chaff stacks and screenings and destroy or bury before April 1. Cutting and removal of hay during first week in June will greatly reduce seed chalcid populations.

Volunteer and waste-area red clover plants should be removed since they act as a reservoir for the pest. Cultivation and irrigation in the fall will help reduce chalcids. Disking to bury infested seeds at least 1 inch in the soil during fall will reduce adult emergence.

CLOVER ROOT BORER— CLOVER ROOT CURCULIO

Application and Remarks

Materials effective in the control of these pests are no longer registered. A crop rotation program in which the crop is planted in the fall, harvested the following summer, and then plowed and rotated reduces populations.

GRASSHOPPERS

ACTUAL TOXICANT PER ACRE

malathion 1 lb

Application and Remarks

Grasshoppers only develop damaging populations during certain seasons. Apply malathion as a water-diluted spray and only during late evening to protect pollinating honey bees. When possible, apply border treatment to prevent invasion of local populations.

LYGUS BUGS

Application and Remarks

Data obtained in various parts of the Pacific Northwest indicate that lygus bugs prefer other crops to red clover and that they do **not** cause significant damage to red clover raised for seed.

LESSER CLOVER LEAF WEEVIL

Application and Remarks

Damage to red clover seed crops has occurred in Idaho and in western Washington and Oregon; however, heavy populations and early season bud damage have not been shown to reduce seed yields in eastern Washington. Chemicals effective for controlling this pest do not have registration at present.

BLACK POLLEN BEETLE

Application and Remarks

Damage to red clover seed crops has occurred in western Washington and western Oregon. Materials effective in the control of this pest are no longer registered. Not a pest in Idaho or Nevada.

WESTERN SPOTTED CUCUMBER BEETLE

ACTUAL TOXICANT PER ACRE (Use only one)

methoxychlor 2 lb
malathion 1 lb†
diazinon 0.5 lb†

Application and Remarks

Adults feed on seedlings and retard or destroy stand. This insect can also damage blooms. Sometimes requires control in western Washington and western Oregon. Not a pest in Idaho or Nevada.

MEADOW SPITTLEBUG

ACTUAL TOXICANT PER ACRE (Use only one)

methoxychlor 1 lb
azinphosmethyl (Guthion) 0.5 lb

Application and Remarks

Apply when large number of spittle masses seen in spring. Average of one nymph per stem justifies control measures.

PEA LEAF WEEVIL

ACTUAL TOXICANT PER ACRE

malathion 1 lb

Application and Remarks

Adult feeding in the spring may kill seedlings when planted with peas, especially in the Columbia Basin area of Washington.

TWOSPOTTED MITE

ACTUAL TOXICANT PER ACRE (Use only one)

propargite (Comite) 1.7 lb
demeton (Systox) 0.25 lb
sulfur 25 lb

Application and Remarks

Chemical control only justified when seed fields are heavily infested in the early part of season

Additional materials which are registered for use on clovers, and which may be useful under certain conditions: carbaryl (Sevin), diazinon, mevinphos (Phosdrin), parathion.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

White Dutch, Alsike and Ladino Clover Seed

***CLOVER SEED WEEVIL**

ACTUAL TOXICANT PER ACRE (Use only one)

methoxychlor 3 lb†
malathion 1.25 lb†

Application and Remarks

Apply when first seed crop blooms begin to turn down and become brown; usually the first week in June. Use at least 3 pounds methoxychlor in aerial applications. If honey bee colonies are to be placed in the field, delay until 36 hours after treatment is applied. Malathion should only be applied as a spray during late evenings to protect pollinating bees. Methoxychlor is much safer to bees.

Total chemical use can often be minimized by treating portions or borders of a field as they become infested.

Seed weevil population buildup is often delayed past the time of first brown blooms. In such cases, apply treatment when there are 2 or more weevils per straight sweep (5 or more per 180° sweep).

CLOVER LEAF WEEVIL

ACTUAL TOXICANT PER ACRE
malathion 1 lb

Application and Remarks

Apply early when clover has just started new regrowth. A fungus disease often kills heavy infestations of clover leaf weevil larvae in moist springs. (Diseased larvae gradually turn brown.)

LYGUS BUGS

Application and Remarks

Lygus bugs on white clovers raised for seed are

usually controlled by the clover seed weevil program.

LESSER CLOVER LEAF WEEVIL

Application and Remarks

Damaging infestations of the larvae may be present in white clover seed fields during May or June. Chemicals effective in the control of this pest are no longer registered.

CLOVER BUD CATERPILLAR

ACTUAL TOXICANT PER ACRE

parathion 0.25-0.5 lb

Application and Remarks

This native insect is mainly a pest of alsike, ladino, white dutch, and red clovers raised for seed in the Clearwater River drainage of northern Idaho. It shows a preference for alsike clover and does not infest alfalfa or sweet-clover. To protect pollinating insects, apply parathion only as a spray in late evening. Treat before any sizable number of clover flowers are open and before honey bees are placed in field. Do **not** treat light infestations because severe bee losses can occur. Apply parathion in at least 30 gallons of water per acre.

CLOVER APHID

Application and Remarks

See program listed under red clover seed.

TWOSPOTTED MITE

Application and Remarks

See program listed under red clover seed.

ALFALFA LOOPER— ZEBRA CATERPILLAR—CUTWORMS

Application and Remarks

See program listed under red clover seed.

CLOVER ROOT BORER— CLOVER ROOT CURCULIO

Application and Remarks

Materials effective in the control of these pests are no longer registered.

GRASSHOPPERS

Application and Remarks

Grasshoppers on white clovers raised for seed are usually controlled by the clover seed weevil program.

MEADOW SPITTLEBUG

Application and Remarks

See program listed under red clover seed. Spittlebugs are usually controlled by the clover seed weevil program.

LADINO CLOVER SEED MIDGE

Application and Remarks

Previously a problem in western Oregon. Clipping of blossoms at the time the first brood of midges emerge appears helpful in preventing damage to later blooms. No satisfactory chemical control. Not a pest in Idaho or Nevada.

Additional materials which are registered for use on clovers and which may be useful under certain conditions: carbaryl (Sevin), diazinon, mevinphos (Phosdrin).

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Sweetclover Seed

***SWEETCLOVER WEEVIL**

Application and Remarks

Materials effective in the control of this pest are no longer registered.

***SWEETCLOVER APHID**

ACTUAL TOXICANT PER ACRE

malathion 1 lb

Application and Remarks

Apply only as spray during late evening to protect pollinating bees in bloom period.

Vetch Seed

OMNIVOROUS LEAF TIER

Application and Remarks

Oregon data indicate that control of this insect on hairy vetch is of questionable value.

PEA APHID—COWPEA APHID

ACTUAL TOXICANT PER ACRE

malathion 1 lb

Application and Remarks

If bees are in the field, apply insecticides during late evening only.

PEA LEAF WEEVIL

ACTUAL TOXICANT PER ACRE

malathion 1 lb†

Application and Remarks

Adult feeding on young plants common in spring. Larval damage to roots may reduce stand.

***VETCH BRUCHID**

ACTUAL TOXICANT PER ACRE

malathion 1 lb

Application and Remarks

If bees are in the field, apply insecticide during late evening only.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Grasses

The major pests of each seed crop, those which are likely to require some type of control program each season, are marked with an asterisk.

Grass Seed

GREAT BASIN WIREWORM— DRYLAND WIREWORM— WESTERN FIELD WIREWORM

Application and Remarks

Materials effective in the control of these pests are no longer registered.

GRASS MITE—BROWN WHEAT MITE

ACTUAL TOXICANT PER ACRE (Use only one)

sulfur 25 lb
parathion 0.5 lb (dust)
parathion 0.8 lb (spray)

Application and Remarks

Use 25 pounds of either dusting sulfur or 2%

parathion dust per acre. Apply spray or dust when infestation is noted, usually late in summer. Late summer leaf infestations do **not** reduce yields. Florescence infestations can be very damaging.

MEADOW PLANT BUG

Application and Remarks

Burning destroys the overwintering eggs of this pest in the straw. These insects suck plant juices and reduce seed yields, when abundant. They produce silvertop by feeding on the stem just above the uppermost node, causing the stem to shrink, the inflorescence to turn white, and the seed to be sterile.

GRASS SAWFLIES

ACTUAL TOXICANT PER ACRE

malathion 1 lb†

Application and Remarks

Treat if large numbers of caterpillar-like green worms appear in early summer and are clipping seed stalks.

GRASS MEALYBUG

ACTUAL TOXICANT PER ACRE

malathion 1 lb†

Application and Remarks

Use malathion spray when mealybugs occur.

GRASS THRIPS

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1 lb
diazinon 0.5 lb

Application and Remarks

Apply just as seed heads are forming if thrips are readily found by striking heads on a flat surface. Some species can cause the foliage to turn whitish or rusty colored, damage developing florets, and cause seed sterility. Part or all of the seed heads turn white and often is referred to as one type of silvertip. These insects have been proven to be a pest of bluegrass and bentgrass in Oregon. The cause of stunting and browning of grass seed heads is **not** known.

PACIFIC GRASS BUG— BLACK GRASS BUGS— LABOPS GRASS BUGS

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1-1.25 lb†
diazinon 0.5 lb†
trichlorfon (Dylox) 1 lb

Application and Remarks

Heavy populations of grass bugs usually do not develop in fields being treated for other pests. Use at least 10 gallons of spray per acre.

***SOD WEBWORMS— GLASSY AND OTHER CUTWORMS— GRASS GELICHIIDS (CHIONODES)**

ACTUAL TOXICANT PER ACRE (Use only one)

fonofos (Dyfonate) 4 lb
chlorpyrifos (Dursban) 1 lb

Application and Remarks

Dursban should not be applied on crops not under irrigation unless rainfall can be expected immediately. Dursban is not labeled for use with aircraft. Dyfonate should be watered in by irrigation or rainfall as quickly as possible. Do not graze or feed harvest refuse following either of these treatments. Fall treatments are necessary where webworms, gelechiids, or cutworms are abundant at harvest time. These treatments should be applied as soon after harvest or burning as possible. Spring treatments must be applied no later than April 1 to give reductions of overwintering larvae. Needed only if fall applications omitted. See Washington Extension Bulletin 681, "Insect and Mite Pests of Bluegrass Seed Fields," for more information on these pests.

OAT BIRDCHERRY APHID— ORCHARDGRASS APHID— ENGLISH GRAIN APHID— ROSE GRASS APHID

ACTUAL TOXICANT PER ACRE (Use only one)

diazinon 0.5 lb†
malathion 1 lb
parathion 0.4 lb

Application and Remarks

Apply in spring when aphids are present and grass shows injury.

Orchardgrass aphid is specific to that crop and particularly destructive to Latac orchardgrass. It is tapered on both ends and usually is found along the midribs of the leaves.

Do not allow sprays to contaminate blooming weeds because of hazard to bees.

WINTER GRAIN MITE

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.5 lb
malathion 1 lb†

Application and Remarks

Damage by this mite causes fields to look gray or silvery.

***ORCHARDGRASS BILLBUG—
OTHER GRASS BILLBUGS**

ACTUAL TOXICANT PER ACRE

diazinon granular 3 lb—Oregon registration only

fensulfothion (Dasanit) granular — Oregon registration only

Application and Remarks

Diazinon and fensulfothion have been registered for use against the orchardgrass billbug in Oregon. This species is **not** a pest in Idaho, Washington, and Nevada.

Apply in mid-April avoiding periods of heavy rainfall. Do not apply with fertilizer. Do not graze stubble or feed harvest refuse.

GRASSHOPPERS

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1 lb

carbaryl (Sevin) 1 lb

encapsulated methyl parathion (PennCap-M) 0.5 lb

Application and Remarks

Grasshoppers only develop damaging populations during certain seasons.

Do not allow sprays to contaminate blooming weeds because of hazard to bees.

Additional material which is registered for use on grasses and which may be useful under certain conditions: methoxychlor.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Vegetable and Field Crops

The major pests of each seed crop, those which are likely to require some type of control program each season, are marked with an asterik.

Beet Seed

***GREEN PEACH APHID—
BEAN APHID (BLACK)**

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.5 lb

malathion 1 lb

carbophenothion (Trithion) 0.5 lb

diazinon 0.5 lb

Application and Remarks

Especially important to control aphid spread of yellows virus diseases before seed crop development.

**ALFALFA LOOPER—WESTERN
YELLOWSTRIPED ARMYWORM—
BEET ARMYWORM—
ZEBRA CATERPILLAR—
VARIEGATED CUTWORM**

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.6 lb†

trichlorfon (Dylox) 1.5 lb

Application and Remarks

Larger caterpillars are difficult to control—

check fields early. Trichlorfon performance improved by acidification of alkaline spray waters. See lygus bug program on alfalfa seed.

***REDBACKED CUTWORM—
OTHER CUTWORMS**

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon cutworm baits

carbaryl cutworm baits

carbaryl (Sevin) 1 lb

trichlorfon (Dylox) 1 lb

Application and Remarks

Control erratic when cutworms in soil—best results usually following irrigation. Keep close check early in season, because mature cutworms are extremely difficult to control. Trichlorfon performance is improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed. See label directions when using cutworm baits.

FLEA BEETLES

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.6 lb

carbaryl (Sevin) 1.5 lb

methoxychlor 1.5 lb

Application and Remarks

Watch for shot-holing of foliage by adults and treat when populations begin to develop.

TWOSPOTTED MITE

ACTUAL TOXICANT PER ACRE (Use only one)

carbophenothion (Trithion) 1 lb (dust)
carbophenothion 0.5 lb (spray)
parathion 0.6 lb

Application and Remarks

Watch for early symptoms and treat when white speckling of foliage becomes noticeable.

PACIFIC COAST WIREWORM— SUGARBEET WIREWORM— GREAT BASIN WIREWORM

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 4 lb
fonofos (Dyfonate) 2 lb†
diazinon 6 lb

Application and Remarks

Broadcast 40 pounds of 10% parathion granules or 20 pounds of 10% Dyfonate granules or 60 pounds of 10% diazinon granules per acre and thoroughly mix in top 6 to 9 inches of soil. **Keep all persons and animals out of parathion-treated area for 48 hours.**

Additional material which is registered for use on beets and which may be useful under certain conditions: mevinphos (Phosdrin).

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Cabbage and Mustard Seed

***CABBAGE SEEDPOD WEEVIL**

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.5 lb
diazinon 0.5 lb†
endosulfan (Thiodan) 2 lb§

Endosulfan gave good control of adult weevils in western Washington tests. It is the preferred material for early season sprays since it can be applied to blooming crops when bees are not actively foraging (late evening or early morning) with relative safety.

Application and Remarks

Apply 10 gallons of spray per acre by air. **Do not apply** parathion or diazinon until bloom

period is over and bees are no longer working in the field. Apply when there are 2 or more weevils per straight sweep (5 per 180° sweep) or when pods are 1¼ inches long and 1/16 inch wide.

CABBAGE APHID—TURNIP APHID

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1 lb
parathion 0.5 lb
diazinon 0.5 lb
dimethoate (Cygon or De-Fend) 0.25-0.5 lb
(on cabbage only)

Application and Remarks

Apply 10 gallons of spray per acre by air. Do not apply during bloom period in order to safeguard essential pollinating bees. Treatment for aphids seldom justified on cabbage seed crops.

***CABBAGE MAGGOT**

ACTUAL TOXICANT PER ACRE (Use only one)

azinphosmethyl (Guthion)
diazinon
fonofos (Dyfonate) 2 lb

Application and Remarks

Use ¼ pound 50% WP azinphosmethyl in 50 gallons of water at transplanting time only. Apply as a drench 4 to 6 ounces per plant, or immediately after transplanting. Be sure adequate agitation is provided. Excess amounts of azinphosmethyl may cause plant injury.

Use 4 ounces of the 4 pounds per gallon EC diazinon or ¼ pound 50% WP in 50 gallons of water. Apply as a soil drench, 4 ounces per plant during, or immediately after transplanting. Be sure adequate agitation is provided.

Broadcast fonofos at 20 pounds 10% granular per acre and incorporate into soil by disking prior to seeding or transplanting.

CABBAGE FLEA BEETLE— WESTERN BLACK FLEA BEETLE

ACTUAL TOXICANT PER ACRE (Use only one)

endosulfan (Thiodan) 1 lb§
parathion 0.5 lb

Application and Remarks

Do **not** use dust formulations on seed crops because of hazard to bees. Do not apply parathion during bloom period.

IMPORTED CABBAGEWORM— DIAMONDBACK MOTH— CABBAGE LOOPER

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox) 0.5-1 lb (cabbage only)
naled (Dibrom) 1 lb
methamidophos (Monitor) 0.5 lb.

parathion 0.5 lb
Bacillus thuringiensis, WP, D, suspensions
(microbial insecticide)

Application and Remarks

Trichlorfon is the preferred material because of safety to bees. Do not use dust formulations on seed crops. Apply naled or methamidophos sprays **only** during evening when bees are not in field. Do **not** apply parathion during bloom period. Follow manufacturer's directions for **B. thuringiensis**. Foliage damage by caterpillars usually does not justify treatment of cabbage seed crops.

BLISTER BEETLES

ACTUAL TOXICANT PER ACRE
carbaryl (Sevin) 1 lb†

Application and Remarks

Do not apply carbaryl during bloom period because of extreme hazard to pollinating bees.

Additional materials which are registered for use on cabbage and which may be useful under certain conditions: disulfoton (Di-Syston), methoxychlor, mevinphos (Phosdrin), Perthane, rotenone, TEPP.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

§SPECIAL CAUTION: **Do not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

Carrot Seed

***LYGUS BUGS**

ACTUAL TOXICANT PER ACRE
trichlorfon (Dylox) 1.5 lb
methamidophos (Monitor) 0.5 lb

Application and Remarks

Methamidophos should only be applied in early season before bloom because of hazard to bees. Apply spray during late evening to protect pollinating bee colonies. Acidified trichlorfon sprays are more effective against lygus bugs. Do **not** use more than 1 pint of buffering agent per 100 gallons of spray mixture because of increased hazard to honey bee pollinators. Standard strength nutrient sprays and insecticides cannot be effectively mixed for this purpose. One lygus bug per umbel can reduce seed yield and quality significantly.

***TWO SPOTTED MITE**

ACTUAL TOXICANT PER ACRE
propargite (Comite) 1.7 lb

Application and Remarks

Do **not** graze or feed harvest refuse or seed screenings.

CARROT BUDMITE

ACTUAL TOXICANT PER ACRE
diazinon 0.5 lb

Application and Remarks

This pest has only been known to cause damage in southern Idaho and in California. Diazinon sprays applied at 1½-week intervals until bloom apparently reduce infestations.

CARROT SEED CHALCID

Application and Remarks

This pest has not caused significant damage to carrot seed crops in the Pacific Northwest to date.

CARROT APHID— GREEN PEACH APHID

ACTUAL TOXICANT PER ACRE (Use only one)
malathion 1 lb
diazinon 0.5 lb
endosulfan (Thiodan) 0.5-1 lb§

Application and Remarks

Apply malathion only as spray and during late evening during the bloom period. Do not apply diazinon during bloom because of hazard to pollinating bees.

CARROT RUST FLY

ACTUAL TOXICANT PER ACRE (Use only one)
diazinon 2 lb (granules)
diazinon 0.5 lb (spray)

Application and Remarks

Apply granular diazinon in the furrow with the seed at planting time. Use ½ pound of 14% granular diazinon for 1,000 lineal feet of row. On mineral soils, no control procedure is available. Diazinon will cause reduction in seedling emergence. Not a pest in Idaho and Nevada.

Additional materials which are registered for use on carrots and which may be useful under certain conditions: methoxychlor, mevinphos (Phosdrin), parathion, toxaphene.

§SPECIAL CAUTION: **Do not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

Lettuce Seed

*LETTUCE APHID— GREEN PEACH APHID

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.5 lb
naled (Dibrom) 2 lb
diazinon 0.5 lb
demeton (Systox) 0.5 lb
disulfoton (Di-Syston) 1-2 lb
oxydemetonmethyl (Meta-Systox-R) 0.25-0.5 lb

Application and Remarks

Parathion and naled also control cutworms and loopers.

It is particularly important to control aphids starting early in the season to reduce virus disease transmission.

TENLINED JUNE BEETLE

Application and Remarks

Materials effective in the control of this pest are no longer registered.

*ALFALFA LOOPER—CUTWORMS— CORN EARWORM

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.5 lb
naled (Dibrom) 2 lb
trichlorfon (Dylox) 1 lb
Bacillus thuringiensis (microbial insecticide)
—alfalfa looper only

Application and Remarks

Start spraying when young larvae are first observed and repeat in 2 weeks, as required. For **B. thuringiensis** dosage follow manufacturer's recommendations.

PACIFIC COAST WIREWORM— SUGARBET WIREWORM

ACTUAL TOXICANT PER ACRE (Use only one)

ethylene dibromide 83%, 3 gal
parathion 4 lb

Application and Remarks

Use ethylene dibromide in spring when soil temperature is above 45° F. (2 weeks prior to planting). Apply without dilution with equipment constructed to deliver low volume. If such equipment is not available, dilute 3 gallons ethylene dibromide with 7 gallons stove or fuel oil. Inject with plow sole, chisel, sweep or blade applicator. If chisel equipment is used, spacings should not exceed 12 inches. **Do not use** row or side-dressing application of any insecticide or fumigant for wireworm control.

Where Telone has been applied at the rate of 25 gallons per acre for the control of root knot nematodes, or the garden symphylan, effective control of wireworms in the soil treatment time should also be obtained.

Spring planting. (Treatment not effective before April 1 or after August 31.) Apply parathion to soil prior to planting. Broadcast 40 pounds of 10% parathion granules per acre and thoroughly mix in top 6 to 9 inches of soil. **Keep all persons and animals out of treated area for 48 hours.**

SLUGS

ACTUAL TOXICANT PER 1,000 SQ. FT.
metaldehyde bait 0.5 lb/1,000 sq. ft.

Application and Remarks

Bait formulations. Apply to soil surface around plants.

Additional materials which are registered for use on lettuce and which may be useful under certain conditions: carbaryl (Sevin), dimethoate (Cygon or De-Fend), endosulfan (Thiodan), methoxychlor, mevinphos (Phosdrin), Perthane.

Mustard Seed

See pests and control measures listed under cabbage seed.

Onion Seed

*ONION THRIPS

ACTUAL TOXICANT PER ACRE (Use only one)

methyl parathion 0.875 lb‡
parathion 0.8 lb
malathion 2 lb
toxaphene 3 lb
fensulfothion (Dasanit) 1 lb

Application and Remarks

Apply malathion as a spray and only during late evening during the bloom period to protect pollinating bees. Do **not** apply methyl parathion or parathion during bloom. Onion thrips is **not** damaging after seed heads are formed. Western flower thrips, which feeds on pollen without damaging seed, is often most prevalent in the flower heads. It is rarely justified to treat for thrips beyond the initial early application.

*ONION MAGGOT

ACTUAL TOXICANT PER ACRE (Use only one)

carbophenothion (Trithion) 2 lb
ethion 2 lb
fensulfothion (Dasanit) 1 lb

Application and Remarks

Use soil application to furrow at planting. Apply granular ethion or carbophenothion in the furrow. Use the following amounts of insecticides per 1,000 lineal feet of row: 8% G—12 ounces; 10% G—10 ounces; 15% Dasanit G—3.7 ounces.

CUTWORMS

ACTUAL TOXICANT PER ACRE
toxaphene 2 lb

Application and Remarks

Apply as soon as young larvae are observed. Apply only in evening or early morning during the bloom period. Better control is obtained by treating only those fields that are well irrigated.

Additional materials which are registered for use on onions and which may be useful under certain conditions: azinphosmethyl (Guthion), diazinon, Dyfonate, mevinphos (Phosdrin), parathion.

†Do not use microencapsulated formulation (Penncap-M) because of hazard to bees.

Radish Seed

*CABBAGE MAGGOT

ACTUAL TOXICANT PER ACRE
diazinon 0.75-1.5 lb

Application and Remarks

Apply at planting time, 4 ounces of 14% diazinon granules in furrow per 1,000 lineal feet of row.

*CABBAGE APHID—TURNIP APHID

ACTUAL TOXICANT PER ACRE (Use only one)
malathion 2 lb
diazinon 0.5 lb

Application and Remarks

Apply malathion only as a spray and during late evening in the bloom period. Do **not** use diazinon during bloom because of hazard to pollinating bees.

CABBAGE SEEDPOD WEEVIL

ACTUAL TOXICANT PER ACRE (Use only one)
diazinon 0.5 lb†
endosulfan (Thiodan) 2 lb

Endosulfan gave good control of adult weevils in western Washington tests. It is the preferred material for early season sprays since it can be applied to blooming crops when bees are not actively foraging (late evening or early morning) with relative safety.

Application and Remarks

Apply 10 gallons of spray per acre by air. Do

not apply diazinon until bloom period is over and bees are no longer working in the field. Apply when there are 2 or more weevils per straight sweep (5 per 180° sweep) or when pods are formed. Radish is not as severely damaged as cabbage by seedpod weevil larvae. Lack of wild radishes and turnips in an area will also decrease the problems with this pest.

Additional materials which are registered for use on radishes and which may be useful under certain conditions: carbaryl (Sevin), Dyfonate, methoxychlor.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Rape Seed

(Only two insecticides are currently registered for use on rape seed and only in Idaho.)

*CABBAGE SEEDPOD WEEVIL— CABBAGE APHID—TURNIP APHID

ACTUAL TOXICANT PER ACRE (Use only one)
parathion 0.5 lb
endosulfan (Thiodan) 2 lb§

Do **not** apply parathion during bloom because bees will be killed. Thiodan gave good control of adult weevils in northern Idaho tests. It is the preferred material for early season sprays since it can be applied to blooming crops when bees are not actively foraging (late evening or early morning) with relative safety.

Application and Remarks

Apply 10 gallons of spray per acre by air. Do **not** apply parathion until bloom period is over and bees are no longer working in the field. Apply when there are 2 or more weevils per straight sweep (5 per 180° sweep) or when pods are formed (¼ inch long).

§SPECIAL CAUTION: Do **not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

Rutabaga and Turnip Seed

*CABBAGE SEEDPOD WEEVIL

ACTUAL TOXICANT PER ACRE (Use only one)
parathion 0.5 lb
diazinon 0.5 lb (turnips only)†
endosulfan (Thiodan) 2 lb§

Endosulfan gave good control of adult weevils in western Washington tests. It is the preferred material for early season sprays since it can be applied to blooming crops when bees are not actively foraging (late evening or early morning) with relative safety.

Application and Remarks

Apply 10 gallons of spray per acre by air. Do **not** apply parathion or diazinon until bloom period is over and bees are no longer working in the field. Apply when there are 2 or more weevils per straight sweep (5 per 180° sweep) or when pods are formed (¼ inch long).

CABBAGE APHID—TURNIP APHID

ACTUAL TOXICANT PER ACRE (Use only one)

oxydemetonmethyl (Meta-Systox-R) 0.5 lb
(turnips only)
malathion 2.5 lb (turnips only)
parathion 0.5 lb
naled (Dibrom) 1 lb (turnips only)

Application and Remarks

Oxydemetonmethyl is the preferred material on turnips because of safety to bees. Apply malathion and naled (turnips only) only as spray in late evening during bloom period. Do **not** apply parathion during bloom.

***CABBAGE MAGGOT**

ACTUAL TOXICANT PER ACRE (Use only one)

parathion 0.4-0.45 lb (rutabaga only)
diazinon (turnip only) 2-3 lb
fensulfothion (Dasanit) 1 lb (rutabaga only)

Application and Remarks

Make first application of parathion on rutabagas one week after planting and at 10-day intervals thereafter as long as flies are present. Aerial application is preferred to avoid plant injury by ground rigs. Do **not** apply during bloom.

Use 4 ounces of the 4 pounds/gallon EC diazinon or ¼ pound 50% WP in 50 gallons of water on turnips only. Apply as a soil drench, 4 ounces per plant during, or immediately after, transplanting. Be sure adequate agitation is provided.

Broadcast diazinon G at 2 to 3 pounds to soil prior to seeding. Mix with top 1 to 2 inches. Apply at planting when direct seeding.

Apply Dansanit in 4-6 inch band (see label).

Additional materials which are registered for use on turnips and which may be useful under certain conditions: methoxychlor, mevinphos

(Phosdrin), oxydemetonmethyl (Meta-Systox-R), toxaphene; **on rutabaga only:** toxaphene.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

§SPECIAL CAUTION: Do **not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

Spinach Seed

ALFALFA LOOPER

ACTUAL TOXICANT PER ACRE (Use only one)

methoxychlor 1-1½ lb
Perthane 0.5-0.75 lb **plus** malathion 0.4-0.6 lb

Application and Remarks

Apply 5% methoxychlor dust at 20 to 30 pounds per acre for the first application on small seedlings. Follow with weekly applications of an equal mixture of 4% malathion and 5% Perthane dust at 20 to 30 pounds per acre. Apply as needed. All materials **only** effective when loopers are very young.

LYGUS BUGS

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1.5 lb
naled (Dibrom) 1.5 lb†

Application and Remarks

Best results when applied to nymphs less than half grown.

BEAN APHID—GREEN PEACH APHID—MELON APHID

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1.5 lb
parathion 0.5 lb
diazinon 0.5 lb
dimethoate (Cygon or De-Fend) 0.25 lb
disulfoton (Di-Syston) 1 lb (EC only)
endosulfan (Thiodan) 0.75 lb (green peach aphid only)

Application and Remarks

Best results with early treatments before foliage development and higher temperatures reduce effectiveness.

Additional materials which are registered for use on spinach and which may be useful under certain conditions: carbaryl (Sevin), mevinphos (Phosdrin), toxaphene.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on

the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Sugarbeet Seed

***GREEN PEACH APHID— BEAN APHID (BLACK)**

ACTUAL TOXICANT PER ACRE (Use only one)

phorate (Thimet) 1 lb
disulfoton (Di-Syston) 1 lb
demeton (Systox) 0.5 lb (black aphid only)
endosulfan (Thiodan) 1 lb (green peach aphid only)§

Application and Remarks

Start a seasonal program with a phorate spray first week of May and a second application the third week of May. Growers may wish to change their second phorate spray to a granular application for control of leaf miners and leafhoppers.

Follow the two phorate sprays with one application of 10 pounds of 10% disulfoton granules or 6.7 pounds 15% disulfoton granules or 10 pounds of 10% phorate granules the second week of June.

Apply demeton as needed to control black aphids—usually in July or August, but **not** more than three times per season.

Especially important to control green peach aphid spread of yellows viruses during first season to protect second-year seed crop.

***BEET LEAFHOPPER**

ACTUAL TOXICANT PER ACRE

aldicarb (Temik)—see label directions
phorate (Thimet) 1 lb
disulfoton (Di-Syston) 1 lb

Application and Remarks

Apply 1 pound actual phorate or disulfoton per acre in granular form the third week of May. See label for details. A second application may be made the second week of June, as may be required. This could be included as a part of the aphid control program. Especially important to control leafhopper spread of curly top virus during first season to protect second-year seed crop.

***ALFALFA LOOPER— WESTERN YELLOWSTRIPED ARMYWORM—BERTHA ARMYWORM— ZEBRA CATERPILLAR— BEET ARMYWORM— VARIEGATED CUTWORM**

ACTUAL TOXICANT PER ACRE

trichlorfon (Dylox or Proxol) 1.5 lb†

Application and Remarks

Apply as needed—usually in July and August. Bertha armyworm often damaging in September and October. Trichlorfon performance improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

BLISTER BEETLES

ACTUAL TOXICANT PER ACRE

carbaryl (Sevin) 1 lb

Application and Remarks

Apply on foliage as needed.

***REDBACKED CUTWORM— OTHER CUTWORMS**

ACTUAL TOXICANT PER ACRE (Use only one)

carbaryl (Sevin) cutworm baits
trichlorfon (Dylox or Proxol) cutworm baits
trichlorfon 1 lb
carbaryl (Sevin) 2 lb

Apply trichlorfon or carbaryl as needed. May cut off seedling plants or rag foliage of large plants. May hide in the soil during the day. Trichlorfon performance improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

Control erratic when cutworms in soil—best results usually following irrigation. Keep close check early in season, because mature worms are extremely difficult to control.

LYGUS BUGS

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) 1 lb†
phorate (Thimet) 1 lb

Application and Remarks

Overwintering lygus bugs may kill young plants in May. Trichlorfon performance improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

BEET WEBWORM

ACTUAL TOXICANT PER ACRE

trichlorfon (Dylox or Proxol) 1.5 lb
endosulfan (Thiodan) 1 lb§

Application and Remarks

Apply as needed—usually not before August. Trichlorfon performance improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

***TWO SPOTTED MITE**

ACTUAL TOXICANT PER ACRE (Use only one)

carbophenothion (Trithion) 1 lb

sulfur 33 lb
phorate (Thimet) 1 lb

Application and Remarks

May be required from mid July through September. Apply phorate at 1 pound active ingredient as granules when mites first appear (about July 1) and a second application about July 15.

FLEA BEETLES

ACTUAL TOXICANT PER ACRE
carbaryl (Sevin) 2 lb

Application and Remarks

Small plants may require treatment.

GARDEN SYMPHYLAN

ACTUAL TOXICANT PER ACRE (Use only one)
parathion 5 lb
fonofos (Dyfonate) 2 lb

Application and Remarks

Use fall application for protection of sugarbeets the following year. Broadcast parathion or fonofos prior to fall plowing and disc thoroughly. **Do not allow persons or animals to enter treated fields within 48 hours after application.**

GRASSHOPPERS

ACTUAL TOXICANT PER ACRE (Use only one)
carbaryl (Sevin) 1 lb
malathion 2 lb

Application and Remarks

Use on foliage as needed.

BEET LEAFMINERS— SPINACH LEAFMINER

ACTUAL TOXICANT PER ACRE (Use only one)
trichlorfon (Dylox or Proxol) 1 lb
phorate (Thimet) 1 lb
disulfoton (Di-Syston) 1 lb†

Application and Remarks

Apply phorate or disulfoton the third week of May. A second application may be made the second week of June as required. Small plants may require treatment in areas where other insecticides have not been applied for control of aphids.

PACIFIC COAST WIREWORM— SUGARBEET WIREWORM GREAT BASIN WIREWORM

ACTUAL TOXICANT PER ACRE (Use only one)
parathion 4 lb
fonofos (Dyfonate) 4 lb

Telone fumigant 20 gal
D-D fumigant, Vidden D 25 gal

Application and Remarks

Broadcast parathion or fonofos granules before planting and mix thoroughly with the top 6 to 9 inches of soil. Apply 4 pounds actual parathion per acre (40 lbs 10% granules) or fonofos at 4 pounds actual per acre (40 pounds 10% granules). **Do not allow persons or animals in fields treated with parathion for at least 48 hours after application.**

Apply any of the fumigants undiluted, 6 to 9 inches in the soil with chisel, blade, or sweep equipment. Space chisels 12 inches apart. Compact soil slightly after application. Do not treat extremely heavy soils.

Additional materials which are registered for use on sugarbeets and which may be useful under certain conditions: diazinon, naled (Dibrom), oxydemetonmethyl (Meta-Systox-R).

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

§SPECIAL CAUTION: **Do not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

Seed Corn

***OAT BIRDCHERRY APHID— BEAN APHID—POTATO APHID— GREEN PEACH APHID— CORN LEAF APHID**

ACTUAL TOXICANT PER ACRE (Use only one)
phorate (Thimet) 1 lb
oxydemetonmethyl (Meta-Systox-R) 0.5 lb
diosulfoton (Di-Syston) 1 lb

Application and Remarks

Oat birdcherry aphid is the dark gray-green species which has been most destructive on corn in recent years. The shiny-black bean aphid has been less common for a number of years.

Apply oxydemetonmethyl as soon as aphids are found in July and August. Only 1 application per season.

Apply phorate to whorl of plants immediately before tasselling. Do not apply if previous soil application was made. Use 1.2 ounces actual phorate per 1,000 feet of row. The 1 pound rate is based on a 40-inch row spacing.

Disulfoton granular material should be placed in a 4- to 6-inch band at planting time or applied

to soil as a side dress treatment or to foliage by broadcasting into whorl. Do not apply closer than 40 days before harvest for food, feed or silage. **Do not apply more than twice per season by any method.**

***CORN EARWORM (Sweet Corn Only)**

ACTUAL TOXICANT PER ACRE

methomyl (Lannate or Nudrin) 0.33-0.45 lb

Application and Remarks

Methomyl is the **first choice material** because it controls aphids, does not encourage twospotted mite populations, and is much safer to bees than carbaryl.

REDBACKED CUTWORM— GLASSY CUTWORM

ACTUAL TOXICANT PER ACRE (**Use only one**)

trichlorfon (Dylox or Proxol) cutworm bait
carbaryl (Sevin) cutworm bait
trichlorfon 1 lb

Application and Remarks

Apply trichlorfon only once per season. Apply as soon as injury to seedlings is noticed. Control of larger worms and subterranean feeders may be poor. Irrigation just prior to treatment may materially improve control.

Trichlorfon performance improved by acidification of alkaline spray waters. Usual effective rate is 1 pint of acidifier (Sorba-Spray, Nutra Wet, Nu-Trex, or Tri-Fol) per 100 gallons spray mixture. Greater quantities are more hazardous to honey bees.

***TWO SPOTTED MITE**

ACTUAL TOXICANT PER ACRE (**Use only one**)

phorate (Thimet) 1 lb
propargite (Comite) 1.7 lb

Application and Remarks

Apply phorate to whorl of plants immediately before tasselling. Do not apply if previous soil application was made. Use 1.2 ounces actual per 1,000 feet of row. One pound rate based on 40-inch row spacing. Apply propargite before ears are formed.

WESTERN CORN ROOTWORM

Populations restricted to Oneida and Franklin counties in southeastern Idaho; primarily on sweet or silage corn. If problems develop, consult your Extension agent or fieldman.

Additional materials which are registered for use on corn and which may be useful under certain conditions: carbaryl (Sevin), methoxychlor, methyl parathion (do **not** use microencapsulated formulation—PennCap-M—because

of hazard to bees), mevinphos (Phosdrin), toxaphene.

Dry Edible and Seed Peas

See labels for interval between last application and harvest for peas used for food or feed.

***PEA APHID**

ACTUAL TOXICANT PER ACRE (**Use only one**)

parathion 0.3-0.4 lb
malathion 1 lb
demeton (Systox) 0.25 lb
disulfoton (Di-Syston) 1 lb

Application and Remarks

Parathion, particularly EC, may cause some slight, but unimportant, burning of the leaves. Where application for pea aphid and pea weevil is needed at the same time, parathion applied for aphid control has given excellent control of weevil.

Apply disulfoton 10 pounds of 10% granules by drilling or broadcasting at planting time.

Although honey bees usually do **not** forage on field peas, severe bee poisoning problems do arise when aircraft fly back and forth or turn across adjacent bee forage crops—also when blooming weeds are contaminated with spray in the fields or field edges or by drift onto adjacent areas. Apply materials as spray in late evening to minimize hazard to bees.

ALFALFA LOOPER— WESTERN YELLOWSTRIPED ARMYWORM—CUTWORM

ACTUAL TOXICANT PER ACRE (**Use only one**)

naled (Dibrom) 2 lb†
toxaphene 3 lb
parathion 0.5 lb

Application and Remarks

Do **not** apply parathion near residential areas.

***PEA WEEVIL**

ACTUAL TOXICANT PER ACRE (**Use only one**)

methoxychlor 1½-3 lb
malathion 1.2 lb
malathion ULV 0.5 lb
parathion 0.3 lb
phosmet (Imidan) 1 lb

Application and Remarks

Phosmet (Imidan) residues can remain highly hazardous to bees up to 4 days. Do not use this material if blooming weeds are present at the field edges or adjacent areas.

Weevil often controlled by limited application to brushy draws and borders near wintering areas of the adults. Note bee poisoning hazard statements under pea aphid. A warm day with temperatures of 70° F. or better is required for best results with malathion applications.

***PEA LEAF WEEVIL**

ACTUAL TOXICANT PER ACRE (Use only one)
methoxychlor 1.25-2.5 lb
phosmet (Imidan) 1 lb

Application and Remarks

Phosmet (Imidan) residues can remain highly hazardous to bees for up to 4 days. Do not use this material if blooming weeds are present at the field edges or adjacent areas. Methoxychlor is the safest material for this use. See labels for interval between last application and harvest for peas used for food or feed.

Watch for adult weevil ragging of foliage as pea seedlings emerge from soil. Treat only when damage is unusually severe. With ideal pea growing weather, plants often outgrow weevil damage.

Seedbed preparation and temperatures should favor rapid germination and seedling growth. This in turn will enable plants to withstand weevil feeding without requiring chemical treatment.

***WIREWORMS—SEEDCORN MAGGOT**

ACTUAL TOXICANT PER ACRE
lindane

Application and Remarks

Use lindane at 2 ounces actual material per bushel. Mix thoroughly with seed or have prepared as a commercial mix.

Additional materials which are registered for use on peas and which may be useful under certain conditions: carbaryl (Sevin), diazinon, dimethoate (Cygon or De-Fend), methyl parathion (do not use microencapsulated formulation—PennCap-M—because of hazard to bees), mevinphos (Phosdrin).

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Dry Edible and Seed Lentils

See label for interval between last application and harvest for lentils used for food or feed.

WIREWORMS

(For seed treatment only)

lindane (see previous section)

***WESTERN YELLOWSTRIPED ARMYWORM—ALFALFA LOOPER—CUTWORMS—PEA APHIDS—COWPEA APHID**

ACTUAL TOXICANT PER ACRE
malathion 1 lb†

Application and Remarks

Start checking fields for caterpillars during last half of May. If allowed to develop to large size, they are extremely difficult to control.

†Recommended in previous years, but no labels have been found in the Northwest which include this pest(s). Where several pests are listed, one or more may not appear on the label. Proposed amendments to the federal law (FIFRA) would permit such recommendations, but until the law is amended or the pests appear on labels, these uses will violate EPA regulations.

Dry Edible and Seed Beans

***SEEDCORN MAGGOT**

(Use only one—for seed treatment only)

lindane PLUS thiram
lindane PLUS captan
diazinon PLUS captan
ethion PLUS captan
phorate (Thimet) (planting time—not seed treatment)

Application and Remarks

Plant seed commercially treated with insecticide plus fungicide or: treat 100-pound lots of bean seed prior to planting.

Follow the manufacturer's directions concerning the amounts of fungicide to use. Treat beans shortly before planting in a slurry treater or pour the slurry mixture over the seed and mix with a shovel until the beans are well coated and dry. Add 2/3 pint of methyl cellulose powder per gallon of water. The insecticide-fungicide mixture may also be used as a dry treatment, but the results will not be as satisfactory.

Use 1 ounce 75% WP lindane plus thiram or captan plus enough water to make 1 pint. Use 1 pint of slurry to 100 pounds of seed.

Use 1 ounce 50% WP diazinon or 4 ounces 25% WP ethion plus captan plus enough water to make 1 pint. Use 1 pint of slurry to 100 pounds of seed.

Use 10% granular phorate at 10 to 15 pounds per acre or 9 to 14 ounces per 1,000 feet of row.

Distribute evenly in the row to the side of the seed at planting time. Do **not** place Thimet in direct contact with the seed.

TWOSPOTTED MITE

ACTUAL TOXICANT PER ACRE (Use only one)

propargite (Comite) 1.7-2.5 lb
carbophenothion (Trithion) 1.2 lb
dicofol (Kelthane) 1.2 lb
demeton (Systox) 0.5 lb
phorate (Thimet) 1-1.5 lb

Application and Remarks

Apply propargite spray when mites appear in damaging numbers, **not** closer than 28 days before harvest.

Apply demeton EC at a dosage rate of 8 ounces actual material per acre. Apply to foliage as needed.

Apply phorate 10% granular as a side dress 2 weeks after plant emergence. Apply at 10 to 15 pounds of the granular material per acre or 9 to 14 ounces per 1,000 feet of row.

CORN EARWORM

ACTUAL TOXICANT PER ACRE

carbaryl (Sevin) 2 lb

Application and Remarks

Earworms are an occasional pest on beans in years when populations are heavy on corn.

LYGUS BUGS

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) 1-1.5 lb
naled (Dibrom) 1 lb PLUS toxaphene 3 lb
malathion 1 lb PLUS toxaphene 3 lb
dimethoate (Cygon, De-Fend) 0.5 lb
phorate (Thimet) 1-1.5 lb

Application and Remarks

Make one application of naled or malathion plus toxaphene at bud or early blossom stage, a second when pods are about 1 inch long, and a third when beans swell in pods.

Three lygus bugs (adults or nymphs) per plant will cause damage. Treatment level for immature pod ($\frac{3}{4}$ inch or less in length) loss is 2-4 lygus bugs per straight sweep and, for "sting" injury to seeds, it is 2-4 per 10 straight sweeps. Double these numbers when using 180° sweeps.

Apply dimethoate on foliage at bud stage. Do **not** apply to bloom.

Apply phorate as a side dress about 2 weeks after plant emergence. Apply 10 to 15 pounds of 10% granular Thimet per acre or 9 to 14 ounces per 1,000 feet of row.

BEAN APHID—GREEN PEACH APHID—COWPEA APHID

ACTUAL TOXICANT PER ACRE (Use only one)

carbophenothion (Trithion) 1.2 lb
endosulfan (Thiodan) 1 lb (green aphid only)[§]
dimethoate (Cygon, De-Fend) 0.5 lb
disulfoton (Di-Syston) 1-2 lb
demeton (Systox) 6-8 oz

Application and Remarks

Aphids are only occasionally abundant on dry beans. There is no evidence that control of aphids or leafhoppers will reduce the spread of mosaic or other virus diseases. Do not apply endosulfan more than 3 times per season.

WESTERN FLOWER THRIPS—ONION THRIPS

ACTUAL TOXICANT PER ACRE (Use only one)

malathion 1 lb
dimethoate (Cygon, De-Fend) 0.5 lb
mevinphos (Phosdrin) 6 oz
phorate (Thimet) 1-1.5 lb

Application and Remarks

Found to be a pest in a few areas of central and eastern Washington. Apply sprays only where thrips damage is apparent and blossom and leaf loss will justify chemical sprays.

Apply dimethoate EC at 0.5 pound active chemical per acre or 1 to 1½ pints or 2.67 pounds per gallon material per acre. Use only as needed. Apply Thimet 10% granular at 10 to 15 pounds per acre or 9 to 14 ounces per 1,000 feet of row. Apply phorate as a side dress about 2 weeks after plant emergence.

***VARIEGATED CUTWORM—WESTERN BEAN CUTWORM (Only a pest in south central Idaho)**

ACTUAL TOXICANT PER ACRE (Use only one)

trichlorfon (Dylox or Proxol) cutworm bait
carbaryl (Sevin) cutworm bait
trichlorfon (Dylox) 1-1.5 lb
endosulfan (Thiodan) 1 lb[§]
naled (Dibrom) 1-2 lb (variegated cutworm only)
toxaphene 3 lb (variegated cutworm only)

Application and Remarks

Larvae feed on foliage, pods and developing beans. Trichlorfon performance improved by acidification of alkaline spray waters. See details under lygus bug program on alfalfa seed.

The western bean cutworm is not a pest in Washington, Oregon, and Nevada. In Idaho, the adult moths emerge during late July. Treatment indicated by black light trap collections is gen-

erally applied about August 15. Only trichlorfon, carbaryl, and endosulfan are effective against the western bean cutworm.

MEXICAN BEAN BEETLE

ACTUAL TOXICANT PER ACRE (Use only one)

carbaryl (Sevin) 1 lb
trichlorfon (Dylox or Proxol) 1-1.5 lb
azinphosmethyl (Guthion) 0.5 lb
disulfoton (Di-Syston) 1-2 lb
endosulfan (Thiodan) 1 lb
phorate (Thimet) 1-2 lb
ethion 1 lb

This pest is now found in southern Idaho in localized areas.

Additional material which is registered for use on beans and which may be useful under certain conditions: aldrin (existing stocks can be used according to label directions).

§SPECIAL CAUTION: **Do not** plant root crops other than carrots, potatoes, sugarbeets, and sweetpotatoes as followup crop.

COMMON AND SCIENTIFIC INSECT NAMES

BENEFICIAL PREDATORS AND PARASITES

Alfalfa aphid parasite	<i>Aphidius ervi pulcher</i>
Alfalfa weevil parasite	<i>Bathyplectes curculionis</i>
Bird syrphid	<i>Eupeodes volucris</i>
Cabbageworm parasite	<i>Apanteles glomeratus</i>
Clover aphid parasite	<i>Aphelinus lapisligni</i>
Common damsel bug	<i>Nabis americanoferus</i>
Common syrphid	<i>Scaeva pyrastris</i>
Convergent lady beetle	<i>Hippodamia convergens</i>
Crab spider	<i>Misumenops celer</i>
Cutworm tachina	<i>Exorista larvarum</i>
European aphid parasite	<i>Aphidius ervi ervi</i>
Field predator mite	<i>Amblyseius cucumeris</i>
Greenbug parasite	<i>Aphidius testaceipes</i>
Green lacewing	<i>Chrysopa carnea</i>
Indian aphid parasite	<i>Aphidius smithi</i>
Large bigeyed bug	<i>Geocoris bullatus</i>
Minute egg parasite	<i>Trichogramma minutum</i>
Minute pirate bug	<i>Orius tristicolor</i>
Mite destroyers	<i>Scymnus</i> spp.
Ninespotted lady beetle	<i>Coccinella 9-notata</i>
Pea aphid parasite	<i>Praon pequodorum</i>
Predator mites	<i>Amblyseius falacis</i> and <i>A. californicus</i>
Red clover syrphid	<i>Sphaerophoria guttulata</i>
Redtailed tachina	<i>Wintthemia quadripustulata</i>
Seed chalcid parasites	<i>Amblymerus bruchophagi</i> , <i>Liodontomerus perplexus</i> , and <i>Habrocytus medicaginis</i>
Sinuate lady beetle	<i>Hippodamia sinuata</i>
Spined assassin bug	<i>Sinea diadema</i>
Transverse lady beetle	<i>Coccinella transversoguttata</i>
Western bigeyed bug	<i>Geocoris pallens</i>

Western damsel bug

Nabis alternata

Western syrphid

Syrphus opinator

PEST INSECTS

Alfalfa aphid	<i>Macrosiphum creelii</i>
Alfalfa looper	<i>Autographa californica</i>
Alfalfa seed chalcid	<i>Bruchophagus roddi</i>
Alfalfa weevil	<i>Hypera postica</i>
Army cutworm	<i>Euxoa auxiliaris</i>
Bean aphid	<i>Aphis fabae</i>
Beet armyworm	<i>Spodoptera exigua</i>
Beet leafhopper	<i>Circulifer tenellus</i>
Beet leafminers	<i>Pegomya betae</i> and <i>Psilopa leucostoma</i>
Beet webworm	<i>Loxostege sticticalis</i>
Bertha armyworm	<i>Mamestra configurata</i>
Black grass bugs	<i>Irbisia fuscipubes-</i> <i>cens</i> , <i>I. shulli</i> , and <i>I. nigripes</i>
Black pollen beetle	<i>Meligethes nigrescens</i>
Blue alfalfa aphid	<i>Acyrtosiphon kondoi</i>
Brown wheat mite	<i>Petrobia latens</i>
Cabbage aphid	<i>Brevicoryne brassicae</i>
Cabbage flea beetle	<i>Phyllotreta cruciferae</i>
Cabbage looper	<i>Trichoplusia ni</i>
Cabbage maggot	<i>Hylemya brassicae</i>
Cabbage seedpod weevil	<i>Ceutorhynchus assimilis</i>
Carrot aphid	<i>Cavariella aegopodii</i>
Carrot budmite	<i>Aceria peucedani</i>
Carrot rust fly	<i>Psila rosae</i>
Carrot seed chalcid	<i>Systole geniculata</i>
Clover aphid	<i>Nearctaphis bakeri</i>
Clover bud caterpillar	<i>Grapholiiha conversana</i>
Clover leaf weevil	<i>Hypera punctata</i>
Clover root borer	<i>Hylastinus obscurus</i>

Clover root curculio	<i>Sitona hispidula</i>	Mexican bean beetle	<i>Epilachna verivestis</i>
Clover seed chalcid	<i>Bruchophagus platyptera</i>	Oat birdcherry aphid	<i>Rhopalosiphum padi</i>
Clover seed midge	<i>Dasyneura leguminicola</i>	Omnivorous leaf-tier	<i>Cnephasia longana</i>
Clover seed weevil	<i>Miccotrogus picirostris</i>	Onion maggot	<i>Hylemya antiqua</i>
Corn earworm	<i>Heliothis zea</i>	Onion thrips	<i>Thrips tabaci</i>
Corn leaf aphid	<i>Rhopalosiphum maidis</i>	Orchardgrass aphid	<i>Hyalopteroides dactylidis</i>
Cowpea aphid	<i>Aphis craccivora</i>	Orchardgrass billbug	<i>Sphenophorus venatus confluens</i>
Diamondback moth	<i>Plutella xylostella</i>	Pacific Coast wireworm	<i>Limonius canus</i>
Dryland wireworm	<i>Ctenicera glaucus</i>	Pacific grass bug	<i>Irbisia pacifica</i>
English grain aphid	<i>Macrosiphum avenae</i>	Pea aphid	<i>Acyrtosiphon pisum</i>
Garden symphylan	<i>Scutigera immaculata</i>	Pea leaf weevil	<i>Sitona lineata</i>
Glassy cutworm	<i>Crymodes devastator</i>	Potato aphid	<i>Macrosiphum euphorbiae</i>
Grass billbugs	<i>Sphenophorus venatus</i> , <i>S. cicatristriatus</i> , and <i>S. sayi</i>	Redback cutworm	<i>Euxoa ochrogaster</i>
Grass gelechiid	<i>Chionodes psiloptera</i>	Rose grass aphid	<i>Acyrtosiphon dirhodum</i>
Grasshoppers	<i>Melanoplus sanguinipes</i> , <i>M. bivittatus</i> , <i>M. femurrubrum</i> , <i>Camnula pellucida</i> , and <i>Aulocara elliotii</i>	Seedcorn maggot	<i>Hylemya platura</i>
Grass mealybug	<i>Heterococcus graminicola</i>	Slugs	<i>Deroceras reticulatum</i> , <i>Arion ater</i> , and others
Grass mite	<i>Oligonychus pratensis</i>	Sod webworms	<i>Chrysoteuchia topiaria</i> and <i>Crambus</i> spp.
Grass sawflies	<i>Dolerus collaris</i> , <i>Pachynematus</i> sp.	Spinach leafminer	<i>Pegomya hyoscyami</i>
Grass thrips	<i>Aptinotrips rufus</i> , <i>A. stylifera</i> , and <i>Anaphotrips obscurus</i>	Spotted alfalfa aphid	<i>Therioaphis maculata</i>
Great Basin wireworm	<i>Ctenicera pruinina</i>	Sugarbeet wireworm	<i>Limonius californicus</i>
Green Peach aphid	<i>Myzus persicae</i>	Sweetclover aphid	<i>Therioaphis riehmii</i>
Imported cabbageworm	<i>Pieris rapae</i>	Sweetclover weevil	<i>Sitona cylindricollis</i>
Labops grass bugs	<i>Labops hesperius</i> and <i>L. utahensis</i>	Tenlined June Beetle	<i>Polyphylla decemlineata</i>
Ladino clover seed midge	<i>Dasyneura gentneri</i>	Turnip aphid	<i>Hyadaphis pseudobrassicae</i>
Lesser clover leaf weevil	<i>Hypera nigrirostris</i>	Twospotted mite	<i>Tetranychus urticae</i>
Lettuce aphid	<i>Macrosiphum barri</i>	Variiegated cutworm	<i>Peridroma saucia</i>
Lygus bugs	<i>Lygus hesperus</i> and <i>L. elisus</i>	Vetch bruchid	<i>Bruchus brachialis</i>
Meadow plant bug	<i>Leptopterna dolabrata</i>	Western bean cutworm	<i>Loxagrotis albicosta</i>
Meadow spittlebug	<i>Philaenus spumarius</i>	Western black flea beetle	<i>Phyllotreta pusilla</i>
Melon aphid	<i>Aphis gossypii</i>	Western corn rootworm	<i>Diabrotica virgifera</i>
		Western field wireworm	<i>Limonius infuscatus</i>
		Western flower thrips	<i>Frankliniella occidentalis</i>
		Western spotted cucumber beetle	<i>Diabrotica undecimpunctata</i>
		Western yellowstriped armyworm	<i>Spodoptera praefica</i>
		Winter grain mite	<i>Penthaleus major</i>
		Zebra caterpillar	<i>Ceramica picta</i>

Use of a trade name does not imply endorsement of one product over another.

1978 SUMMARY OF USEFULNESS OF INSECTICIDES AND ACARICIDES TO ALFALFA SEED INSECT MANAGEMENT IN THE PACIFIC NORTHWEST

	Lb/A	Safety to Alkali Bees	Safety to Alfalfa Leafcutting Bees	Safety to Predators	Effect on Lygus Bugs	Effect on Aphids	Effect on Mites	Effect on Alfalfa Weevil	Effect on Cut-worms and Armyworms	Effect on Grasshoppers	Effect on Stem Nematode	Safety to Applicator
PREBLOOM TREATMENTS												
Carzol	0.46	3*	2	2	5	3	5	—	—	—	0	2
Cygon or Defend	0.5	0	0	0	5	4	2	1	0	5	—	3
Diazinon	1.0	0	0	0	1	2	0	3	1	3	0	3
Di-Syston G	1.0	5	5	1	3	5	—	0	6	0	2	3
Furadan	1.0	0	0	0	5	3	0	5	4	5	1	3
Lannate	0.23-0.45	3	2	1	4	4	—	3	5	—	0	0
Malathion	1.25	2	0	1	1	3	0	2	2	5 (ULV)	0	5
Supracide	1.0	0	0	0	5	3	4	4	—	3	—	2
Thimet G	2.0	4	4	1	4	3	—	2	0	0	2	3
Toxaphene	3.0	4	0	2	4	0	0	—	4	4	0	3

PREBLOOM OR BLOOM TREATMENTS												
Dibrom	1.0	3	1	1	5	1	0	2	2	3	0	3
Dylox or Proxol	1.0	4	4	4	3	0	0	0	4	1	0	3
Kelthane	1.0	5	4	4	0	0	5	0	0	0	0	5
Meta-Systox-R	0.25	4	3	4	4	4	—	0	0	0	—	3
Methoxychlor	1.5-3.0	4	4	1	2	0	0	4	3	3	0	5
Comite	2.0	5	4	5	0	0	5	0	0	0	0	5
Systox	0.25	4	4	4	1	5	2	0	0	0	—	0
Toxaphene (alkali bee operations only)	3.0	4	0	2	4	0	0	—	4	4	0	3

* Index of 0-5 indicates greatest benefit with largest figure.



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