

DEC 27 1988

Ms. Carolyn Bussey
Ciba-Geigy Corporation
P.O. Box 18300
Greensboro, NC 27419

Subject: Amendment - Revised draft manufacturing-use label
indicating end-use patterns to be supported by data;
Submission of associated Technical Bulletin
D-z-n MG-2
EPA Reg. No. 100-652
Your submission dated December 20, 1988

Dear Ms. Bussey:

The amendment referred to above, submitted in connection with a registration under the Federal Insecticide, Fungicide, and Fertilizer Act, is acceptable. The following revisions/corrections should be made before actual printing of the finished label:

- 1) Please delete the hyphen appearing in "pyrimidin-yl" in the formula name. As previously indicated, the active ingredient should be declared as:

Diazinon [O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate]
- 2) In the "Precautionary Statements", the signal word DANGER must also appear directly under the heading "Hazards to Humans and Domestic Animals" (i.e., inserted in front of "Corrosive").
- 3) You may choose to hyphenate "end-use" in the use statement appearing on the top of the front panel (as it appears in your cover letter, and on your other manufacturing-use labels, in their "Directions for Use").
- 4) The associated Technical Bulletin, as you are aware, was prepared some time ago (a copyright date of 1972 appears on the first page) and needs updating. Among other revisions, be sure to delete reference to the use as a nematocide or against forest insects, you may wish to include D.z.n.® as a trademark, the toxicology, metabolism, and degradation sections should reflect current study results (it is noted that there

are no references to any potentially toxic impurities which may be present, as reported in the scientific literature), the current address and phone number should be given for emergency medical information, the listing of tolerances should be current up through the last issuance (Chinese radish), the crop listing should be revised to reflect only supported use patterns, the crop application rates should be revised to reflect the proposed new rates which will appear on your revised end-use labels to be submitted in February 1989, and the product availability listing should include your current products. The Agency is starting the Technical Bulletin "Accepted with Comments" at this time, understanding that it will take longer to prepare and submit such revisions to the Technical Bulletin, especially the crop recommendations section, than to prepare the finished product label with the revisions indicated in items number 1, 2, and 3 above.

A stamped copy of the label and the associated Technical Bulletin are enclosed for your records. Please submit five (5) copies of the finished label (bearing the above-mentioned revisions), prior to release for shipment. When available (but no longer than 6 months), please submit five copies of a revised Technical Bulletin, which may be in draft form, for Agency review.

Sincerely yours,

George T. LaRocca
Product Manager (15)
Insecticide-Fungicide Branch
Registration Division (TS-767)

CIBA-GEIGY

Gallons
U.S. Standard Measure

Doc no MG-2

A micro-emulsion insecticide for formulating use only into registered end use pesticides.

Active Ingredient:

Diazinon: O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidin-yl) phosphorothioate 23.8%

Inert Ingredients: 76.2%

Totals: 100.0%

Contains 2.0 lbs. of diazinon per gallon
Contains xylene range aromatic solvent.

Control No. _____

ACCEPTED
with COMMENTS
in EPA Letter Dated

KEEP OUT OF REACH OF CHILDREN.

DEC 7 1971

DANGER

Under the Federal Insecticide,
Fungicide, and Rodenticide Act
as amended, this pesticide
registered under EPA Reg. No.

160-652

Precautionary Statements

Hazards to Humans and Domestic Animals

Corrosive. Causes irreversible eye damage. Harmful if swallowed, inhaled, or absorbed through skin. Wear goggles or face shield when handling and mixing. Do not get in eyes, on skin or clothing. Avoid breathing of vapors or mist. Wash thoroughly with soap and water after handling and before eating, drinking or smoking. Remove contaminated clothing and wash before reuse.

Continued

Animal studies have indicated the product to be contact allergenic. Hypersensitive individuals should avoid exposure. Avoid contamination of food and feeds.

Statement of Practical Treatments

If in eyes: Immediately flush eyes with plenty of water. Get medical attention promptly.

If swallowed: Contact a physician or Poison Control Center. DO NOT INDUCE VOMITING as vomiting may present aspiration hazard. Drink 1 or 2 glasses of water and get medical help. If no other treatment is available, induce vomiting only under medical supervision. Do not induce vomiting or give anything by mouth if person is unconscious or convulsing.

If on skin: Wash with plenty of soap and water. If irritation develops or persists, get medical attention.

If inhaled: Move to fresh air and apply artificial respiration if indicated.

Note to Physician: Diazinon is a cholinesterase inhibitor. Gastric lavage is indicated. Do not induce emesis since solvent presents aspiration hazard. If symptoms of cholinesterase inhibition are present, atropine sulfate by injection is antidotal. 2-PAM is also antidotal and may be administered but only in conjunction with atropine. After lavage, install and leave 30 gm of activated charcoal in 3-4 oz. of water in the stomach.

Environmental Hazards

The product is highly toxic to fish and wildlife. Do not discharge effluent into lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NEDES permit. Do not discharge effluent containing this product into sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the Environmental Protection Agency.

Physical or Chemical Hazards

Do not use or store near heat or open flame.

Directions for Use

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

This pesticide may be used only for the formulation of an insecticide with the following use patterns:

Indoor: domestic indoor
food/feed handling establishments (including food/feed areas)

Outdoor: domestic outdoor (formulation band spray only)

Refer to "Technical Bulletin - Dieldrin Insecticide" for further information on physical and chemical properties, formulations, and other important product information. Contact your CIBA-GEIGY Specialty Sales Representative or the CIBA-GEIGY Communications Department at (40) 292-7100 for a copy of this document.

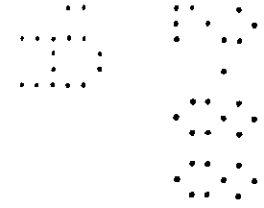
Formulators using this product are responsible for obtaining EPA registration for their formulated product.

Storage and Disposal

Do not contaminate water, food or feed by storage, disposal, or cleaning of equipment. Open dumping is prohibited.

Pesticides: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, mixtures, or rinsates is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional office for guidance.

Containers: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. Combustible containers may be burned or incinerated if allowed by state and local authorities. If burned, stay out of smoke.



For minor spills, leaks, etc., follow all precautions indicated on this label and clean up immediately. Take special care to avoid contamination of equipment and facilities during cleanup and disposal of wastes.

In the event of a major spill, fire, or other emergency, call (919) 292-7100 day or night.

EPA Reg. No. 100-652

EPA Est.

D-z-n® trademark of CIBA-GEIGY for diazinon

Agricultural Division
CIBA-GEIGY Corporation
Greensboro, NC 27419

CGA 1L129C

April 4, 1984
Initial

July 25, 1984
added phys. or chem.
haz. statement, added
formulation information.
FR Notice 83-3
revised statement.

April 2, 1985
Incorporates EPA
comments limiting to
"indoor" formulations
and FR wordage.

May 27, 1985
Change in brand name to
D-z-n® MG-2 and minor
revisions.

Accepted 7/3/85

August 9, 1985
Revised; added xylene
statement page

September 2, 1988
Revised - changed chem.
name, added spill
statement.

November 3, 1988
Revised - changed chem.
name back to original.

December 16, 1988 -
Revised per EPA letter
of 12/9/88 - changed
chem. name back to
original, revised Note
to Physician, added use
patterns to DFU, re-
vised environmental
statements.

(LABELS-D.4 - DENM62/F2)

955
555

ppm level and cholinesterase inhibition at all levels.

b. Three-generation rat reproduction study:

There were no malformations or adverse effects on reproduction.

c. 43-week oral administration to dogs:

4.3 - 5.3 mg/kg/day (in terms of active ingredient) of Diazinon 25W. There were no effects in any of the parameters examined except cholinesterase inhibition.

d. 106-week oral administration to monkeys: 5.0, 0.5, 0.05 mg/kg/day (in terms of active ingredient) of Diazinon 50W. There were no effects in any of the parameters examined except for cholinesterase inhibition at 5.0 mg/kg/day.

Toxicity to fish and wildlife

Species	LC ₅₀ ppm active ingredient	Exposure period
Mallard duck	90.0	5 days
Bobwhite quail	68.0	7 days
Rainbow trout	0.4	96 hours
Goldfish	9.0	96 hours
Bluegill sunfish	0.136	96 hours

Toxic symptoms which may be observed after accidental ingestion

Headache, giddiness, blurred vision, nervousness, weakness, cramps, diarrhea, discomfort in the chest, sweating, miosis, tearing, salivation, and other excessive respiratory tract secretion, vomiting, cyanosis, papilledema, uncontrollable muscle twitches, convulsions, coma, loss of reflexes, and loss of sphincter control.

Antidote

Atropine is antidotal providing it is used as soon as early poisoning symptoms appear and the dose of Diazinon is not too great. It is important to give large doses of atropine, up to ten times the usual dosage.

I. In very severe cases, the order of treatment for adults should be as follows:

- Artificial respiration, if required, preferably by mechanical means.
- Atropine sulfate, 2 to 4 mg (1/30 to 1/15 grain) intravenously as soon as cyanosis is overcome. Repeat at 5 to 10-minute intervals until signs of atropinization appear (dry, flushed skin and tachycardia as high as 140 per minute).
- 2-PAM slowly (pyridine-2-aldoxime methochloride), intravenously, if the patient fails to re-

spond satisfactorily to atropine sulfate. Dose of 1 g for adults, 0.25 g for infants.

- Lavage stomach.
 - Wash contaminated skin with soap and water.
 - In case of contact with eyes, flush with plenty of water for at least 15 minutes and get medical attention.
 - Symptomatic treatment.
- II. In moderate or mild cases, proceed as follows:
- Atropine sulfate, 1 to 2 mg (1/60 to 1/30 grain) if symptoms appear. If excessive secretions occur, keep the patient fully atropinized. Give atropine sulfate every hour up to 25 to 59 mg in a day.
 - Lavage stomach.
 - Wash contaminated skin with soap and water.
 - In case of contact with eyes, flush with plenty of water for at least 15 minutes and get medical attention.
 - Symptomatic treatment.

Note: Morphine, theophylline, aminophylline and large amounts of intravenous fluids as contraindicated. Atropine should not be given to a cyanotic patient until oxygenation has been restored by artificial respiration. Tranquilizers are seldom indicated and there is evidence that phenothiazine drugs increase mortality in experimental animals poisoned by organic phosphates.

FOR ADDITIONAL INFORMATION, contact the nearest Poison Control Center, or write to the Department of Industrial Medicine, CIBA-GEIGY Corporation, Ardsley, New York 10502; in case of emergencies, phone (day or night) 914-478-3131.

Residue Tolerances for Diazinon

The Environmental Protection Agency has set tolerances for residues of Diazinon on certain raw agricultural commodities as follows:

- 60.00 ppm grass (reduced to 40.00 ppm after 24 hours)
 40.00 ppm alfalfa (fresh), clover (fresh), corn forage, peanut forage, pineapple forage
 25.00 ppm bean forage, pea vines
 10.00 ppm alfalfa hay, bean hay, clover hay, grass hay, pea vine hay,

peanut hulls and hay, sugar beet tops, sorghum forage

- 3.00 ppm almond hulls
 1.00 ppm lespedeza, olives
 0.75 ppm apples, apricots, beans (snap, includes pinto), beet roots, beet tops, blackberries, blueberries, boysenberries, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celery, cherries, citrus (grapefruit, lemons, limes, oranges, tangelos, tangerines, citrus citron, kumquats, and hybrids of these), collards, corn (kernels and cob with husks removed), cranberries, cucumbers, dandelions, dewberries, endive (escarole), figs, grapes, hops, kale, lettuce, lima beans, loganberries, melons, mustard greens, nectarines, onions, parsley, parsnips, peaches, peanuts, pears, peas with pods (determined on peas after removing any shell present when marketed), peppers, pineapples, plums (fresh prunes), radishes, raspberries, sorghum grain, spinach, strawberries, sugar beet roots, sugarcane, summer squash, Swiss chard, tomatoes, turnip roots, turnip tops, watercress, winter squash, cattle (meat, fat and meat by-products), sheep (meat, fat and meat by-products)
 0.5 ppm almonds, filberts, pecans, walnuts
 0.2 ppm bananas (of which not more than 0.1 ppm shall be present in the pulp after peel is removed), cottonseed
 0.1 ppm cowpea forage, cowpeas, potatoes, soybean forage, soybeans, sweet potatoes

Animal and Plant Metabolism

The metabolism of Diazinon has been investigated by many researchers since this compound has such broad insecticidal value. The primary route of metabolism in animals is hydrolysis of the phosphorous ester bond yielding 2-isopropyl-6-methyl-4-hydroxy pyrimidine and oxidation at the primary and tertiary C-atom of the isopropyl side chain. Diazinon and its metabolites are rapidly excreted in urine and feces. Studies dealing with metabolic and residual fate of Diazinon in animals have shown that residues in fats and milk of cows and sheep are very short-lived, if at all present and are only found in trace amounts if present. Other tissues in the body are found to be free of resi-

dues. Urine is the main route of elimination of Diazinon.

The excretion balance, distribution in organs, and the structures and properties of main metabolites of Diazinon in the rat have been studied by Mucke et al. Practically complete elimination of Diazinon and its metabolites was observed to occur very rapidly. Half of the applied dose was excreted in 12 hours and the radiolabeled material could not be detected in the rats 2 days after application. Of the material excreted, 69 to 80% was in the urine and 18 to 20% was in the feces.

The absence of radioactive CO_2 in the expired air after application of ^{14}C Diazinon proved that no cleavage of the pyrimidine ring took place. Dissipation curves of the isotope in the respective body organs following a ten day ^{14}C Diazinon feeding period clearly excluded any accumulation of the insecticides or its metabolites in the essential organs of the rat. The oxygen analog, Diazoxon which is a labile and transient intermediate, was absent in extracts of urine and feces when checked with TLC procedures. Four metabolic fractions were found in the urine. Three metabolites representing approximately 70% of the radioactivity totally applied were identified in addition to trace amounts of unchanged Diazinon in the feces. Hydrolysis of the ester bond yielding 2-isopropyl-6-methyl-4-hydroxy-pyrimidine and oxidation of the primary and tertiary C-atom of the isopropyl side chain were found as the main degradation mechanisms. The two main metabolites no longer inhibit cholinesterase and their acute oral toxicities are less than one tenth of that of the parent compound. The relationships between the oxidation of the thiono sulfur, a toxication reaction, and the hydrolysis especially at the pyrimidinyl phosphorous bond, a detoxication reaction, were comparatively investigated in insects and mice by Krueger et al. The enhanced selectivity in insects was attributed to high levels of Diazoxon whereas mice showed a much greater capacity to hydrolyze Diazinon and Diazoxon.

The decrease of insecticidal activity of Diazinon on plants appears to occur by two methods namely, evaporation and hydrolysis of the ester. The resulting isopropyl-6-methyl-4-hy-

droxy-pyrimidine is degraded to more polar metabolites. The formation of biologically active metabolites during these degradation processes on plants is minimal if present. The half life of residues on plants is about 1-2 weeks. Eberle's and also Rall's work indicate that the only cholinesterase-inhibiting metabolite detectable at any time after Diazinon application to plants was Diazoxon at a maximum level of 0.004 ppm to 0.007 ppm. At harvest the fruits and vegetables tested all contained less than 0.002 ppm. Eberle concluded that the appearance and subsequent disappearance of traces of Diazoxon gives evidence that Diazinon is oxidized in plants to Diazoxon which in turn is rapidly altered to non-cholinesterase-inhibiting products because of its low hydrolytic stability. Another cholinesterase-inhibiting metabolite has been reportedly found in a trace amount in kale by Pardue et al. It has been tentatively identified as hydroxydiazinon (O,O-diethyl-O-(2'-hydroxy-2'-propyl-6-methyl-4-pyrimidinyl) phosphorothioate), a breakdown product which can be produced by UV irradiation of Diazinon. This compound has not been detected in residue analysis in our laboratories.

Chemical and Microbial Degradation

Studies with radiolabeled Diazinon in soils have shown that the primary degradation pathway of this insecticide is hydrolysis at the heterocyclic phosphate bond, followed by disruption of the cyclic moiety with subsequent formation of CO_2 . No oxygen analog has been detected in soils and no toxic metabolites have been reported. The hydrolysis product, 2-isopropyl-6-methyl-4-hydroxy-pyrimidine, has been extracted from soil, but has a low mammalian toxicity and low cholinesterase inhibition ability according to Eberle et al.

The persistence of C^{14} -labeled Diazinon has been determined in several different soil types. In a study by Getzin the disappearance rate of Diazinon was similar in four different soil types. One half of the original application was lost in 2 to 4 weeks and less than 8% remained after 20 weeks. Getzin also studied the persistence of Diazinon in autoclaved

and non-autoclaved silt loam at 3 temperatures, 4 soil moisture levels, and 4 pH levels. Diazinon degraded faster in non-autoclaved soils than in autoclaved soil; however, the difference observed was slight. The initial half-life of Diazinon was approximately 5 weeks in the non-autoclaved soil and 6 weeks in the autoclaved soil. A comparison of the residues remaining after 4 weeks showed that 80% of the total Diazinon loss was due to non-biological degradation. Diazinon degraded faster with increasing temperature, moisture, and acidity levels in both autoclaved and non-autoclaved soils.

Knutson et al studied the long range residue potential of Diazinon when used in a normal soil and foliar insect control program for irrigated corn. During the 4 year study no detectable residues of Diazinon were found after repeated applications when this silty clay loam soil was sampled 1.5 to 2.5 months after the annual soil treatments. Foliar applications were made at silking time and resulted in no detectable residue in the grain. The corn foliage at harvest contained 0.05 ppm or less Diazinon. Water samples from capped wells and surface water in the irrigation district were analyzed and contained no residues at the 0.1 ppb level indicating no vertical or lateral contamination of ground or surface water from repeated applications of Diazinon.

Various workers have investigated the role of soil microflora in the degradation of Diazinon. Getzin has reported that greater amounts of the hydrolysis products were recovered from sterilized than non-sterilized soil. Researchers generally report that soil microflora play an important role in the degradation of the breakdown products of Diazinon, but not in the degradation of the parent molecule. Harris has reported that 100 ppm of Diazinon in the soil did not have any pronounced effect on either the fungal or bacterial populations of the soil. Gunner and co-workers reported increases in the number of rhizosphere microflora and actinomyces at various times during their experiment with Diazinon treated soil and untreated soil in laboratory studies. They did not see any change in the numbers of fungi throughout the experiments.

Crops and Uses for which Diazinon[®] is Presently Registered

Consult the current labels for specific use directions and additional information.

Fruit and nut insects

	Rate/Application (Pounds Active)
Almonds	
Mites	1/2 - 3/4 per 100 gals.
Twig borers	1/2 - 3/4 per 100 gals.
Parlatoria scales (<i>Parlatoria blanchardi</i>)	1/2 - 3/4 per 100 gals.
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	1/2 - 3/4 per 100 gals.
Apples	
Leathoppers (<i>Empoasca</i> spp.)	1/2 per 100 gals.
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
San Jose scale crawlers (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
Forbes scale crawlers (<i>Quadraspidiotus forbesi</i>)	1/2 per 100 gals.
European red mite eggs (<i>Panonychus ulmi</i>)	1/2 per 100 gals.
Brown mite eggs (<i>Bryobia rubrioculus</i>)	1/2 per 100 gals.
Eye-spotted bud moths (<i>Spilonota ocellana</i>)	1/2 per 100 gals.
Fruit tree leaf rollers (<i>Archips argyrospilus</i>)	1/2 per 100 gals.
Codling moths (<i>Laspeyresia pomonella</i>)	1/2 per 100 gals.
Rosy apple aphids (<i>Dysaphis plantaginea</i>)	1/2 per 100 gals.
Green apple aphids (<i>Aphis pomi</i>)	1/2 per 100 gals.
Wooly apple aphids (<i>Eriosoma lanigerum</i>)	1/2 per 100 gals.
Apple maggots (<i>Rhagoletis pomonella</i>)	1/2 per 100 gals.
Mealybugs	1/2 per 100 gals.
Mites	1/2 per 100 gals.
Apricots	
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
Brown apricot scales	1/2 per 100 gals.
Walnut scales (<i>Quadraspidiotus juglansregiae</i>)	1/2 per 100 gals.
Apricot mealybugs	1/2 per 100 gals.
Aphids	1/2 per 100 gals.
Brown mites (<i>Bryobia rubrioculus</i>)	1/2 per 100 gals.
Clover mites (<i>Bryobia praetiosa</i>)	1/2 per 100 gals.
Two-spotted spider mites (<i>Tetranychus urticae</i>)	1/2 per 100 gals.
Olive scale crawlers (<i>Parlatoria oleae</i>)	1/2 per 100 gals.
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
Blueberries	
Cranberry fruitworms (<i>Acrobasis vaccinii</i>)	1/2 per 100 gals.
Cherry fruitworms (<i>Grapholita packardii</i>)	1/2 per 100 gals.
Blueberry maggots (<i>Rhagoletis mendax</i>)	1/2 per 100 gals.
Aphids	1/2 per 100 gals.
Thrips	1/2 per 100 gals.
Two-spotted mites (<i>Tetranychus urticae</i>)	1/2 per 100 gals.
Caneberries (i.e. blackberries, boysenberries, dewberries, loganberries, raspberries)	
Leafhoppers (<i>Empoasca</i> spp.)	1/2 per 100 gals.
Thrips	1/2 per 100 gals.
Aphids	1/2 per 100 gals.
Two-spotted mites (<i>Tetranychus urticae</i>)	1/2 per 100 gals.

Raspberry sawflies (<i>Mnophadnoides geniculatus</i>)	1/2 per 100 gals.
Raspberry fruitworms	1/2 per 100 gals.
Dryberry mites (<i>Phyllocoptes gracilis</i>)	1 per 100 gals.
Raspberry crown borers (<i>Bembecia marginata</i>)	2 per 100 gals.
Cherries	
Brown apricot scales	3/8 per 100 gals.
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	3/8 per 100 gals.
Black scales (<i>Saissetia oleae</i>)	3/8 per 100 gals.
Black cherry aphid eggs (<i>Myzus cerasi</i>)	3/8 per 100 gals.
Brown mite eggs (<i>Bryobia rubrioculus</i>)	3/8 per 100 gals.
Eye-spotted bud moths (<i>Spilonota ocellana</i>)	1/2 per 100 gals.
Fruit-tree leaf rollers (<i>Archips argyrospilus</i>)	1/2 per 100 gals.
Leafhoppers (<i>Empoasca</i> spp.)	1/2 per 100 gals.
Cherry fruit flies (<i>Rhagoletis cingulata</i>)	1/4 - 1/2 per 100 gals.
Black cherry aphids (<i>Myzus cerasi</i>)	1/2 per 100 gals.
San Jose scale crawlers (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
Cherry rust mites	1/4 - 1/2 per 100 gals.
Cranberries	
Blackheaded fireworms (<i>Rhopobota naevana</i>)	2 per
Cranberry fruitworms (<i>Acrobasis vaccinii</i>)	3 per
Figs	
Vinegar flies (<i>Drosophila</i> spp.)	1/2 per 100 gals.
Dried fruit beetles (<i>Carpophilus hemipterus</i>)	1/2 per 100 gals.
Filberts	
Filbert leaf rollers (<i>Archips rosana</i>)	1-2 per A.
Aphids	1-2 per A.
Citrus fruits (grapefruit, lemons, limes, oranges, tangelos, tangerines, citrus citron, kumquats, and hybrids of these)	
Citrus aphids	1/4 - 1/2 per 100 gals.
Cottony-cushion scale crawlers (<i>Icerya purchasi</i>)	1/4 - 1/2 per 100 gals.
Soft scale crawlers	1/4 - 1/2 per 100 gals.
Fruit-tree leaf rollers (<i>Archips argyrospilus</i>)	1/4 - 1/2 per 100 gals.
Citrus thrips (<i>Scirtothrips citri</i>)	1/2 per 100 gals.
Citrus snow scales (<i>Unaspis citri</i>)	1/2 - 1 per 100 gals.
Grapes	
Pacific spider mites (<i>Tetranychus pacificus</i>)	1/2 per 100 gals.
Leafhoppers (<i>Empoasca</i> spp.)	1/2 per 100 gals.
Grape berry moths (<i>Paralobesia viteana</i>)	1/2 per 100 gals.
Grape leaf folders (<i>Desmia funeralis</i>)	1/2 per 100 gals.
Vinegar flies (<i>Drosophila</i> spp.)	3/16 per 100 gals.
Olives	
Olive scales (<i>Parlatoria oleae</i>)	3/8 - 1/2 per 100 gals.
Peaches and nectarines	
San Jose scales (<i>Quadraspidiotus perniciosus</i>)	1/2 per 100 gals.
Brown apricot scales	1/2 per 100 gals.
Walnut scales (<i>Quadraspidiotus juglansregiae</i>)	1/2 per 100 gals.
Apricot mealybugs	1/2 per 100 gals.
Peach twig borers (<i>Anarsia lineatella</i>)	1/2 per 100 gals.

Apple	1960	10
Apricot	1960	10
Banana	1960	10
Blackberry	1960	10
Blueberry	1960	10
Cherry	1960	10
Cranberry	1960	10
Fig	1960	10
Grape	1960	10
Guava	1960	10
Honeydew	1960	10
Kiwi	1960	10
Lemon	1960	10
Lime	1960	10
Mango	1960	10
Orange	1960	10
Peach	1960	10
Pineapple	1960	10
Raspberry	1960	10
Strawberry	1960	10
Watermelon	1960	10

Walnuts	1960	10
Almonds	1960	10
Coconut	1960	10
Pistachio	1960	10
Macadamia	1960	10

Vegetable Foliar Insects		
Beet	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10
Colorado potato beetle	1960	10

Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10
Bean	1960	10

Broccoli	1960	10
Cabbage	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10
Brussels sprouts	1960	10

Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10
Carrot	1960	10

Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10
Celery	1960	10

Collards	1960	10
Kale	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10
Swiss chard	1960	10

Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10
Cucumbers	1960	10

Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10
Lettsuce and endive	1960	10

Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10
Melons and squash	1960	10

BEST AVAILABLE COPY

Serpentine leaf miners (*Liriomyza brassicae*) ¼ - ½ per A.
Thrips ¼ - ½ per A.

Mushroom houses
Mushroom flies (*Phorids & Sciarids*) 2-4 per 50 gals.

Onions
Onion thrips ½ per A.

Peas
Aphids ¾ - ½ per A.
Leaf miners ¾ - ½ per A.

Peppers
Aphids ¼ per A.
Serpentine leaf miners (*Liriomyza brassicae*) ¼ per A.

Potatoes
Aphids ¼ - ¾ per A.
Flea beetles (*Epitrix* spp. *Phyllotreta* spp. *Chaetocnema* spp.) ¼ - ¾ per A.
Dipterous leaf miners ¼ - ¾ per A.
Banded cucumber beetles (*Diabrotica balteata*) ¾ - ½ per A.
Leafhoppers (*Empoasca* spp.) ¾ - ½ per A.
Southern armyworms (*Spodoptera eridania*) ¾ - ½ per A.

Radishes, parsnips and turnips
Aphids ¼ - ½ per A.
Flea beetles (*Epitrix* spp. *Phyllotreta* spp. *Chaetocnema* spp.) ¼ - ½ per A.
Dipterous leaf miners ¼ - ½ per A.

Spinach and beets
Aphids ¼ - ½ per A.
Dipterous leaf miners ¼ - ½ per A.

Sweet corn
Corn earworms (*Heliothis zea*) 1-1 ¼ per A.

Tomatoes
Aphids ¼ per A.
Dipterous leaf miners ¼ per A.
Banded cucumber beetles (*Diabrotica balteata*) ¾ - ½ per A.
Vinegar flies (*Drosophila* spp.) ¼ - ¾ per A.
Fall armyworms ¾ - ½ per A.
Southern armyworms (*Spodoptera eridania*) ¾ - ½ per A.

Watercress (Hawaii only)
Cyclamen mites (*Steneotarsonemus pallidus*) ½ per A.

Vegetable Soil Insects

Broccoli, brussels sprouts
Cutworms (surface & subterranean) 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Root maggots 3 per A.
Wireworms 3-4 per A.

Cabbage
Cutworms 2-4 per A.
Garden symphylans (*Scutigerella immaculata*) 10 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Root maggots 2-3 per A.
Wireworms 3-4 per A.

Carrots
Carrot rust flies (*Psila rosae*) 2 per A.
Garden symphylans (*Scutigerella immaculata*) 10 per A.
Wireworms 3-4 per A.

Cantaloupes
Cutworms 2-4 per A.
Wireworms 3-4 per A.

Cauliflower
Root maggots 2-3 per A.
Cutworms 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

Celery
Cutworms 2-4 per A.
Wireworms 3-4 per A.

Collards
Cutworms 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

Cucumbers
Cutworms 2-4 per A.
Wireworms 3-4 per A.

Endive (escarole)
Cutworms 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

Kale
Cutworms 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

Lettuce
Cutworms 2-4 per A.
Garden symphylans (*Scutigerella immaculata*) 10 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

Lima beans
Cutworms 2-4 per A.
Wireworms 3-4 per A.

Muskmelons
Cutworms 2-4 per A.
Wireworms 3-4 per A.
Mustard mole crickets 1 per A.

Onions
Onion maggots (*Hylemya antiqua*) 2-4 per A.

Parsley
Cutworms 2-4 per A.
Wireworms 3-4 per A.

Peas
Cutworms 2-4 per A.
Garden symphylans (*Scutigerella immaculata*) 10 per A.
Wireworms 3-4 per A.

Peppers
Cutworms 2-4 per A.
Mole crickets (*Scapteriscus* spp.) 1 per A.
Wireworms 3-4 per A.

BEST AVAILABLE COPY

Pole beans	
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Potatoes	
Cutworms	2-4 per A.
Wireworms	3-6 per A.
Southern potato wireworms (<i>Conoderus falli</i>)	2-4 per A.
Radishes	
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Root maggots	2 per 100 gals.
Mole crickets	1 per A.
Red Beets	
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Snap beans	
Cutworms	2-4 per A.
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Wireworms	3-4 per A.
Spinach	
Cutworms	2-4 per A.
Wireworms	3-4 per A.
Summer squash	
Cutworms	2-4 per A.
Wireworms	3-4 per A.
Sweet potatoes	
Wireworms	3-4 per A.
Swiss chard	
Cutworms	2-4 per A.
Wireworms	3-4 per A.
Tomatoes	
Cutworms	2-4 per A.
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Wireworms	3-4 per A.
Mole crickets	1 per A.
Turnips	
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Mole crickets (<i>Scapteriscus</i> spp.)	1 per A.
Watermelons	
Cutworms	2-4 per A.
Wireworms	3-4 per A.
Winter squash	
Cutworms	2-4 per A.
Wireworms	3-4 per A.

Field and Forage Insects

Alfalfa & clover	
Spotted alfalfa aphids (<i>Therioaphis maculata</i>)	3/8-1/2 per A.
Yellow clover aphids (<i>Therioaphis trifolii</i>)	3/8-1/2 per A.
Pea aphids (<i>Acyrtosiphon pisum</i>)	3/8-1/2 per A.
Leafhoppers	3/8-1/2 per A.
Plant bug nymphs	3/8-1/2 per A.
Mites	3/8-1/2 per A.
Grasshoppers	1/2 per A.
Cutworms (surface & subterranean)	2-4 per A.
Alfalfa weevil larvae (<i>Hypera postica</i>)	1-1 1/2 per A.
Striped ground crickets	1/2-1 per A.

Corn (field and sweet)	
Corn rootworm larvae (<i>Diabrotica</i> spp.)	1 1/4-2 1/2 oz. per 1000 linear ft.
Lesser cornstalk borers (<i>Elasmopalpus lignosellus</i>)	1 1/4-2 1/2 oz. per 1000 linear ft.
Seed corn maggots (<i>Hylemya platura</i>)	2-4 per A.
Cutworms (surface and subterranean)	2-4 per A.
Wireworms	3-4 per A.
Corn rootworm adults (<i>Diabrotica</i> spp.)	1/4-1/2 per A.
Corn leaf aphids (<i>Rhopalosiphum maidis</i>)	1/2-1 per A.
Grasshoppers	1/2 per A.
Sap beetles	1-1 1/4 per A.
European corn borers (<i>Ostrinia nubilalis</i>)	1-1 1/4 per A.
Fall armyworms (<i>Spodoptera frugiperda</i>)	1-2 per A.
Southwestern corn borers (<i>Diatraea grandiosella</i>)	1-2 per A.
Garden symphylans (<i>Scutigera immaculata</i>)	10 per A.
Cotton	
Spider mites	1/2-1 per A.
Aphids	1/2-1 per A.
Leafhoppers	1/2-1 per A.
Lygus (<i>Lygus lineolaris</i>)	1/2-1 per A.
Cotton leafworms (<i>Alabama argillacea</i>)	1/2-1 per A.
Cotton leaf perforators (<i>Bucculatrix thurberiella</i>)	1/2-1 per A.
Cowpeas	
Cutworms (surface & subterranean)	2-4 per A.
Hops	
Aphids	1 per A.
Mites	1 per A.
Lespedeza	
Cutworms (surface and subterranean)	2-4 per A.
Peanuts	
Southern corn rootworms (<i>Diabrotica undecimpunctata howardi</i>)	4 per A.
Cutworms (surface and subterranean)	2 per A.
Lesser cornstalk borers (<i>Elasmopalpus lignosellus</i>)	2-3 per A.
Sorghum	
Lesser cornstalk borers (<i>Elasmopalpus lignosellus</i>)	1-2 per A.
Sorghum midge (<i>Contarinia sorghicola</i>)	1/4-1/2 per A.
Cutworms (surface and subterranean)	2-4 per A.
Mites	1/2 per A.
Greenbugs (<i>Schizaphis graminum</i>)	1/4-1/2 per A.
Soybeans	
Cutworms (surface and subterranean)	2-4 per A.
Lesser cornstalk borers (<i>Elasmopalpus lignosellus</i>)	1-2 per A.
Sugarbeets	
Sugarbeet root maggots (<i>Tetrahymena myopaeformis</i>)	1-2 per A.
Leafhoppers	3/8-1/2 per A.
Grasshoppers	1/2 per A.
Wireworms	3-4 per A.
Sugarcane	
Sugarcane borers (<i>Diatraea saccharalis</i>)	1.5-2.5 per A.
Aphids	1/4-1/2 per A.
Wireworms	4 per A.

Tobacco

Apple

Banana

Cashew

Cashew nut

Cashew seed

Cashew seedling

Cashew tree

Seed Treatment (planter-box)

Beans

Corn

Peas

Soybeans

Range, Pasture, and Grassland Insects

Bermuda grass

Bluegrass

Timothy

Range and pasture insects

roadside waste and other areas and

barren sites

Livestock Insects

Sheep ticks

Ornamental Insects

On ornamentals such as arbutus, azalea, birch, boxwood, camellia, carnation, chrysanthemum, douglas fir, elm, gladioli, hawthorn, holly, juniper, lilac, locust, maple, oak, pine, plum, poplar, rhododendron, rose, spruce, & willow

Apple

Banana

Cashew

Cashew nut

Cashew seed

Cashew seedling

Cashew tree

Cashew wood

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

Cashew wood (planting material)

... ..

... ..

... ..

... ..

... ..

Lawn Insects

... ..

... ..

... ..

... ..

... ..

... ..

Forest Insects

... ..

Indoor Pests

... ..

... ..

... ..

... ..

BEST AVAILABLE COPY