E-216-W

Beekeeping

Department of Entomology

USING HONEY BEES IN POLLINATION

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TYPES OF BEES

Solitary Bees

Many crops depend on pollination by bees for adequate fruit set. North America has over 3,000 species of "wild" bees. Some of these species are much more efficent than honey bees on a per-bee basis for pollinating specific plants, but almost all wild bees are solitary. A single female makes a nest and forages and cares for the brood. So solitary bees do not have colonies. Many of the wild bees only visit specific kinds of plants, or are only active for part of the season.

Bumblebees

Bumblebees are important because they are large, active foragers and are also social - living in small colonies of about 50 individuals that are active throughout the season. Bumblebee colonies are small in the springtime because only the queen bumblebee overwinters and she must start a new colony on her own. Bumblebee queens often choose abandoned mouse nests and other existing cavities for their nests. Some bumblebee colonies have been made commercially available because they are efficient pollinators in greenhouses.

Honey Bees

Honey bees are social - they have a colony containing one queen that lays all the eggs and with tens of thousands of worker bees to do the foraging. Honey bee colonies also are active throughout the growing season and are much larger than bumblebee colonies, especially in the spring. Worker honey bees will visit any flowers that provide good amounts of nectar or pollen, the two resources bees need for energy and protein. The main advantage of using honey bees is that we can manage colonies with tens of thousands of bees that serve as mobile pollination units.

WHAT'S A GOOD POLLINATING HIVE?

Bee hives consist of several boxes - one or two brood chambers and several smaller boxes, called "supers." A tall hive usually is a strong hive (having 5 to 10 frames of comb covered with bees), which makes it good for pollination, but beekeepers add empty boxes containing comb or wax "foundation" to hives to give them room to grow. Sometimes a tall hive contains empty boxes, plus one box that has bees in it! If it is a strong hive, it should have lots of bees coming and going from the entrance on a warm day. If you have the lid off, there should be many bees filling at least one or two large brood chambers, with a carpet of bees covering the tops of the frames. A good pollinating unit will have at least one deep brood chamber full of bees, brood and eggs (indicating that they have a queen). A hive newly established from a package of bees is not a good pollinating unit.

The minimum size of a pollinating hive depends on the time of year. Perhaps prior to April 1, at least 3 frames of brood should be present. From mid-April to May 1, a pollination service provider may be able to promise a grower that his hives will have 5 to 6 frames of brood. It is reasonable for a grower to ask the beekeeper to show him how strong his hives are by opening some hives that the grower selects.

MOVING HIVES

Bee hives are usually moved after sunset or very early in the morning to avoid losing foraging bees. Beekeepers that move only a few hives usually just screen off the entrances and load the hives individually on a truck. Larger beekeepers usually move hives on pallets with four hives per pallet. The grower should expect the hives to come at night and make arrangements with the beekeeper regarding where the hives will be placed in the orchard or the edges of the field.

Timing the Move

The importance of timing depends on what flowers are competing for the attention of the bees. One thing to consider is the attractiveness of the crop as a nectar source. Bees are very good at locating the sweetest nectar in the area (often from weeds in the surrounding

fields). Bees like to forage within 300 feet of the hive but will travel two miles or more for a good nectar source. Ideally, it is best to have the bees moved into the crop just as flowering has started in earnest, so that the bees do not get used to foraging on the nearby weeds. If they are moved in too soon, there may not be enough of the crop blooming to effectively compete with the weeds.

CONSIDER HAVING A POLLINATION CONTRACT

When contracting for pollination, it is important that the beekeeper and grower discuss details such as how many hives are needed and when. The beekeeper needs to have a backup plan to provide the grower with colonies from another beekeeper if his colonies are insufficient for pollination when needed. Bees are extremely sensitive to insecticide sprays on flowers. It is possible for a beekeeper to lose all of his colonies in one week to pesticide poisoning during pollination. The beekeeper should have access to the colonies at all times to inspect them and make sure they still have queens, adequate stores and are healthy. The beekeeper and grower should be aware of which pesticides are most toxic to bees. It is best to sign a formal contract. This protects both the grower and the beekeeper. A sample pollination contract appears at the end of this document.

HOW MANY HIVES ARE NEEDED?

The Literature Average for Recommended Number of Hives Per Acre of Crop [A]

Apples: 1.2
Blueberries: 4
Cantalope: 2.4
Cucumber 2.1
Squash: 1
Watermelon: 1.3

[A] Data taken from Delaplaine et al. 1994, Bee pollination of Georgia crop plants. CES Bulletin 1106.

PROTECTING BEES FROM PESTICIDES

Nearly all bee kills by pesticides are caused by application or drift of pesticides onto blooms that are attractive to bees. Bees are attracted to flowers to collect both nectar and pollen. Do not apply bee-hazardous pesticides to blooms. The magnitude of bee kill by pesticides largely depends on the number of flowers present and the number of bees on the flowers. Spraying larger fields results in higher losses of honey bees. Spraying when the field is in full bloom results in higher losses than spraying in partial bloom. For the same reason, applications by home owners in the suburbs has little effect on bee populations because the number of flowers treated is small.

Pesticide Toxicity

The acutely toxic effects of pesticides to bees are measured by experiments in which the test compound is administered to bees as a contact pesticide in a controlled way. The following short table indicates how pesticides are rated based on their LD_{50}'s (the concentration in microgram/bee needed to kill 50% of the test bees). This information was used in the development of the recommendations in the table that follows.

Classification of toxicity based on µg/bee	
>100	virtually non-toxic
11-100	slightly toxic
2.0-10.99	moderately toxic
<2.0	highly toxic

Residue Exposure

Residue is the amount of pesticide that remains on the plants after they have been sprayed. The residue decreases over time as the pesticide degrades and the rate of decrease depends on the pesticide. Some pesticides are very toxic to bees but will rapidly decay to less toxic compounds. Other compounds have longer residual toxicity. Pesticides decompose more quickly when the temperature is warm. Cooler temperatures can dramatically increase the time needed for residues to become non-toxic to bees. Be careful when the weather is cool. Cold nights followed by warm summer days can greatly increase the danger of bee kills.

Timing

Do not spray chemicals that are harmful to bees when bees are foraging on the crop or on weeds that will receive pesticide. Proper timing of the spray can greatly reduce the hazards to bees. Often spraying in the evening or early morning is recommended for pesticides that have short residuals (see Table).

Bees will collect pollen from corn, even though it is wind pollinated. With some types of corn, bees will collect pollen only in the morning, but other cultivars shed pollen all day. Often plants shed pollen that is attractive to bees only in the morning. Watch the bees to see when they are working the plants.

Pesticide Recommendations and the Duration of the Toxic Effects on Bees

(data taken from Johansen, CA and DF Meyer 1990, *Pollinator Protection, A bee and Pesticide Handbook*. Wicwas Press, Cheshire, CT.)

GROUP A: DO NOT APPLY DURING BLOOMING IN CROPS OR WEEDS

Pesticides	Duration of Toxic Effects
Accothion (fenitropthion)	1-5 days
Actellic (pirimiphosmethyl)	> 8 hours
Advantage (carbosulfan)	> 3 days
Agrothion (fenitrothion)	1-5 days
aldrin (Alderstan, Aldrex, Astex, HHDN, naldrin, Octalene)	> 1 day
Amaze (isofenphos)	> 1 day
Ambush (permethrin)	1-2 days*
Ammo cypermethrin) (at more than 0.025 lb/acre)	> 3 days
Anthio (formothion)	-----
Asana (esfenvalerate)	1 day
Avermectin (at more than 0.025 lb/acre)	1-3 days
Azodrin (monocrotophos)	> 1 day**
Banol (carbanolate)	-----
Baygon (propoxur)	1 day
Baytex (fenthion)	2-3 days
Baythion (phoxim)	> 1 day
Baythroid (cyfluthrin)	> 1 day
Belmark (fenvalerate) (at >0.09 lb/acre)	-----
Bidrin (dicrotophos)	1.5 days
Bladafum (sulfotep)	-----
Bolstar (suprofox)	>1 day
Bomyl	2 days
Bracklene (dicapthon)	-----
Bromex D, WP (naled)	> 1 day
Brigade (bifenthrin)	> 1 day
calcium arsenate	> 1 day
Capture (bifenthrin)	> 1 day
Carbicron (dicrotophos)	1.5 days
chlorthion	-----
Cidial (phenthoate)	> 1 day
Ciodrin (crotoxyphos)	-----
Colep	-----
Curater F (carbofuran)	7-14 days
Cyflee (famphur)	-----
Cygon (dimethoate)	3 days
Cymbush (cypermethrin) (at 0.02 lb/acre)	> 3 days
Cynem (thionazin)	-----
Danitol (fenopropathrin)	1 day
Dasanit (fensulfothion)	1 day
De-Fend (dimethoate)	3 days
DDVP (dichlorvos)	> 1 day
Decis (deltamethrin)	-----
diazinon (Diazitol, Basudin)	2 days
Dibrom D or WP (naled)	> 1 day
Dicofen (fenitrothion)	1-5 days
dieldron (Dilstan, HEOD)	2 days
Dithiofos (sulfotep)	-----
DNBP (dinoseb) (Basanite, DN-239, DNIBF, DNOSBP, DNSBP, Ivosit)	1 day
DNC or DNOC (dinitrocresol) (>0.4% dilution)	> 1 day
Draza (methiocarb)	> 3 days
DTMC (aminocarb)	> 3 days
Dursban (chlorpyrifos)	4-6 days
Ekalux (quinalphos)	-----
Ekamet (etrimphos)	> 2 days
Elgetol (dinitrocresol) (at 1.5 qt/100 gallon or more)	> 1 day
Elsan (phenthoate)	> 1 day
EPN	1 day
Ethyl Guthion (azinphosethyl)	-----
Ethyl-methyl Guthion	-----
Famophos (famphur)	-----
Fenstan (fenitrothion)	1-5 days
fenoxycarb	-----
Ficam (bendiocarb)	> 1 day
flucythrinate	-----
Folimat (omethoate)	> 1 day
Folithion (fenitrothion	1-5 days
Furadan F (carbofuran)	1-5 days
Gamma-Col (gamma-HCH)	-----
Gammalin (gamma-HCH)	-----
Gardona (tetrachlorvinphos) (at higher rates)	-----
Garrathion D (carbophenthion)	> 1 day
Gusathion (azinphos-methyl)	2.5 days
Guthion (azinphos-methyl)	2.5 days
Hamidop (methamidophos)	1 day**
HCH (gamma-HCH)	-----
heptachlor (Velsicol)	>1 day
heptenphos	-----
Hostathion (triazophos)	-----
Imidan (phosmet)	1-4 days
Karate (cyhalothrin)	> 1 day
Kilval (vamidothion)	-----
Knox Out (encapsulated diazinon)	> 2 days
Kotol (gamma-BHC)	-----
Lannate D (methomyl)	> 1 day
lead arsenate	> 1 day
Lebaycid (fenthion)	2-3 days
lindane	> 2 days
Lorsban (chlorpyriphos)	4-6 days
malathion D	> 1 day
malathion ULV (at 8 fl oz/acre or more)	5.5 days
(Cythion, Maldison, mercaptothion)	-----
Matacil (aminocarb) (1lb/acre or more)	> 3 days
Mesurol (methiocarb)	> 3 days
methyl parathion(Metacide, metaphos, Wofatox)	1-4 days
Methyl Trithion (methyl-carbophenothion)	-----
Monitor (methamidophos)	1 day**
Murvin 'fifty' (carbaryl)	> 3 days

Pesticides	Duration of Toxic Effects
Nemacur P (fenamiphos)	> 1 day
Nemaphos (thionazin)	-----
Nexagon (bromophos-ethyl)	> 1 day
Nogos (dichlorvos)	> 1 day
Nudrin D (methomyl)	> 1 day
Nuvacron (monocrotophos)	> 1 day**
Nuvan (dichlorvos)	> 1 day
Orthene (acephate)	> 3 days
Pact (thianitrile)	> 1 day
Papthion (phenthoate)	> 1 day
paraoxon	-----
parathion (Folidol, Fosfex, Thiophos)	1 day
Penncap-M (methyl parathion)	5-8 days**
phosphamidon (Dicron 54 SC, Dimecron, Lirothion)	1-2 days
Pirimicid (pirimiphos-ethyl)	> 1 day
Pounce (permethrin)	1-2 days*
Prolate (phosmet)	1-4 days
Pydrin (fenvalerate) (at > 0.1 lb/acre)	1 day*
Pyramat	-----
Rebelate (dimethoate)	3 days
resmethrin	-----
Ripcord (cypermethrin) (at >0.02 lb/acre)	-----
Rogor (dimethoate)	3 days
Sevin WP (carbaryl)	3-7 days
Sevin-4-oil (carbaryl) (at >0.5 lb/acre)	> 3 days
Sevin XLR (carbaryl) (at>1.5 lb/acre)	> 1 day
Sinox (dinitrocresol)	1 day
Sinox General (dinoseb)	> 1 day
Soprocide (gamma-BHC)	-----
Standak (aldicarb sulfone)	1 day
Stirofos (tetrachlorvinphos) (higher rates)	-----
Strykol (gamma-BHC)	-----
Sumithion (fenitrothion)	1-5 days
Supersevtox (dinoseb)	1 day
Supracide (methidathion)	1-3 days
Swat (bomyl)	2 days
Tamaron (methamidophos)	1 day**
Telodrin (isobenzan)	-----
Temik G (aldicarb) (apply at least 4 weeks before bloom)	-----
Terracir (fensulfothion)	1 day
Tiguvon (fenthion)	2-3 days
TRI-ME (methyl-carbophenothion)	-----
Trithion D (carbophenothion)	> 1 day
Ultracide (methidathion)	1-3 days
Unden (propoxur)	1 day
Vapona (dichlorvox)	> 1 day
Vigon F (dinoseb)	1 day
Volaton (phoxim)	> 1 day
Warbex (famphur)	-----
Yaltox F (carbofuran)	7-14 days
Zectran (mexacarbate)	1-2 days
Zinophos (thionazin)	-----

** Made safer by repellency under arid conditions.*

***Can cause serious problem if allowed to drift into vegetable or legume seed crops.*

GROUP B: APPLY ONLY DURING LATE EVENING

Pesticides	Duration of Toxic Effects
Avermectin(0.025 lb/acre or less)	8 hours
Belmark (fenvalerate) (<0.1 lb/acre)	6 hours
Bromex EC (naled)	16 hours
Dibrom EC (naled)	16 hours
Dursban ULV (chlorpyrifos) (at 0.05 lb/acre or less)	< 2 hours
Ekatin (thiometon)	-----
malathion EC	2-6 hours
Phosdrin (mevinphos)	< 5 hours
Pydrin (fenvalerate) (<0.1 lb/acre)	6 hours
Savit (carbaryl) (at 1.5 lb/acre or less)	8 hours+
Sevin XLR (carbaryl) (at 1.5 lb/acre or less) (not >1:19 dilution)	8 hours+
Thimet EC (phorate)	5 hours
Thiodan or Thiovel (endosulfan) (more than o.5 lb/acre)	8 hours
Vydate (oxamul) (1 lb/acre or more)	8 hours

+These materials are more hazardous to bees in moist conditions.

GROUP C: APPLY ONLY DURING LATE EVENING, NIGHT OR EARLY MORNING

Pesticides	Duration of Toxic Effects
Abar (leptophos)	< 3 hours
Abate (temephos)	3 hours
Acrex (dinobuton)	< 2 hours
Acricid (binapycryl)	-----
Afugan (pyrazophos)	-----
Ammo (0.025 lb/acre or less)	< 2 hours
Aphox (pirimicarb)	< 2 hours
Aramite D	-----
Aspon (propyl thiopyrophosphate)	< 2 hours
Asuntol (coumaphos)	-----
Baygon ULV (propoxur) (at 0.07 lb/acre or less)	< 2 hours
Baytex ULV (fenthion) (at 0.1 lb/acre or less)	2 hours
Biothion (temephos)	< 2 hours
Birlane (chlorfenvinfos)	-----
Bladan (TEPP)	< 5 hours
Carzol (formetanate)	2 hours
chlordane (actachlor, Octa-Klor, Syndane 25)	< 2 hours
DDT (Deestan, Didi-Col, Didimac, Vitanol)	< 4 hours
DDVP MA (dichlorvos)	-----
Delnav (Dioxathion)	< 2 hours
Derris D (rotenone)	< 2 hours
Dessin (dinobuton)	-----
dieldrin G (HEOD)	< 2 hours
Dilan	-----
Dimetilane (dimetilan)	-----

Pesticides	Duration of Toxic Effects
Dipterex (trichlorfon)	3-6 hours
Di-Syston ED (disulfoton)	7 hours
DNOC (dinitrocresol) (<0.4% dilution)	-----
Dyfonate (fonofos)	3 hours
Dylox (trichlorfon)	3-6 hours
Elgetol (dinitrocresol) (at 1.5 pt/100 gal or less)	2 hours
endrin (nendrin)	2 hours
Eradex (thioquinox)	-----
ethion (dithion, Nialate, Sintox)	3 hours
Fernos (pirimicarb)	< 2 hours
Gardona (tetrachlorvinphos) (lower rate)	< 2 hours
Garrathion	-----
Granulox EC (disulfoton)	< 2 hours
heptachlor G (Velsicol)	< 2 hours
isodrin	-----
isolan (primin)	-----
isopropyl-parathion	< 2 hours
Korlan (ronnel)	1 day
Kroneton	-----
Labaycid G or MA (fenthion)	-----
Lannate LS (methomyl)	2 hours+
Larvin (thiodicarb)	< 2 hours
Lorsban MA, ULV (chlorpyrifos) (at 0.045 lb/acre)	-----
malathion ULV (at 3 fl oz/acre or less)	3 hours
Malonoben	-----
Matacil ULV (aminocarb) (at 2.4 oz/acre or less)	< 2 hours
Mavrik (fluvalinate)	< 2 hours
menazon	< 2 hours
Metasystox (demeton-S-methyl)	-----
Metasystox-R (oxydemetonmethyl)	< 2 hours
methoxylchlor (DMDTm Markate)	2 hours
MNFA (Nissol)	-----
Mobilawn (dichlorfenthion)	2 hours
Morocide (binapacryl)-	< 2 hours
Nankor (fenchlorphos)	-----
NDP (propyl thiopyrophosphate)	-----
Neguvon (trichlorfon)	3-6 hours
Nemacide (dichlorfenthion)	2 hours
Niagra 9044 (binapacryl)	< 2 hours
Nissol	-----
Nogos MA (dichlorvos)	-----
Nudrin LS (methomyl)	2 hours+
Nuvan MA (dichlorvos)	-----
oil sprays (superior type)	< 3 hours
Parsolin ED (disulfoton)	7 hours
Perthane (ethylan)	2 hours
phostex	< 2 hours
Phosvel (leptophos)	< 3 hours

Pesticides	Duration of Toxic Effects
Pirimor (pirimicarb)	< 2 hours
Proxol (trichlorfon)	3-6 hours
Rabon (tetrachlorvinphos)	-----
Rhothane (TDE)	2 hours
Ripcord (cypermethrin) (at <0.02 lb/acre)	< 2 hours
Sapecron (chlorfenvinphos)	< 2 hours
Saphi-Col, Saufos (menazon)	< 2 hours
Scout (tralomethrin)	2 hours
Sevin-4-oil (carbaryl) (at 0.5 lb/acre or less)	2 hours
Shirlan (sabadilla)	-----
Solvigran, Solvirex EC (disulfoton)	7 hours
Spur (fluvalinate)	2 hours
Supona (chlorfenvinphos)	< 2 hours
Syfos (menazon)	< 2 hours
Systox (demeton)	< 2 hours
TEPP	< 5 hours
Thanite (isobornyl thiocyanate)	< 3 hours
Thimet G (phorate)	< 2 hours
Thiocron (amidithion)	-----
Thiodan (endosulfan) (0.5 lb/acre or less)	2-3 hours
Tiguvon G, MA (fenthion)	-----
Tiovel (endosulfan) (0.5 lb/acre or less)	2-3 hours
Torak (dalifor)	< 2 hours
toxaphene (polychorcamphene, Strobane)	2-4 hours
Tranid	-----
Trigard (cyromazine)	< 2 hours
Trithion (carbophenothion)	2-5 hours
Trolene (fenchlorphos)	-----
Tugon (trichlorfon)	3-6 hours
Unden (propoxur) MA	-----
Vapona ULV (dichlorvos) (at 0.1 lb/acre or less)	< 2 hours
Vydate (oxamyl) (0.5 lb/acre or less)	3 hours
Wotexit (trichlorfon)	3-6 hours
Zolone (phosalone)	2 hours

+*These materials are more hazardous to bees in moist conditions.*

GROUP D: CAN BE APPLIED AT any TIME WITH REASONABLE SAFETY TO BEES

Pesticides

Acaraben (chlorobenzilate)
Acaralate (chloropropylate)
Acarol (bromopopulate)
Akar (chlorobenzylate)
Akaritox (tetradifon)
allethrin
Altozar (hydroprene)
Ambush (permethrin)
Apollo (chlorfentezene)
azocyclotin

BAAM (amitraz)

Pesticides

Bacillus thuringensis (Bactospeine, Bactur, Bakthane, Bug Time, Cekubacilina, Certan, Foil, Trident, Dipel, Sok-Bt)
Baygon G (propoxur)
chlorobenzylate
chloropropulate
Chloroparacide (chlorbenside)
Comite (propargite)
CPAS (chlorfensulphide)
CPBS (fenson)
CPCBS (chlorfenson)
Chlorothane (dinocap)
Curator G (carbofuran)
Cryolite (fluoride)

Dasanit G (fensulfothion)
Dikar
Dimilin (diflubenzuron)
Dimite (chlorfenethol)
Di-Syston G (disulfoton)
Dithane (mancozeb, maneb, zineb)
DMC (chlorfenethol)
DN-111 or DNOCHP (dinex)

Folbex (chlorobenzilate)

Fundal (chlordimeform)
Furadan G (carbofuran)

Galecron (chlordimeform)
Genite 923 or Genitol 923
Granulox (disulfoton) G

Helyothis polyhedrosis virus (Elcar)

Karathane (dinocap)
Kelthane (dicofol)
Kepone (chlordecone)
Kroyocide (cryolite)

Largon (difluvenzuron)
Lethane 384 (butoxy thiocyanodiethyl ether)
lime sulfur
Lovozal (fenazaflor)

malathion G (Cynthion, maldison, mercaptothion)
margosan (neem oil)

Pesticides

Micasin (chlorfensulphide)
Milbex (chlorfensulphide-chlorfenethol)
Mirex G
Mitac (amitraz)
Mitox (chlorbenside)
Morestan (oxythioquinox)

Neoron (bromopropylate)
Neotran (oxythane)
nicotine sulfate

Oftanol (isofenphos)
Omite (propargite)
Ovex, Ovotran (chlorfenson)

Parsolin G (disulfoton)
PCPBS (fenson)
Pentac (dienochlor)
Plictran (cyhexatin)
Pounce (permethrin)
pyrethrum

Quikron (chlorfenethol)

Rospin (chloropropulate)
rotenone EC (Derris)
Ryanodine (ryania)

Savey (hexythiazox)
schradan (OMPA, Pestox III, Systam)
Sevin bait G (carbaryl)
sodium fluosilicate baits
Solvigran or Solvirex G (disulfoton)
Sulphenone
sulfur

Tedion (tetradifon)
Terracur G (fensulfothion)
thiocyclam

Unden G (propoxur)

Vendex (fenbutatin-oxide)

Yaltox G (carbofuran)

Draft Pollination Contract

(for consideration of legal counsel)

This contract is made on _____ between _____, the
(date) (beekeeper's name)

beekeeper, and _____, the grower, for the _____ season.
(grower's name) (year)

1. Beekeeper's Responsibilities.

a. The beekeeper shall supply the grower with _____ hives of bees to be delivered to

the _____ for pollination as specified below.
(blueberry field, cucumber field, etc.)

Date to move colonies in: _____
(date crop usually blooms)

Date to move colonies out: _____

Directions to location: _____

_____

_____

Description of hive placement in field: _____

_____

b. The beekeeper shall provide hives of the following minimum standards:

A laying queen with _____ frames of brood. The _____ story hive will have _____ lbs. of capped honey or equivalent feed.

The beekeeper will open and demonstrate the strength of any colonies selected by the grower and shall maintain the hives at the above standards for the duration of pollination.

c. The beekeeper shall leave the bees on the crop long enough to achieve pollination, a period of _____, after which bees will be removed within two weeks, or after a new contract is negotiated.

Projected date of removal: _____ . Actual date of removal: _____ .

Beekeeper shall, absent any other notice, remove hives no later than midnight on _____.
(date)

2. Grower's responsibilities.

a. The grower shall provide a location for the hives that is accessible to the beekeeper and his vehicles whenever it is necessary to work with the bees.

b. The grower shall provide a source of water for the bees, if none is available within one-half mile from the colonies.

c. The grower shall not apply highly toxic chemicals for_____ days prior to the arrival of the bees on the crop and for the entire period when bees are present. The following agricultural chemicals and methods of application may be used while the bees are on the crop: _____

_____

_____

d. The grower agrees to inform the beekeeper of known pesticide use in the area.

e. The grower will compensate beekeeper for hives that are damaged or severely weakened by pesticides, accidents or vandalism and assumes a maximum financial liability of $85 per hive for the loss of bees.

f. The grower assumes public liability for stinging while bees are located in the crop.

g. Grower will pay beekeeper $_____ per hive of bees for _____ hives of bees. The total payment will be $_____. Payment to the beekeeper will be as follows: $_____ per hive upon delivery.

h. Grower will inform beekeeper within two days of when bees are required.

Additional moves not previously agreed to require $_____per hive per move.

By evidence of the signature below, the beekeeper and grower agree to fulfill all portions of the contract as written. (Signature of a witness may also be included.)

Grower:

_____ _____
(Print) (Signature)

_____
(Address)

_____ Date:_____

_____
(Phone)

Beekeeper:

_____ _____
(Print) (Signature)

_____
(Address)

_____ Date:_____

_____
(Phone)

READ AND FOLLOW ALL LABEL INSTRUCTIONS. THIS INCLUDES DIRECTIONS FOR USE, PRECAUTIONARY STATEMENTS (HAZARDS TO HUMANS, DOMESTIC ANIMALS, AND ENDANGERED SPECIES), ENVIRONMENTAL HAZARDS, RATES OF APPLICATION, NUMBER OF APPLICATIONS, REENTRY INTERVALS, HARVEST RESTRICTIONS, STORAGE AND DISPOSAL, AND ANY SPECIFIC WARNINGS AND/OR PRECAUTIONS FOR SAFE HANDLING OF THE PESTICIDE.

Revision 5/2000