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Control of the

Narcissus Bulb Fly

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CONTROL OF THE NARCISSUS BULB FLY

By

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The narcissus bulb fly[1] is the most important insect affecting narcissus bulbs wherever they are grown. In British Columbia this insect has infested up to 75 per cent of the bulbs in fields in which they were left for two to four years for cut-flower production and in which control was not undertaken.

DISTRIBUTION

Probably a native of southern Europe, the narcissus bulb fly appeared in the bulb areas of northern Europe early in the nineteenth century. It was found in the United States as early as 1879, and in British Columbia in 1908. The bulb fly has been increasing in importance annually and is now established throughout the bulb-growing areas of the United States and Canada.

HOST PLANTS

The insect is mainly a pest of daffodils (narcissi). Occasionally it attacks snowdrops, amaryllis, hyacinths, lilies, tulips, and other bulbous plants.

DESCRIPTION OF INSECT

The adult (cover illustration) is a robust, hairy, two-winged fly about ½ inch long, greatly resembling a small bumble bee. It varies considerably in color; it may be black with yellow, orange, or gray bands, or any one of these colors may predominate.

The egg is chalk-white, similar to a jelly-bean candy in shape, and about 1/16 inch long. It sheds its skin twice as it develops and when full-grown is about ¾ inch long. The mature larva has a plump, slightly arched body, nearly circular in cross section, with a tough, wrinkled skin. The head is slightly tapered and bears black mouth hooks, which are used to tear the bulb tissue.

The skin of the mature larva hardens and becomes a pupal case (puparium); in this the pupa changes to the adult fly. The brown, oval puparium is ½ inch long and ¼ inch wide, has wrinkled, tough skin, and is rounded at both ends.

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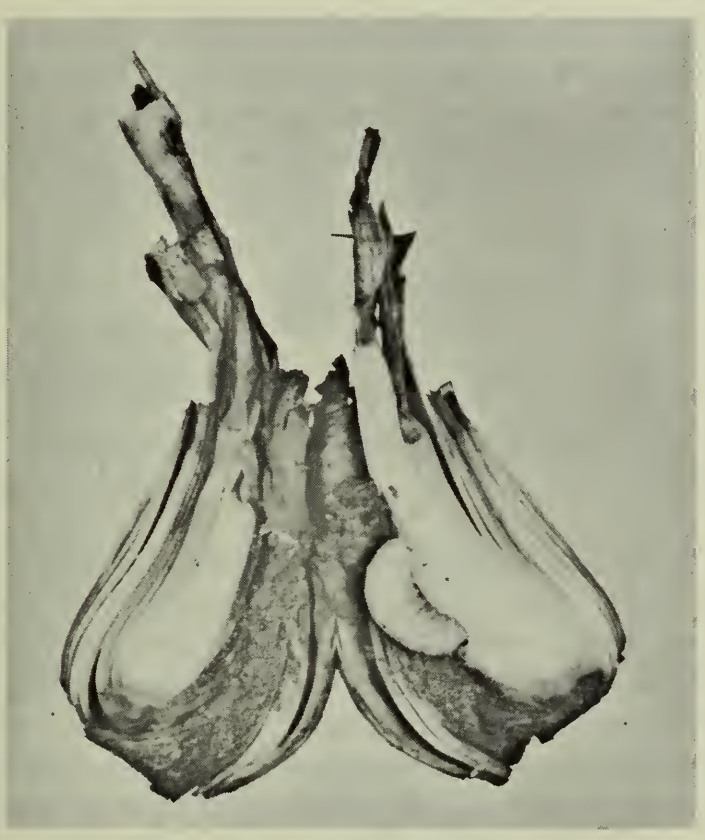
[1] *Lampetia equestris* (F.).

DESCRIPTION OF DAMAGE

The newly hatched larva enters the bulb through the root ring of the basal plate (bottom of bulb). Using its mouth hooks, it tunnels back and forth in the tissue of the basal plate for several weeks, and then moves upward into the scales, usually toward the flower parts. As the larva grows, the tunnel lengthens; and eventually the center of the bulb becomes a mass of soft, brown, decayed tissue. Small bulbs are generally killed and large ones seriously damaged. In large bulbs, enough of the basal plate remains undamaged to allow the bulb to continue growth, but it takes two or three years for the bulb to return to normal. Those that do survive have fewer leaves than normally; these are small and grassy in appearance.



Vertical section of a narcissus bulb showing extensive injury in October, when the maggot is mature. Natural size.

In the fall, before planting the bulbs, you may detect some of the infested ones by examining the basal plate. Remove the soil and old roots with a small brush, and scrape the basal plate with a knife. If there is a maggot in the bulb part of the root ring surrounding the base is brown and sunken. This dark-brown discoloration often extends upward on the side of the bulb above the point where the maggot entered.

LIFE HISTORY AND HABITS

The flies occur from early May to the beginning of July and are active chiefly on bright, warm days. They feed on pollen and nectar from the blossoms of strawberry, apple, morning glory, dandelion, and many other plants. They fly among the plants in zigzag fashion and generally along the rows, about 8 to 10 inches above the ground. The flies are more likely to be found in sheltered places; consequently, narcissi planted in open, windswept fields are usually infested only lightly.

The female lays about 40 eggs, placed singly on the soil or foliage, as near the bulbs as possible. When laying she crawls down a crack or crevice that remains in the soil when the foliage dies down and shrivels. The egg hatches in 10 to 15 days and the minute larva moves downward to the base of the bulb, growing to full size by late September or October. Usually only one larva develops in a bulb, sometimes there are two but rarely more. The larvae remain in the bulbs during the winter, and leave them in early spring to form puparia at the soil surface in the bulb row. It is from these puparia that the flies emerge during May or early June. The life cycle is usually completed in one year.

CONTROL

Control measures are of three kinds: (a) cultural practices, (b) field treatments to prevent attack by the larvae, and (c) after-harvest treatments to kill larvae in the bulbs.

Cultural Practices

When planting, destroy unduly soft bulbs because they are likely to be infested by larvae. Most experienced growers discard such bulbs but often overlook that it is necessary to destroy them. To do so easily and economically, place the bulbs in a pile, coat them with stove oil or discarded crankcase oil and burn them. A fire from about 1 gallon of oil reduces 500 bulbs to ashes.

Bulbs left in the field at digging time, commonly called "volunteers", may be infested by the bulb fly. As these bulbs are a serious source of infestation, collect and destroy them before mature larvae begin to emerge from them (before March 1 in the bulb-growing areas of British Columbia).

Field Treatments

Treatments at planting

Experiments at Saanichton have shown that the larvae can be prevented from entering narcissus bulbs by treatment at planting time with aldrin, dieldrin or heptachlor. You may (a) dust the bulbs in the furrow, (b) spray them in the furrow, or (c) soak them for ten minutes in a cold-water mixture, or for 3 hours in a hot-

water (110°F.) mixture before planting. Any one of the treatments will prevent the larvae from entering bulbs left in the treated furrows for three years after application.

Dusting.– After placing the bulbs in the furrow, and before covering them with soil, thoroughly dust them with 2½ per cent aldrin, dieldrin or heptachlor dust. Apply the material by hand or with a fertilizer spreader at 1½ pounds per 200 feet of row, or 100 pounds per acre for rows planted 3 feet apart. The most suitable spreader is one with holes in the bottom of the hopper, about 3/8 inch in diameter and 1 inch apart. Leave six holes open so that the insecticide is spread evenly in a 10-inch swath.

Spraying.– After placing the bulbs in the furrow, and before covering them with soil, spray them with aldrin, dieldrin or heptachlor emulsible concentrate. Apply the material with a row-crop sprayer similar to that described in the pamphlet "A Home-made Sprayer for Attachment to a Tractor Power Take-off" (Canada Department of Agriculture Publication 1007). By operating a piston pump from the power take-off and adjusting the nozzles over the furrow to cover a 10-inch swath, you may cover the bulbs and soil adequately. Use two flat-type nozzles, size 8008, directed at a 45-degree angle and about 6 inches above the row of bulbs. Travel at 3 miles per hour and operate the pump at 100 pounds' pressure so that you apply about 100 gallons of spray per acre. Apply 2 pounds of the active ingredient per acre, or 1 gallon of 20 per cent concentrate per 100 gallons of water.

The cost of these insecticides, applied by the dust or the spray method, is about $8.00 to $12.00 an acre.

Soaking.– Soak the bulbs, before planting, in either cold or hot water after adding an emulsible concentrate of aldrin, dieldrin or heptachlor.

In a cold-water mixture, soak the bulbs for ten minutes. Use a 20 per cent concentrate at 1 gallon (2 pounds of active ingredient) per 100 gallons of water. To prevent the basal rot disease from spreading, add a fungicide to the insecticide mixture in the treating tank. Use formalin at 2 quarts, or phenyl mercuric acetate at 3 ounces, per 100 gallons of water. The cost of these materials per 100 gallons of water is about $11.00.

For a hot-water mixture, add 1 gallon of a 20 per cent concentrate to 1,000 gallons of hot water (110°F.) and formaldehyde as described later in "After-harvest Treatments". This treatment also controls eelworms and the bulb scale mite.

Treatments after Planting

If you have not treated your bulbs at planting time, spray the plants with aldrin, dieldrin or heptachlor during the first week of May. Use a 20 per cent concentrate liquid at 1 gallon per 100 gallons of water. Apply the insecticide as a drench using 1 gallon of spray per 15 feet of row, or about 1,000 gallons per acre.

Naphthalene flakes (refined) at 200 pounds per acre, or 1 pound per 75 feet of row, have given satisfactory control when applied three times at 15-day intervals, commencing during the first week of May. Hilling or mounding the soil to cover the flakes after each application ensures best results. Naphthalene, costing approximately 17 cents per pound, is expensive for areas of an acre or more and is more suitable for home gardens, or small plantings of high-priced bulbs.

Whatever material you use, apply it to the neck area of the bulb at the soil surface. It is here that the eggs are laid and the insecticide may kill either the eggs or the newly emerged larvae. You must repeat these after-planting treatments each year that the bulbs are left in the soil.

Cautions

Follow closely all the cautions listed on the insecticide label, especially the following: Aldrin, dieldrin and heptachlor may be fatal if swallowed. Avoid contact with the insecticide, as it is absorbed through the skin. Do not breathe the vapor, fumes, or spray mist. Avoid contaminating feed and foodstuffs.

None of these pesticides controls eelworms or the bulb scale mite. For control of these pests see "Hot-water Treatment".

After-Harvest Treatments

In all the following treatments be sure to dig and treat the bulbs as early as possible, before the larvae damage the flower parts in the bulbs. Under average weather conditions in the coastal area of British Columbia, the larvae usually ruin the flower parts of 50 per cent of the infested bulbs by the end of the first week in August. If you dig the bulbs during late July and allow them to cure for 3 weeks, the flower parts in the bulbs will be destroyed by the larvae before they can be killed.

Hot-water Treatment

Hot water is necessary for treating planting stock infested by both the bulb fly and eelworms. Dig the bulbs as early as possible and treat them after they are cured, i.e., two to three weeks after lifting. For bulb-fly control, immerse the bulbs for one hour in water containing formaldehyde, 2 quarts per 100 gallons, and kept at a temperature of 110-111°F. If the bulbs are infested by eelworms also, soak them for three hours.

Observe the following: (a) use a rectangular tank; (b) apply the heat preferably as steam or hot water in coils from a boiler that has the capacity to bring the bath up to the required temperature quickly; (c) agitate the water in the tank by means of a boat-type propeller driven by a motor, or use a water pump; (d) equip the tank with an automatic device for controlling the temperature and maintaining it within one or two degrees; (e) use a tank large enough to handle your bulbs within reasonable time; (f) use proper bulb containers, such as wire-mesh boxes or wooden tray racks; and (g) use an accurate thermometer that you can read conveniently without removing it from the water.

Methyl Bromide Fumigation

As an alternative to the hot-water treatment to kill bulb-fly larvae in infested bulbs, fumigate them with methyl bromide in a chamber, specially constructed for the purpose, at 3 pounds per 1,000 cubic feet for 4½ hours at 60° F. Treat the bulbs as soon as they are harvested, but make sure that the temperature at their centers is 60° F. before fumigation. This method is particularly useful for treating infested bulbs that are to be shipped, or used for the forcing trade. Methyl bromide costs approximately 75 cents per pound. It is sold in 1 pound cans, convenient for use as simple and economical applicators. This treatment controls the bulb scale mite but not eelworms.

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For further information, consult your agricultural representative or provincial entomologist, or write to the nearest insect laboratory of the Canada Department of Agriculture, or to the Scientific Information Section, Canada Department of Agriculture, Central Experimental Farm, Ottawa.

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