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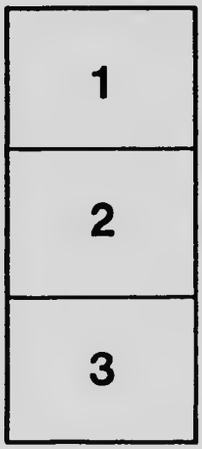

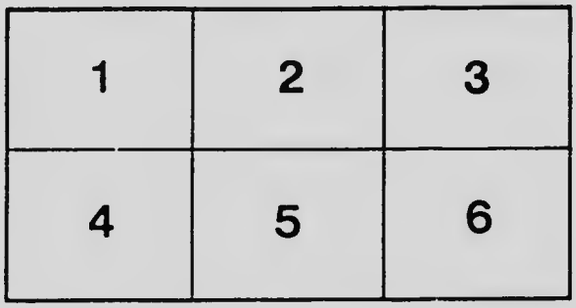

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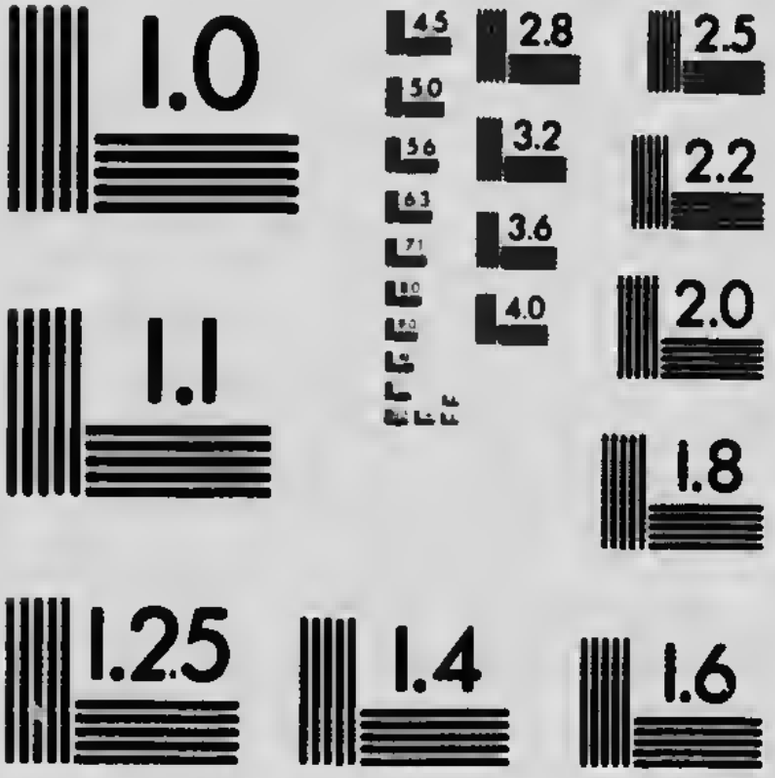

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CIRCULAR No. 32
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PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE
(HORTICULTURAL BRANCH).

THE CABBAGE-ROOT MAGGOT

(*Phorbia brassicæ* Bouche).

THERE are few insects attacking vegetables which cause greater loss and disappointment than the one which as a small white maggot is often found infesting the roots of cabbages, cauliflowers, rape, turnips, and radishes.

During early spring and summer, in the seed-bed and in the permanent plantation, the leaves of certain cabbage and cauliflower plants frequently turn yellow, wilt, and droop. If an examination is

Male.

Female.

The adult flies. (After Gibs and Treherne, Ent. Branch Bull. 12, Dom. Dept. Agric., Ottawa.)

made of the roots a number of maggots, varying in size but attaining the length of 1/3 inch will be found embedded beneath a slimy mass of decaying vegetation and soil. With radishes and turnips similar

white maggots will be found in burrows or galleries in the edible portion of the roots.

The adults which produce these maggots are small flies, resembling the ordinary house-fly in general appearance, but more slender and slightly smaller. They are represented above. They appear on the wing in very early spring, having developed from over-wintering puparia in the soil. They lay eggs on or near the crown of the plant on the level of the soil surface, as shown in the accompanying illustration.

Where the eggs are laid. (After Gibson and Treherne, Ent. Branch Bull. 12, Dom. Dept. Agric., Ottawa.)

These eggs hatch in five to seven days into small larvæ or n. which penerate the soil and attach themselves to the roots of the plant. Here the larvæ remain feeding and destroying the roots for from nineteen to thirty-two days.

It must be understood that all of the adult flies do not emerge from the soil in the spring at the same time. The process of emergence may be continued for over a month. As each female emerges she mates and proceeds at once to lay eggs. Thus we find a continuous and overlapping series of stages in existence. It may be possible, it can be seen, for the larvæ, which have developed from flies which emerged the earliest, to be nearly mature at the time the latest flies are emerging from the soil. This complex and difficult situation proceeds throughout the year, and results in the fact that some egg

are being laid every day from April until September. This point must be clearly borne in mind, as upon it is based one of the essential features of satisfactory control.

When the larvæ become full-g[illegible] they form what are known as puparia, a stage in their life-history which corresponds to the

Where the maggots feed and the type of injury they cause. (After Gibson and Treherne, Ent. Branch Bull. 12, Dom. Dept. Agric., Ottawa.)

chrysalis of a butterfly. The puparia of this fly resemble grains of wheat in size and colour, and may be found in decaying roots or in the soil adjacent to infested plants. From two to three weeks are passed in this stage during the summer months, but towards autumn the stage is lengthened out and the winter is passed in this form. The puparium stage is merely a resting stage from which eventually the adult flies emerge, and, as can be realized, this emergence of adults may be more or less a continuous process throughout the summer months.

Remedial Measures.

Cheese-cloth Screens.—Light, portable frames of wood, of convenient size and about 18 inches to 2 feet high, over which ordinary cheese-cloth is stretched, are invaluable in preventing the adult flies from gaining access to the plants. Braces of wood may be placed over the top, making the structure more rigid and preventing the cloth from sagging. Radishes and garden turnips intended for the table should be grown under such frames throughout the summer. Cabbages and cauliflowers should also be seeded and grown for the first month under this protection. All small gardens should possess some such screen, for in this way radishes may be guaranteed free from the obnoxious "grubs" which often make field-grown roots so unpleasant to eat. Cabbages, further, may be guaranteed free of maggots until the time of transplanting. Commercial vegetable-growers are advised to construct similar cheese-cloth screens on a large scale, using strands of wire instead of wood to prevent the cloth from sagging on the top. A suitable type of screen is herewith shown.

Transplanting.—In the case of cabbages and cauliflowers, the cheese-cloth screen which has been protecting the plants from the attacks of the fly has also been shading them from the direct rays of the sun.

A suitable type of screened seed-bed. (After Gibson and Treherne, Ent. Branch Bull. 12, Dom. Dept. Agric., Ottawa.)

Therefore the screen should be removed about one week before transplanting, thus allowing the plants to harden themselves to more normal conditions. The piece of ground destined for the permanent cabbage

plantation should be thoroughly cultivated during this week and finished off with a light roller and harrows. It is essential that the surface of the soil be smooth and not lumpy.

One-ply Felt Tar-paper Disks.—As the plants are removed from the seed-bed and set in the permanent plantation a disk of one-ply felt tar-paper should be placed around the crown of the plant, flush to the soil. The illustration on the preceding page indicates the correct procedure.

These disks may be circular, square, or hexagonal in shape, approximately 3 inches in diameter, with a slit to the centre, which enables it to be quickly arranged by the planter. If nothing better than ordinary tar-paper can be obtained, two disks to a plant may be

Plant protected by tarred-paper disk. (After Britton and Lowry, Connecticut, 190.)

necessary. Felt tar-paper does not curl from the heat of the sun and is therefore preferable. The idea of these disks is partly to detract the fly by the odour of tar, and partly, if eggs are laid, to guide the young larvæ away from the root system. It is essential that the disks lie flush to the ground-level, otherwise the adult flies may crawl

beneath them and deposit eggs. The virtue of having a smooth surface to the soil becomes readily apparent, and if the ground has been thoroughly cultivated before transplanting, there is no necessity to do further cultivation for two weeks or so. This method is recommended for commercial plantations.

Weekly Washes.—If the tar-paper disks are not used, applications of liquids should be applied to the roots once a week. The object of these applications is to destroy the young maggots before they can destroy the plant. It will be recalled that egg-laying is more or less a continuous process during the summer and that the eggs hatch in about a week after being deposited. Solutions of hellebore 2 oz., or pyrethrum 2 oz., each or either to the gallon of water are effective. Dilutions of carbolic-acid or kerosene emulsions may also be applied. These solutions have been found of special value in gardens. Under field conditions they are not practicable, chiefly on account of their expense.

Autumn Planting.—This method of growing cabbages and cauliflowers is adopted by many growers to ensure earliness the following year, and is intended that the plants should be able better to combat the effects of root-maggots by the mere fact that the plants are well established in the spring. Growers who follow this method would be well advised to seed a few radishes early in the spring in the open near by, to attract the adult females and thus to act as traps. Experience has shown that the success of these autumn-planted cabbages is altogether dependent on the number of flies present in the spring and the number of plants available on which they are able to deposit eggs.

Other Remedial Measures.—There is possibly no insect affecting garden produce that has been the subject of more conflicting evidence in the matter of control than the cabbage-root maggot. Every gardener has applied some form of concoction to combat the maggots in the roots. These applications frequently take the form of solutions of mercury bichloride, tobacco extracts, or patent solutions bought through local supply-houses. Soot, wood-ashes, tobacco powder, lime, and such substances have been applied dry, and often results attending their use have apparently been successful. There is no reason why on a garden scale any mixture properly and frequently applied should not be successful, provided that the mixture has some satisfactory insecticidal value. In a commercial way and under proper control conditions it has been found that the tar-paper disk gives the best and most stable results.

Further information regarding the habits and control of the cabbage-root maggot may be obtained from Bulletin No. 12, Entomological Branch, Dominion Department of Agriculture, Ottawa.

Victoria, B.C., issued March, 1918.

This circular has been prepared by R. C. Treherne, Field Officer for British Columbia, Entomological Branch, Dominion Department of Agriculture, at the request of the Horticultural Branch.

Copies of this circular may be obtained free of charge on application to the Horticultural Branch, Department of Agriculture, Victoria, B.C., or from local branch offices of the Department.

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