INSECT PROBLEMS OF THE NELSON DISTRICT

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FOR THOSE not familiar with the pattern of Nelson agriculture, a brief survey is necessary as a background against which the problem of insect pests may be discussed. Out of a total provincial area of 4,400,000 acres, some 27%, or 1,200,000 acres is occupied. Exclusive of the area in timber plantations, there are about 290,000 acres under cultivation in this province. Some 265,000 acres are devoted to grasses, clovers and lucerne, leaving approximately 25,000 acres for cropping.

The utilization of this latter area is both interesting and unique within New Zealand. On an acreage basis, the principal crop of the Nelson district is tobacco with 6,000 acres. Commercial orchards occupy 4,000 acres, and green peas for canning and freezing some 2,500 acres. The only cereal crop of any significance is barley with approximately 2,000 acres. Market gardening occupies some 1,100 acres and hop growing another 500 acres. The existence of these specialized crops has led to the occurrence of particular insect problems and, in turn, to the development of efficient methods of chemical control.

INSECTS AND CROPS

The greatest usage of insecticides in the Nelson area undoubtedly occurs in orchards. In this field, formulations and application techniques are highly developed and most insect pests are held under very satisfactory control. The major problem facing the orchardist is the development of resistance to currently used insecticides. This resistance problem leads to frequent changes in recommendations, utilizing new materials as they become available. While there does not appear to be a drop off in the number of such insecticides coming forward, costs of insecticidal application become greater each year, to the point where the present overall spray programmes in Nelson are costing in excess of £50 per acre per annum.

As a fresh approach to this problem of insecticidal resistance in orchard insects and in an effort to reduce the amount of insecticide applied to food crops, investigation of integrated biological and chemical control has been commenced. This project has been undertaken co-operatively by Entomology, Fruit Research and Plant Diseases Divisions of the Department of Scientific and Industrial Research. The aim is to reduce and modify the chemical material applied so that natural enemies in the form of parasites and predators become the main controlling agents. Such a programme has been successfully used in some overseas orchard areas but it will be a long time before the applicability of the method to New Zealand conditions can be fully assessed.

Tobacco has singularly few insect pests during cultivation. The greasy cutworm, *Agrostis ypsilon* Rott., is a common problem at the time of setting out. The usual practice involved treatment of the soil with either aldrin or DDT. The new agricultural chemical regulations have led to a change from aerial to ground application of

these insecticides and, in future, spray formulations will be the principal type applied. In some seasons the silver-Y moth, *Plusia chalcites* Esp., can be locally important in tobacco but, in general, this insect does not present a serious problem.

Like tobacco the large area of green peas grown in Nelson suffers few insect problems. Those insects which occur in pea crops are usually the result of carry-over from the pasture area cultivated to produce the crop. In other districts some of these carry-over insects can be a serious problem—such is the case with the white-fringed weevil, *Graphognathus leucoloma* Boh., in green peas in Hawke's Bay. In Nelson a certain amount of carry-over of grass-grub, *Costelytra zealandica* (White), occurs but this insect is not regarded as a serious problem in green peas.

The one cereal crop of significance in Nelson is barley and, like barley grown anywhere in New Zealand, the most commonly encountered insect problem is armyworm. Two species of armyworm are involved, the native *Persectania aversa* (Walk.) and the cosmopolitan *Pseudaletia separata* (Walk.). In Nelson, *Pseudaletia separata* is the species more usually involved in damage to barley, although in some cases damage due to mixed populations of both species can occur, particularly in the earlier part of the season. Trichlorphon as a spray provides a successful control at rates of 1 lb active ingredient per acre. Such usage requires a withholding period of 14 days but no permit is needed.

The insect problems associated with market gardening are of a specialized nature and it is not proposed that these be discussed here. The only other individual crop of importance is hops. In general, hops do not suffer from many insect problems. In the long dry summer of the past season, some trouble with the mite *Tetranychus telarius* (L.) was experienced. In normal seasons, mite is of little consequence and it may be a number of years before the trouble occurs again. At the moment there is some tendency on the part of growers to think in terms of soil injection of a systemic organophosphorous insecticide about August. The adoption of such a programme would probably lead to the familiar problem of dependence on an annual spray programme. A much better approach would be the use of a "knockdown" insecticide such as naled or mevinphos only in those years when populations of mite build up.

Although some 5,000 acres of cruciferous fodder crops are grown annually, some of the insects usually encountered elsewhere with this type of crop appear to cause little trouble. White butterfly, *Pieris rapae* L., diamond back moth, *Plutella maculipennis* Curt., and crucifer aphid, *Brevicoryne brassicae* (L.), are rarely of importance on an agricultural scale. No cases of springtail, Collembola, damage to germinating crucifers have been reported in this district. The only major problem is cutworm which can sometimes be serious in the early stages of growth. Cutworm has been successfully controlled in the past with DDT-superphosphate but the new agricultural chemical regulations make necessary a fresh approach to this problem. Occasionally grass-grub can severely damage young cruciferous plants but this type of damage is not common in Nelson.

PASTURE INSECTS

Almost all the insects which occur on pastures and lucerne throughout the South Island are represented in the Nelson area. The heavy emphasis on certain crops has dictated a pattern of pastoral farming which does not lead to damage by most of these

insects. The clover case-bearer, *Coleophora* spp., is commonly present but since the area of white clover harvested is very small, clover case-bearer cannot be considered an important pest. Similarly, the stem weevil, *Hyperodes bonariensis* Kusch., occurs in pastures throughout the province. Owing possibly to the small amount of short-rotation ryegrass grown, the presence of adequate December-January rainfall and less intensive grazing management, stem weevil is not recognized as a problem in this district. The same pattern could be mentioned for a number of other common pasture insect pests, but with two notable exceptions — grass-grub and subterranean grass caterpillar, the latter now more correctly known as *Wiseana* spp., rather than the more familiar *Oxycaenus* or *Porina*.

Considering the district as a whole, subterranean grass caterpillar is probably a more important major pest insect than grass-grub. Two species of subterranean grass caterpillar are known to be present, *Wiseana cervinata* (Walk.) with a flight period from August to November, and *Wiseana signata* (Walk.), which flies from January to March. These species often occur together in mixed populations and this phenomenon is responsible for the two distinctly different sizes of caterpillar often encountered in the soil when subterranean grass caterpillar damage first comes to notice in the autumn. Subterranean grass caterpillar infestations in the Nelson area have a feature which is unique in the writer's experience. This insect frequently occurs in pastures without the additional presence of grass-grub. In other districts such a situation is more the exception than the rule. The occurrence of unmixed populations of subterranean grass caterpillar and grass-grub gives the entomologist an opportunity to assess damage and efficacy of control measures without the complicating presence of the other insect.

Throughout the Nelson district, damaging populations of *Wiseana* spp. have occurred in improved and semi-improved pastures over a very wide range of soil types and slope situations. These situations range from steeply sloping areas such as the D'Urville Island hills to the flats of the Waimea Plains. In the latter district, subterranean grass caterpillar has recently been a serious problem in areas of irrigated lucerne used for cattle grazing. Populations of subterranean grass caterpillar of three to four a square foot can be very destructive; in recent sampling, populations up to 40 per square foot have been detected. These high populations tend to collapse in the late autumn owing to the presence of the green muscardine fungus, *Metarrhizium anisopliae* (Metch.), and the white fungus, *Beauveria bassiana* (Bal.). These fungi cannot be relied upon as a control measure and steps should be taken to use insecticides if pasture damage is to be avoided. There is some prospect for biological control of subterranean grass caterpillar using entomophagous insects. Work in New Zealand with parasites from South America may be possible next season.

Chemical control of subterranean grass caterpillar, in the past, has been achieved with DDT mixed dry, or incorporated wet, with superphosphate. These materials were relatively quick acting and could be applied after the appearance of damage. The limitation of usage of chlorinated hydrocarbon insecticides to pelleted or granular forms has made this speed of action less certain. Some of the pelleted materials in some situations may give satisfactory control within weeks, but such rapidity of control is now not certain. To some extent this possibility of slowness of action can be overcome by early application of the pelleted materials. This would involve

application long before the appearance of damage, preferably in November of the previous year.

In an effort to find acceptable alternative means of chemical control for existing infestations, a number of experiments have been conducted throughout the South Island in the current season. A brief comment can be made on those trials conducted in Nelson. A number of organophosphorous materials were used both in spray formulations and as granules. Both methyl parathion at 8 oz a.i. per acre and trichlorphon at 24 oz a.i. per acre gave rapid and satisfactory control as spray formulations. These materials were closely followed in order of merit by diazinon and the carbamate carbaryl. Since these experiments were conducted, numerous commercial applications of trichlorphon at 16 oz per acre, in this district, have given spectacular control of subterranean grass caterpillar. For reasons of operator safety, Entomology Division is not recommending farmer use of methyl parathion and the present recommendation for control of subterranean grass caterpillar is 16 to 24 oz of trichlorphon as a spray formulation in 40 gal of water per acre. It should be noted that, at 16 oz of trichlorphon a.i. per acre, no permit is required and a 14 day withholding period must be observed. At dosages above this level a permit is required.

Throughout New Zealand, in general, the grass-grub is by far the most important insect problem. In Nelson, even though grass-grub probably takes second place to subterranean grass caterpillar, it is still a major agricultural pest. Control of grass-grub with chemicals was developed by Entomology Division in the period 1948 to 1950 and DDT has been widely used for grass-grub control, particularly in Canterbury, from 1950. In Nelson, farmers have been slow to realize the benefits accruing from DDT usage. Only in the last five to six years has grass-grub control become an accepted practice but the annual acreage treated is still very low. In the Nelson area, the change from DDT-superphosphate mixtures to pelleted forms of DDT appears to have had little effect on the level of control. Certainly, in this season there has been adequate rainfall to disperse the insecticide from the carrier in the granule or pellet.

Despite the relatively limited use of DDT in Nelson, the problem of increased tolerance of the grass-grub to this insecticide has already appeared. These tolerant populations are, however, limited to a relatively small area at present. Grass-grubs tolerant to several times a normally effective dosage of DDT are known from four sites in the Takaka Hill-Riwaka Valley area. In addition to these tolerant populations, there are two cases from the Motueka River Valley and two from Murchison where laboratory proven susceptible grass-grubs cannot be controlled by DDT even when this is adequately distributed through the soil profile. In all other known cases in Nelson, DDT continues to provide effective control of grass-grub.

An intensive study is being made for alternative insecticides to DDT both because of this slowly developing problem of tolerance and the greater problem of residues in food stuffs. Some preliminary promise has been shown by organophosphorous materials, particularly diazinon. This material is relatively transient and thus apparently safe from a residue point of view. The rapidity of breakdown of diazinon is a distinct handicap when attempting to control a soil-inhabiting insect. If diazinon can be brought into contact with the grass-grub it is highly effective. At present there seems little prospect of formulating this insecticide in such a way to give consistent grass-grub control in all situations. An additional

hazard is the possibility of deleterious, but little understood, pasture deterioration associated with diazinon on one soil type.

The search for safe, alternative insecticides to DDT will continue. At present, the possibility of finding such a material does not look promising. Work on biological control of grass-grub has been intensified in recent years. The Commonwealth Bureau of Biological Control is currently searching for suitable parasites and/or predators for grass-grub in South America, Europe and Canada. Some introductions from South America should be made within the next twelve months. While every effort is being made in the direction of biological control of grass-grub, the prospects for success are limited by the difficulties of adapting an exotic parasite or predator to an indigenous insect.