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NOTE ON THE GRASS-GRUBS FOUND IN THE STATE NURSERIES.

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UP to the present time, with certain isolated exceptions chiefly of a non-parasitic nature, such as frost and fires, the main pathological troubles that have had to be contended against in the State afforestation-work have been incurred during the nursery part of the operations.

The most serious of these has been the really considerable loss that has occurred through the ravages of a group of beetles belonging to the endemic genus *Odontria*, which in the larval condition is popularly referred to as the grass-grub.

During the past season it has been stated that in the Rotorua Nursery alone three-quarters of a million larch seedlings and two-year-old plants have been destroyed. This is in itself sufficient to demand the thorough control of these insects in the nursery beds; but there is another and more serious aspect than the mere killing of the plants, and that is the increased price per thousand of the surviving ones will seriously affect the final cost of the mature lumber, especially if the trees are employed for the production of large timber and the rotation of the crop is at all extended.

In forest-tree pathology the most serious losses often occur during the nursery operations, as in most cases the effects are epidemic in their nature, and a total loss of the affected individuals takes place. In growing and standing timber the effects of disease, although apparently more serious from a monetary point of view, can generally be checked by the adoption of methods that mean the elimination of the centres of infection. In the case of trees that are not of marketable size the removal of diseased ones, although an expensive operation, often has but little injurious effect on the ultimate yield, as the number employed per acre presupposes the elimination of a large percentage of those originally planted. With regard to marketable-sized trees, the evil effects of plant-diseases can be often largely obviated by the disposal of the timber before the disease secures too strong a hold, thus tending to remove the centres of infection and at the same time securing some appreciable return from the affected individuals.

It can thus be seen that the guarding of the nursery beds against insect and fungus invasion becomes an essential feature in the nursery work, and the recent effects of the various species of "grass-grubs" indicates clearly the urgent necessity for their suppression, even if the cost may be quite considerable.

For some time I was under the impression that the species responsible for the trouble was the ordinary grass grub, *Odontria zealandica*, but recent researches show that the one attacking the North Island nurseries is the newly described *Odontria puncticollis*. This insect is fully described and figured in the March number of the *Agricultural Journal*. In the South Island, so far as my observations go, I am inclined to think that *Odontria striata* is the main cause of damage. Great care has been taken by the nurserymen in charge to sow only on apparently clean land, and that the infection has in nearly every instance taken place through egg-laying occurring in the beds after the seed has germinated and the seed-frames removed.

At Rotorua larch has been mainly attacked, and *Pinus Laricio* has apparently escaped damage, but in the South Island such is not the case; but one must remember that in each locality it is a different species that is the causative agent. The larvæ completely eat through the roots, and plants that are attacked quickly succumb, being apparently unable to develop fresh roots sufficiently quickly to replace those that are destroyed.

It is, of course, impossible to give any definite information on the line of action that should be adopted until such time as the full life-history of all the species that are responsible for the damage has been worked out. However, it can safely be asserted that if egg-laying can be prohibited on the nursery beds during the summer following the sowing of the seed the effects of the grass-grub can be kept down to a minimum. So far as the nursery beds are concerned, this does not appear to be at all impracticable, provided the times and duration of egg-laying are accurately known. With regard to *Odontria puncticollis*, the main flights appear to take place during February and March, and the same is apparently true of *Odontria striata*, while with *O. zealandica* it is in November and December that the majority of the female beetles are on the wing. It has been proposed to make the present seed-frames beetle-proof, and keep them covered over the beds until any danger of egg-laying is over. Mr. Goudie has suggested certain modifications on the way that the scrim is at present used on the frames which would enable it to be removed during the daytime and replaced every evening without any undue expenditure of labour. In this way the injurious effects of keeping the young plants covered over during a portion of the summer will be avoided.

It is a very significant fact that so far as our present knowledge goes the ordinary grass-grub, *Odontria zealandica*, rarely causes any appreciable damage in the State nurseries. I am confident that this is due to the fact of the seed-frames being kept normally on the beds until after the main egg-laying of that species is completed. Of course, *O. zealandica* has at times been found in considerable numbers in the nursery beds, but the present seed-frames are by no means insect-proof, although they could easily be made so.

Soil fumigation and spraying may also play an important part in the control of the subterranean insects affecting the nursery beds, and experiments are proposed to be carried out in these directions. However, so soon as there are full particulars as to the exact times that the egg-laying of the various species takes place I am sure that the screening of the beds during these crucial portions of the year will provide an efficient and practical means of control.

I would here like to express my obligation to Mr. Goudie and Mr. Robinson for the really excellent notes they have provided me regarding various phases of the life-histories of the species that they have had under observation.