

TRICHOGRAMMA; AN EGG PARASITE.

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INTRODUCTION.

The aim of biological control is to alter the existing equilibrium between a pest and its enemies in favour of the latter, so that the damage done by the former shall be reduced to or below what may be described as the economic minimum. It may be carried out in two ways:—

- (1) By the introduction of a suitable enemy into a region not formerly occupied by it; as an instance, a pest introduced accidentally into a region may be successfully countered by the further introduction of an enemy or enemies from the country of origin.
- (2) By the artificial propagation of an enemy so that it can be liberated in large numbers *at the appropriate time*.

The two methods differ radically in one respect. In the first case, a foreign enemy is introduced which it is hoped will propagate itself in the new conditions and produce a natural balance between itself and the pest. In the second case, the enemy may already be indigenous, but does not exert a control, owing to some factor or factors which allows the pest to increase rapidly before the parasite has been able to attack in any numbers. In this case, artificial mass production is designed to throw into the field a large number of the enemies of the pest at a time when the pest is about to begin its campaign. It is into this category that *Trichogramma* falls.

THE NATURE OF TRICHOGRAMMA

There are several species in this genus, all very much alike. They are minute insects, less than a millimetre in length and belong to the order Hymenoptera, to which bees and wasps also belong. Numerous forms in this order make a speciality of parasitism, and it may be noted in passing that both the caterpillars and pupae of *Tortrix* are parasitised to some extent by several members of this group. *Trichogramma*, however, differs from the others, in that it attacks the eggs by piercing them with its ovipositor and laying an egg of its own in each egg, so that the parasite develops at the expense of the *Tortrix* embryo. This is obviously satisfactory from an economic standpoint, since the pest will be destroyed before it has done any damage.

The species which has been most studied is *T. minutum*, on which work has been carried out for a number of years. To quote S. E. Flanders, "The hosts of this parasite . . . number well over one hundred and fifty species in the orders Lepidoptera, Coleoptera,

Hymenoptera, Neuroptera, Diptera and Hemiptera. It has been known to attempt oviposition in the juice globules of Okra plants, the swollen abdomen of the mite *Pediculoides*, and in paper smeared with the hair covering of the egg-masses of the Browntail moth. The majority of hosts, however, are Lepidoptera, and its oviposition is confined to eggs deposited on exposed surfaces and without a protective covering of a hard, hairy, or sticky substance. A Hymenopterous host is recorded as having the highest number of individuals developing from a single egg. In Wisconsin, thirty pupae were found developing in a single egg of *Cimbex americana*."

MASS PRODUCTION.

The adaptability of this parasite has enabled it to be used for extensive propagation under laboratory conditions, but it is only within the last four years that attempts to raise it on a large scale have been undertaken, and a million a day figure only reached within the last two, in America.

Our indigenous species, *Trichogramma erosicornis*, has not so far shown the remarkable adaptability of *T. minutum*. It has been bred for several generations on the egg of the flour moth, *Corcyra cephalonica*, but the results are extremely variable. It will be necessary to obtain a regular ninety per cent. parasitism before it can be considered enough for mass production purposes. It is hoped to obtain some specimens of *T. minutum* later on for comparative purposes; and it is interesting to note that several of this species were obtained in America in 1926 from the eggs of a Tortrix moth, which were afterwards developed on mass production lines.