

PANTORHYTES CONTROL IN CACAO PLANTATIONS

By the Entomology Section, Department of Agriculture, Stock and Fisheries.

THE cacao weevil borers (*Pantorhytes* spp.) are now firmly established as major pests of cacao in the Territory of Papua and New Guinea. Five different species have so far been recorded from cacao and these occur in seven different districts.* It is, however, only in New Britain, the Markham Valley and the Northern District of Papua that the incidence of the weevil is sufficiently high to cause severe damage. The known habits of the different species indicate that similar control measures should be adopted for each species.

Cacao growers can prevent or reduce weevil damage by following recommended cultural and clean-up practices and by using insecticides.

Pantorhytes is not an introduced insect. Before the advent of cacao growing, the weevil was confined to native host plants in primary and secondary forest. It has, however, adapted itself very satisfactorily to cacao and this can now be regarded as one of the major host plants in the Territory. In areas where cacao is not already established as the host, it should be possible to reduce considerably the build-up of the populations by strict plantation hygiene. Basically, this involves the removal of native host plants from the vicinity of plantations and the concentrated treatment of already infested areas to prevent the further spread of the weevil.

Development

The weevil is a serious pest in all months of the year, although there may be minor seasonal or annual fluctuations in the incidence and severity of damage.

It has four stages in its development—egg, larva (grub), pupa (resting stage) and adult.

The length of the life cycle from the egg stage through the larva, pupa and adult to the following generation varies from none to 16 months.†

Egg

The female adult lays her eggs in the cracks and crevices on the bark of the trunk, usually at or below the jorquette. Trees under about three years are not generally attacked, because the bark at that stage is not sufficiently roughened to provide a suitable egg-laying site for the weevil.



Fig. 1.—*Pantorhytes proximus* Fst.
Larva. (4 x Nat. Size.)

[Drawing by M. L. Szent-Ivany.]

Larva

The larva is typical of weevils and has a well-developed head and a robust, curved body which lacks legs. (Figure 1.) The body is regularly wrinkled and has rows of fine hairs. The head is hard and brown and there is a well-developed mouth. The larvae hatch from the egg after about 14 to 18 days and they grow to about

* *P. plutus* Oberth. from New Britain, New Ireland and Milne Bay; *P. proximus* Fst. from the Markham Valley; *P. szentivani* Mshl. from the Northern District of Papua; *P. biplagiatus* Chevr. from Bougainville; and *P. quadripustulatus* Gestro from the Sepik District.

† The life histories of all species have not yet been fully studied and the durations of the stages given here are approximations based on studies with *P. proximus* and *P. plutus*.

three-fourths of an inch long by a series of moults at which they shed their skin as it is outgrown. From available evidence it appears probable that larval development is more rapid in quick-growing native host trees than in cacao, which is a comparatively hard-wooded tree.

Pupa

After nine to 16 months, the larva is fully developed and it stops feeding and enters the resting stage or pupa. This pupal stage is spent in a hollowed-out cell beneath the bark of the tree. It is at this time that the larval tissues break down and the body undergoes a change to the form of the adult, which eventually becomes visible through the pupal skin. The pupal stage lasts for about 15 days.

Adult

The colour and form of the adult weevils vary with the different species. However, all species are about one-half to five-eighths of an inch long. They have a well-developed head and thorax and an abdomen which is strongly rounded and tapers sharply at the rear. (Figure 2.)

All *Pantorhytes* species are unable to fly, but their well-developed legs enable them to move reasonably rapidly when disturbed. Frequently, when approached, they drop from the trees and withdraw their legs into their bodies and appear to feign death.

This flightless characteristic of *Pantorhytes* should be utilized by planters when devising methods of control. It should be possible to protect cacao areas by providing a barrier to the movement of weevils. The only way that *Pantorhytes* can get into a new cacao area is by walking or by human agency. By eradicating alternative host plants around the perimeters of cacao plantings, the distance to the new host can be a deterrent to the spread of the weevil.

Damage

Most *Pantorhytes* damage is done by the larvae, although the adults may cause minor damage to the bark of the young shoots on which they feed. This superficial feeding is not very important and the adults apparently do not damage the plant enough to reduce yield or to set back the trees.



Fig. 2.—*Pantorhytes szentivanyi* Mls.
Adult. (4 x Nat. Size.)

[Drawing by M. L. Szent-Ivany.]

The larvae generally attack the tree in the region of the jorquette, but they are frequently found also in the branches, particularly of older trees. In the trunk, the tunnels are usually straight, but in the smaller branches ringbarking may occur, with the subsequent death of the limb. Feeding is confined to the sap-wood and considerable amounts of frass are produced as evidence of attack. The tree usually reacts by producing quantities of a gummy exudate which issues from the borer hole and which, in some cases, may effectively immobilize the larva and prevent its further development.

Control measures

Investigations into the control of *Pantorhytes* are continuing at different Territory centres, but meanwhile planters can prevent or greatly reduce weevil damage by following the procedures outlined below.

Eradication of alternative host plants

As stated before, cacao is not the natural host plant of *Pantorhytes*, and in new areas it must gain access to plantations from native host trees

adjacent to the plantations. Some of these indigenous hosts have already been determined, but there are undoubtedly other unknown species occurring in different areas. The most important known host is *Pipturus argenteus* (Forst.) Wedd., a common regrowth species through-

out the Territory (Plate I). *Pipturus* is one of the first species to appear on cleared land, but is soon overshadowed and outgrown by taller species if the secondary growth is allowed to go unchecked.



Plate I.—*Pipturus argenteus* (Forst.) Wedd.

[Photo D. Shaw.]

The tree is rather small, growing about 20 to 30 feet high. The leaves are dark-green above and whitish below. They are spade-shaped and have a serrated margin.

There are three conspicuous longitudinal veins, of which the outer two are less prominent than the central one. The flowers are small and grouped in pale-green globular clusters at the junctions of branches. The fruit is rather similar to a small, white strawberry.

Another naturally-occurring host tree is *Schuurmansia henningsii* (K. Schum). This

tree seems unable to tolerate flat ground with poor drainage, although it demands abundant soil moisture. It may be found on flat places on the edges of terraces and gullies, but it usually inhabits steep slopes.

Schuurmansia is a tall shrub or small tree reaching about 30 feet in height, with a trunk to about six inches in diameter. The branches are thick, brittle with a central pith. The leaves are clustered at the ends of branches and they are pale-green in colour and lack stems. They are very long—up to 30 inches—and up to

five inches broad, with the widest part near the tip. The flowers are pink in colour and very numerous, forming a long, loose panicle about two feet long.

It is important to remember that *Pantorhytes* can only come into new cacao areas from its indigenous hosts in the surrounding forest. Knowing where the weevil comes from and where to expect an invasion of pests helps considerably in its control. Known native host species should be slashed and brought under control within a workable distance from the plantation or grove. Sustained control is possible by the use of cover crops, and selective thinning of secondary growth to keep down *Pipturus* and *Schuurmansia*. To be effective it is necessary to slash down the host trees at about six-month intervals so that the larvae do not have time to complete their development.

Control within Cacao Plantings

In areas where *Pantorhytes* is a serious problem, it is advisable to have a team of perhaps two or three labourers who are permanently engaged in the control of the pest.

Larvae

Attention should be paid to the destruction of larvae in the trees wherever they are seen. Sometimes it is possible to remove the larvae with a sharp knife, but with older larvae this practice is very damaging to the trees, and is generally not worth while.

Adults

Experiments in the control of *Pantorhytes* adults have been proceeding for several years, but no cheap and effective control recommenda-

tion has yet been devised. In small areas, it is often practical to have labourers collecting the adults by hand and then destroying them. A bonus system may be employed to induce better results.

The use of sticky bands incorporating an insecticide has been contemplated and, although effective, it is far too uneconomical to consider on a plantation scale. Future work may result in the development of newer and cheaper materials which may be applied to trees on the borders of plantations to prevent infestation from natural host trees.

Several insecticides have been used in sprays against the adult weevils and present indications are that D.D.T. is the most effective material. In the Markham Valley 0.5 per cent. D.D.T. applied in high-volume sprays considerably reduced the weevil population when applied at six-week intervals. Experiments in New Britain with D.D.T., using power-driven, low-volume sprayers indicate that 10 oz. D.D.T. per acre applied at two-month intervals will also exert good control. The success of a spraying programme depends upon constant supervision to ensure that the insecticides are applied thoroughly and evenly over the affected area.

When considering *Pantorhytes* control, it is important to remember that prevention of infestation is much easier to attain than eradication, once the pest has become established. The removal of alternative host plants and the establishment of a barrier to the passage of the weevils is a very necessary part of plantation hygiene in those areas where *Pantorhytes* occurs.