CHAPTER 16

PESTS

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Among the agricultural crops, rubber is an exception with regard to pests, as the attack is usually mild, mostly sporadic and localized. However, a few pests become serious at times and cause considerable damage in almost all rubber growing countries. One reason attributed for the unattractiveness of rubber to pests is the presence of latex all over the plant from root tip to shoot tip, which may coagulate and block the mouth parts of insects and other animals. But a few insects and non-insect pests do surmount this problem and feed on rubber plants. The cover crops grown as intercrops during immaturity period and rubber wood are attacked by many pests. There are also pests which cause health hazard and inconveniences to the personnel residing in rubber plantations. Detailed accounts of pests in rubber plantations were furnished by Sharples, 1936; *Edgar, 1958; Sripathy Rao, 1965. The pests attacking* rubber can be classified into three major groups such as insects, non-insects (invertebrates) and vertebrates.

INSECT PESTS

Root grubs

Root grubs are larvae of Cockchafer beetles (Coleoptera: Melolonthidae) which feed on roots of rubber. The pest is polyphagous and attacks rubber in nurseries and planted fields, especially in areas adjacent to virgin forests. The pest has been reported mainly in nurseries in India (Ramakrishnan and Radhakrishna Pillai, 1963) and also in main fields in Malaysia and Papua New Guinea (Smee, 1964). Some of the species are Lachnosterna [Holotrichia bidentata (Burn)] reported to be most serious in Malaysia (Sripathi Rao, 1965; RRIM, 1968) and Ceylon, and Psilopholis vestita (Sharp) and Leucopholis rorida in Malaysia. Holotrichia serrata (F.) is the most common in India, and the other species present are H. rufoflava F., H. fissa Brenske and Anomala variance O. (Nehru and

Jayarathnam, 1988). The first instar grubs feed on humus and very tender roots. The third and final instar grubs can feed on tap roots and collars of hardened plants. At this stage the grubs feed voraciously. The whole root system is fed on, in upto 6 month old nursery plants, which sometimes sway in the morning due to the active feeding of grubs at the collar region. In such cases the leaves turn yellow, shed off and then the whole plant dries up. Larger plants can survive the attack, but will lose their vitality. The grubs are fleshy with wrinkled 'c' shaped bodies (Fig. 1). Third and final instar grubs measure about 48 mm.

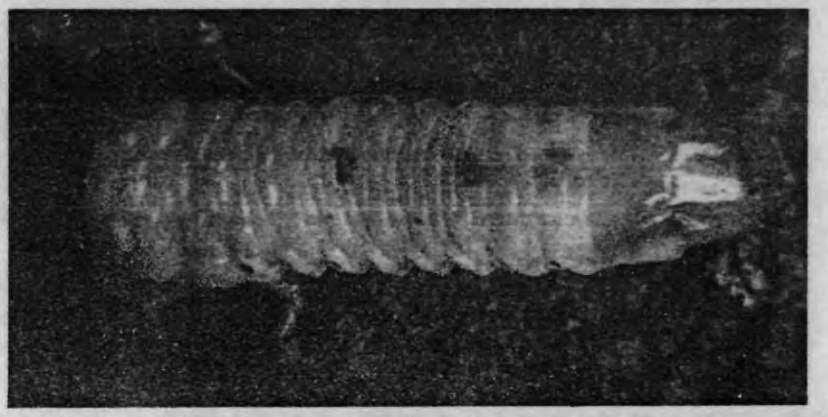

Fig. 1. Third instar grub of H. serrata.

The life cycle of white grubs lasts for one year. Adults emerge from soil with the first rains after summer and are active mostly between 7.30-8.30 pm. Adult beetles are sturdy and females are much larger than males. In India , adults are noticed to feed on leaves of Acacia, neem and tapioca and some specific forest plants, though not on rubber. They mate and lay eggs singly around the host plants at depths of 8-10 cm, enclosed in earthen cells. Adults live for about two months. The grubs emerge in 10-12 days. The three larval instars occupy about 30, 35 and 102 days. The population of grubs can be as high as 500,000 per hectare. Pupation takes place in the month of November-December and lasts for 12 days. The adults lie quiescent until first summer rains and then emerge. The adults are highly attracted to light.

There is good scope for adopting integrated pest management. Control of the pest is achieved to some extent by natural enemies like wasps,

vertebrate predators and fungal and bacterial pathogens. But they are not very effective. In Malaysia, black light traps were found to be useful for attracting the adults and killing them (Sripathi Rao, 1964; Van Iddekinge and Gill, 1969). Spraying DDT 0.4% or endosulphan 0.1% on adult host plants was found effective in reducing the adult population. In nurseries, incorporation of insecticides like sevidol 4:4 G or phorate 10 G at the rate of 25 kg ha^{-1} or BHC 10 D at 100 kg ha^{-1}, in the soil at the time of preparation of nursery beds proved very effective (Jayarathnam and Nehru, 1984; Nehru and Jayarathnam, 1988). Drenching insecticides like aldrin 0.1% solution is recommended for field plants, though it is found to be less effective. Application of insecticide granules in main field also is recommended in Malaysia for better protection.

Bark feeding caterpillar

At present, this pest is reported in rubber from India only (Nehru et al. 1983). Caterpillars of two species of moths Aetherastis circulata Meyr. (Yponomeutidae) and Ptochoryctis rosaria Meyr (Xyloryctidae) feed on brown corky bark of mostly mature trees, the most common being A. circulata. Field incidence of bark feeding caterpillar, A. cirulata, on different alternative host plants and its control was published by Nehru et al. (1987). They build galleries with silk and chewed bark and live within, damaging brown bark all over the tree. They thrive only during dry months and in the wet season they disappear, as the galleries get wet and damaged. The caterpillars feed deeper at certain points in the prepupal stage and pupate. Since they feed as close to the green bark as possible, the latex vessels break at such points due to bending and twisting of trees in strong wind and latex oozes out. This damage is more in clones with stem bleeding character. Latex oozes out continuously and forms a thick pad on the trunk and branches. During rainy months these latex oozing points help easy penetration of wood rotting fungi like Phytophthora, Botryodiploidea, Pythium, etc. With the rotting of tissues upto wood region, there can be branch snap or trunk snap.

The caterpillar is brick red in colour, flat and with a broad head and thorax and tapering abdomen (Fig. 2). At prepupal stage the caterpillar measures about 1.5 cm in length. When disturbed it moves briskly inside the gallery. The adult moths are white in colour with black dots in the fore wing. Each female moth can lay about 400 eggs on the bark. Larva emerges in about 4 days. Larval period lasts for 25-30 days. Pupa is enclosed in a dome shaped cocoon made of thick gallery.

Fig. 2. Bark feeding caterpillar A. circulata on rubber tree.

Satisfactory control is achieved by dusting insecticides fenval 0.4%, methyl parathion 2%, quinalphos 1.5% or carbaryl 5% with a power duster at the rate of 10-15 kg ha^{-1} (Jayarathnam et al. 1989). The duster need be carried only at every fourth row and dusting operation has to be done in the early morning hours, when there is no wind.

Termies

In Malaysia, termites are a big menace to rubber cultivation. A species of termite Coptotermes curvignathus Holmgren (Isoptera: Rhinotermitidae), which can feed on green plant materials was reported in Malaysia (Newsam and Sripathi Rao, 1958; RRIM, 1966). These penetrate rubber trees through tap root, main laterals or collar and build galleries in the trunk (Sripathy Rao, 1965). In many cases, no sign of attack is seen above ground before the tree is killed or uprooted by strong wind. When such trees are examined it can be seen that the central wood portion is consumed by termies. This termite is also reported from Indonesia. C. elisae (Resn.) occurs in Papua New Guinea. Species present in other countries are C. testaceus (L.) in Brazil, Neotermes greeni (Desn.) and N. militaris (Desn.) in Sri Lanka and Odentotermes obesus (Ramb) in India. The species occurring in India damages only dead or partially dead trees. Termite colonies normally originate from old logs buried in soil. They damage the dry mulch, shade baskets, etc.

Control of termites for 23 years could be achieved in India (Jayarathnam, 1968) by drenching aldrin 0.1% solution in the soil around

the affected plants or objects. In Malaysia, drenching with a few soil insecticides is recommended. The earlier practice of tracing buried old logs was discarded due to high costs involved (Sharples, 1936).

Scale insects and mealy bugs

These insects come under the category of plant bugs (Hemiptera: Coccidae) which suck the sap from terminal green parts of rubber plant and trees. The species of scale insects involved in India is Saissetia nigra Nietin and mealy bug Ferrisiana virgata (Ckll.) (Ramakrishnan and Radhakrishna Pillai, 1961; Jayarathnam, 1980). In other countries, scale insects Pulvinaria maxima (Green), Lepidosaphes cocculi (Green), Laccifer greeni (Chamberlain) and mealy bug Planococcus citri (Risso) occasionally attack rubber (RRIM, 1968). Symptoms of attack are yellowing and shedding of leaves and die back of twigs. These insects secrete a sugary secretion known as honey dew, which spreads on the stem and leaves. A black fungus, sooty mould (Capnodium sp.), grows on it. This gives a black and dirty appearance to the leaves and stem. Since these insects are sedentary in nature a number of natural enemies like parasites and predators and a fungal pathogen Hypocrelia reineckiana attack them and keep them under check. However, at times due to absence of natural enemies, population explosion occurs. In such cases malathion 0.05% solution along with a wetting agent, sprayed on infested parts gives effective control.

Leaf eating caterpillar

The insect causing serious damage in Brazil and Guyana (Winder, 1976) is the larva of the moth Erinnys ello L. (Lepidoptera: Sphingidae). This pest also attacks other Euphorbiaceous plants, as well as crops like papaya, tobacco and cotton. Young larvae can feed only on tender leaves while the older ones feed on mature leaves and bark of green twigs. Hence outbreaks normally occur during refoliation. The attacked trees produce less latex. Completely defoliated trees refoliate only the following year.

Eggs are laid on lower surface of leaves. The larvae grow to a length of 8-9 cm and are green or greyish green in colour. There are five instars and larval period lasts for two weeks. Pupation takes place in the soil. Adult moths have a wing span of 34-48 mm and are grey in colour. Even though as many as 30 parasites were identified, for control, spraying of insecticides such as carbaryl, lindane, etc. is practiced (de Abreu, 1982).

The other lepidopterous pest noticed in Indonesia, Sri Lanka, Malaysia and Papua New Guinea is Tiracola plagiata Wlk. (Noctuidae).

Other insect pests

Occasional damage occurs on tender leaves due to the weevil, Hypomyces squamosus (F.) (Coleoptera: Curculionidae). The grass hopper, Valanga nigricornis (Burn.) (Acrididae) appears in swarms and consumes rubber and cover crop leaves. The cricket Brachytrypes portentosus Licht. (Gryllidae) cuts the stem of young nursery plants a few centimeters above ground. The tip wilt bug, Amblypelta lutescens papuensis Brown (Coreidae) damages the young leaves at the tip. Thrips also damage tender leaves 2-3 days from bud burst in Malaysia, though they are not noticed in India (RRIM, 1962).

Wood boring beetles

Some species of powder post beetles attack partially or fully dead rubber wood such as Mynthea rugicollis, Heterobostrychus acqualis and Sinoxylon anale and Platypus sp. The borer beetles invade rubber wood after the attack of diseases, sun scorch and fire. Severe attack was noticed in Malaysia (RRIM, 1959; Tan et al. 1979) subsequent to fire damage. Their presence reduces the timber value. In live plants they are not a problem and can be controlled by swabbing BHC 10 D. Timber preservation methods are detailed by Sekhar (1989).

Pests of cover crops

In India the popular cover crop of rubber Pueraria phaseoloides is attacked by many pests and the important ones are leaf lacerating flea beetle, Pagria signata, stem borer Eucomatocera vittata and flower and pod borer Maruca testulalis. Pests are noticed in cover crops in Malaysia also (RRIM, 1963, 1969). But their attack is significant only in initial stage of growth of the cover crop and they can be managed by dusting BHC 10 D. Other cover crops such as Calopogonium mucunoides, Centrosema pubescens, Mimosa invisa and Mucuna bracteata are rarely attacked by pests.

Pests causing health hazards and inconveniences to personnel

Mosquitoes are a real menace in rubber plantations and can cause health hazard by transmitting diseases (Edgar, 1958). All stagnant waters in plantations other than used for drinking should be covered with a thin film of insecticide mixed diesel oil. The latex collecting cups should be kept upside down when not in use to prevent collection of rain water inside. The beetles Lyprops corticollis Frm. invade the dwelling places in rubber estates in very large numbers and cause considerable inconvenience by their presence and secretion of stain. These can be collected by putting up light

traps with very bright light, or killed by spraying or dusting DDT.

NON-INSECT (INVERTEBRATE) PESTS

Slugs and Snails

Some terrestrial molluscs can considerably retard the growth of young rubber plants and also feed on latex from tapped mature trees. The species of slugs attacking rubber in Malaysia, Ceylon and India are Mariaella dussumieri Grey and Semperula maculata (Templeton) (Ramakrishnan and Radhakrishna Pillai, 1962; RRIM, 1967). The snails present in Malaysia are Parmarion martensi Simroth, Xestina striata and Achatina fulica while Cryptozona (Xestina) bistrialis Beck is reported in India (Jayarathnam and Rajendran, 1979). They are nocturnal in habit and in the day time lie concealed under natural mulch, rocks and crevices of soil. Only by dusk do they become active and climb on rubber plants and trees, returning to their hideouts by day break. On young plants, they move upto the terminal part and rasp the terminal bud with their denticulated tongue. Due to the damage to the tissues, latex oozes out and they feed on latex. With repeated damage, the terminal bud does not grow and get calloused. Similarly the axillary buds also get damaged. Thus the growth of the plant is arrested and the terminal part gives a clubbed appearance. In some cases fasciation and die back occur. In trees, they feed on tender parts and on latex from tapped trees. They are not affected by the latex they feed on and excrete coagulated latex. After feeding they cross the tapping cut to move downwards. When they get habituated to feeding on latex, they are seen to collect at the tapping panel and collecting cup as if waiting for the tappers to begin tapping. Due to this, the latex gets contaminated with slime. During day time, their presence can be identified by the watch spring like excreta and glistening lines of dried slime present all over the shoot. Only a very small portion of the total population attack rubber, as most of them feed on tender parts of cover crops and weeds.

Slugs and snails have an unsegmented, fleshy, wormlike body and continuously secrete slime. They glide on a sole like foot, leaving a track of slime. Snails bear a spiral shell, whereas slugs have a small concealed shell. They are hermaphrodites, but mating is required to lay eggs. Upto 400 leathery, pearly white eggs are laid in groups. Life cycle is completed in a year.

The well known molluscicide metaldehyde is used as 2-5% bait (RRIM, 1964, 1969) or 0.1% spray (Nair et al. 1968). Metabait is prepared by mixing metaldehyde, cement, lime and wheat bran (rice bran) in the ratio

2:3:5:16 by weight and making it into pellets or briquettes with water (Edgar, 1958). They can be effectively controlled by sprinkling the insecticide granule temik 10 G on the surface of soil around the collar region of plants. Painting 0.1% slurry of temik in wheat flour about 30 cm wide at the base of stems is more effective and economical. Similar application of 10% Bordeaux paste repelled the slugs and snails for a period of 30-40 days (Jose et al. 1989).

Mites

Mites infest rubber only during summer months and mostly, the attack is confined to nursery. The species Hemitarsonemus latus Banks (Acaria: Tarsonemidae) suck sap from the underside of tender leaves in India and also in Malaysia (RRIM, 1988). On the upper surface, numerous minute white chlorotic spots appear. Severely affected leaves turn yellow and drop.

VERTEBRATE PESTS

A variety of vertebrate pests ranging from rats to elephants cause various types of damage to rubber plants from nursery to very old plantations (RRIM, 1964; Sripathy Rao, 1965; Jayarathnam, 1980). As these are intelligent animals, controlling with poison baits, scaring devices and traps is difficult. The damage due to large animals is mostly confined to areas near virgin forests. The burrowing rats and mole rats cause considerable damage to nursery plants and upto three year old field plants. They feed on the roots and collar from below or above the ground and the plants dry up. The species of rats attacking rubber in India are Rattus meltada Gray and Bandicota bengalensis Gray. In Malaysia, Rattus jalorensis Bonhote and Bandicota spp. are reported. Various types of traps are available for catching and killing rats. Poison baiting with zinc phosphide or temik 10 G is effective, but results in bait shyness. Mass baiting is required to achieve success. Single dose blood anti-coagulant rodenticides like brodifacoum (Nehru and Jayarathnam, 1985) and bromadiolone are very effective bait poisons.

Porcupines

They feed on the bark of mature trees at the base and when fed all around, the trees dry up. They pull out young plants and chew the roots. The common species found are Hystrix indica kerr in India and H. brachyura, Atherurus macrourus and Trichys lipura in Malayasia. Porcupines are much more intelligent than rats. Killing them by shooting is the only practicable method. Baiting with zinc phosphide or temik 10 G in salt meats can be tried.

Wild pigs, elephants, monkeys, deer and sambar

Wild pigs ransack nursery and field plants by pushing out soil with their snouts and chew the roots of toppled plants. The species found in Malaysia are Sus scroba and Sus barbatus. Elephants damage the young plants by trampling and pulling out the plants. They rub their body on the trunk and damage the bark. They also chew roots of young plants. Monkeys break the branches and tear off the leaves. Deer and sambar feed on the bark of the trees. In Malaysia, sambar deer Cervus unicolor and barking deer, Muntiacus muntjak are recorded. These animals can be driven off by scaring devices or prevented from entering the plantation by putting up ordinary or electric fences or by digging deep trenches.

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