

The manurial value excels the market value by about twice as much and the extra benefits of this manure are : 1) it is an organic manure which is the best of manures, 2) it benefits to the land the same year it is applied if well-rotten compost is prepared out of it, 3) it has its residual effects for three years at least. For the above reasons, I advise my co-farmers not to sell their low grade leaf unless the cost of flue-curing and sun-curing can be realized. It is no loss to a farmer at any time if it is not sold. It may be used as manure. There is the Agricultural Demonstrator to teach us how compost can be made solely with tobacco leaf or scrap or in combination with other organic substances to make a well balanced complete manure.

### **Insect Enemies of the Cashewnut Plant (*Anacardium occidentale*) in South India**

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Though an exotic species the cashewnut plant has gained a strong foothold in this country, especially along the coastal and submontane areas of the West Coast from the Cape in the South to almost as far as Bombay and in different parts of the Coromandel Coast. Due to great demand for the cashew kernels from outside countries, thousands of acres of waste land which have been left uncultivated till recently have been planted up with this tree and year after year new areas are planted up. This is a tree which is found to grow well in almost all kinds of soils, and especially in well drained rain fed hill sides and the sandy coastal tracts; it begins to bear well and give a good return in about six to eight years.

Prospective planters of this crop will, however, do well to bestow sufficient care and precaution towards the healthy growth of the tree free from diseases and pests to which this crop is frequently subjected. As the area under this crop is bound to increase year after year in proportion to the growing demand, the chances for pests and diseases to multiply are great, as has been the experience with crops like sugarcane and groundnut in S. India. While even in the case of several crops like those mentioned above, pests of minor importance in the old days have begun to assume the status of major pests, in perennial plants like mango, cashew or other trees such pests have greater chances of rapid multiplication and wider distribution when the area under the food plant increases rapidly and no attention is paid to these pests in the early stages. In this paper an attempt is made to give a brief account of the different insects associated with this plant, their bionomics as far as we know and a few suggestions towards their control.

**Sucking insects.** As in the case of most fruit trees it is during the younger stages of their growth that the plants are more subject to pest attacks. The more important of the insects which cause injury to the growing plant are insects of the sucking type which feed on the sap of the tender parts and cause fading. These include the following:—

**The Tea mosquito** (*Helopeltis antonii* S.) As the name indicates this is the notorious capsid bug associated with the tea plant in most of the plantations in S. India. This is a very active reddish brown insect almost like a mosquito. The insect has been known to tea and cocoa planters of Ceylon for nearly a century. The adult insect can be easily identified by the peculiar knobbed process projecting from the dorsal side of the thorax of the insect like a pin. The eggs are peculiar and practically thrust into the tender plant tissue by the mother insect; these hatch into minute, antlike active nymphs and after undergoing about four moults assume the adult stage. The thoracic knob is not found developed during the earlier nymphal stages. The nymphs and the adults cause damage to the plant by feeding on the sap of the tender leaves and shoots and allow these parts to fade and dry. In serious outbreaks the leaves and shoots dry up and the whole plant, if it is very young, almost succumbs to the attack. In South India this bug has been so far noted on tea and neem (*Azadirachta indica*) in addition to the cashewnut plant. This insect belongs to the same group and has the same habits as the mosquito bugs of sorghum and betel vine. The damage caused to the plant shoots often appear so serious that workers have often been led to suspect whether the insect does not inoculate some poisonous or irritating virus into the plant tissue.

**The Cocoa thrips** (*Selenothrips rubrocinctus* G.). This is a well known and notorious pest of Cocoa in different tropical areas; it is a small thrips infesting the tender shoots and leaves in large colonies. The injury caused to the plant is more or less as in the case of the tea mosquito. Badly infested leaves turn reddish brown and gradually fade. The insect though provided with wings and capable of flight is a slow moving creature, has a dark reddish brown colour and is about  $\frac{1}{4}$ " in length. The entire body surface including the legs shows a closely reticulate surface fringed with minute bristles. Eggs are thrust into the soft tissues and the emerging larva is very characteristic of this species; the body has a light greenish yellow ground color and over this there are bright red transverse bands across the first and last abdominal segments. Due to this characteristic coloring it is also known as the "red banded thrips". Though there is no cocoa cultivation in India the insect is found often as a major pest on cashew plant and occasionally on the country almond tree (*Terminalia Catappa*). This thrips has been noted by the writer as a serious pest in parts of Malabar, Cochin and S. Canara. Besides the red banded thrips, the writer has noted another species of thrips in company with the former on this plant in parts of N. Malabar. It confines its activities chiefly to the flowers. It was described as a new species by the writer in 1928 under the name *Rhynchothrips raoensis* F.

**Scale Insects.** Two or more species of these insects have been noted on cashew. The fairly common species of scale found on this plant is the soft wax scale (*Ceroplastes floridensis* C.). Hundreds of these scales are found on the surface of tender leaves and shoots. In bad infestations the

infested areas fade and gradually become dry patches. Another species of scale occasionally noted is a soft scale (*Lecanium latiorparculum* G.) which, however, is not a very important pest.

**Biting Insects** We now come to those insects associated with the tree which eat the leaves, buds, etc. These include leaf eating caterpillars, beetles and stray grasshoppers. Of leaf eating caterpillars, the commonest found especially along the West Coast area is the wild silk worm (*Cricula trifenestrata* H.); it is a stout reddish brown hairy caterpillar often found in swarms; the golden yellow hairy spiny silken cocoons of these caterpillars are sometimes found in masses on the tree branches. The moth is also a fairly large one with reddish brown wings. Among other caterpillars there is found a small pale white leaf miner (*Acrocercops svngramo* M.) During the stages when fresh shoots and leaves are given out this slender caterpillar, about  $\frac{1}{8}$ " to  $\frac{1}{4}$ " in length, produces pale whitish patches of blisters on the tender leaves, which curl up and dry. The moth is a small very delicate pale silvery grey insect. Another caterpillar is a slender elongated greenish species which folds and rolls up the foliage; but this is not such a bad pest as the leaf miner. Among leaf eaters a small dark weevil (*Apion amplum* F.) about  $\frac{1}{8}$ " long is often found nibbling the tender shoots and buds. It is not unlikely that further studies might reveal the association of other insects with this plant. It may be interesting to note that while all the other parts of this tree are attacked by insects the fleshy joint and the nut have not so far been found subject to their attention on the tree. The stored kernel is often found subject to the attacks of some caterpillar pests which generally attack dry fruits, oil seeds, etc.

In certain tracts like the coastal and submontane areas of Cochin and Travancore the tree, stem and branches have been occasionally found attacked by the grubs of stem boring longicorn beetles as in the case of mango, jak and other fruit trees; often stems and even trees are killed in bad infestations by the grubs of the beetles which are long, stout and fleshy worm-like creatures. Two species have been noted so far, viz. *Plocaederus ferrugineus* L. a medium sized brown coloured beetle from Cochin and another *Prionoma atratum* G. from Travancore.

**Control methods** Regarding control measures against these pests a few remarks may be added. Unlike as in the case of ordinary field crops like paddy, sorghum, etc., where, methods like spraying, dusting, etc., for pests are out of question, in the case of paying crops like fruits all modern methods whether mechanical or insecticidal are well worth introduction in orchards; in fact such methods should be included in the routine of fruit cultivation just in the same way as cultural methods like manuring, irrigation, hoeing, pruning, etc., etc. It will also be quite economic and practicable for orchardists in extensive areas to equip themselves with the necessary pest controlling apparatus and insecticides for their periodical use; else they can even arrange for stocking all such materials on a co-operative basis for the use of all fruit growers in any area. If modern methods of

spraying, etc., have any definite chances of success in India. Payer crops like fruits and industrial crops like cotton, tobacco, etc., are the ideal ones for such trials. For the sucking insects, especially thrips and the mosquito bug of this tree which constitute the main pests spraying the shoots with a contact insecticide like tobacco decoction after pruning badly infested shoots will be found economic and beneficial. For the leaf eaters which are not so bad, handpicking in time might alone be found sufficient; if, however, the attack becomes wide spread spraying or dusting with stomach insecticides will control the pest. The control of the borer beetles is not, however, an easy job. Preventive measures have to be adopted in the shape of pruning and destroying early infested stems and branches, removing dead and dying branches and keeping the orchard clean. Direct methods in the way of removing or killing the grubs on the attacked trees by hooked wires, injection of petrol, etc., can also be adopted. Biological control may be very effective in some cases but the same will have to be always supplemented by the ordinary prophylactic and curative measures like spraying, dusting, etc. And as far as the pests of this tree are concerned no effective natural enemies have been discovered as yet.

## SELECTED ARTICLES

### **Rabies and its Control in India.**

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Rabies is one of the oldest known diseases. It is found in nearly all parts of the world and in all climates. It has not so far been introduced into Australia or New Zealand and has been stamped out of the British Isles by the destruction of all animals infected with the disease, or suspected to be so infected, by the muzzling order and by strict quarantine regulations concerning the import of dogs. Once the symptoms have developed, it ends fatally almost always. It is also a source of imminent danger to human life and domestic animals, causing considerable economic loss.

To apply suitable measures of control against this disease it is essential as in the case of many other diseases, to have a thorough public awakening.

Rabies is primarily a disease of wild and domesticated canines, e. g. dogs, jackals, foxes and wolves, but all the warm-blooded animals like cattle, horses, goats, sheep, cats, monkeys, rabbits, camels, elephants, fowls and human beings are susceptible. Infected canines particularly pariah dogs, so widely and extensively distributed in India, spread the disease among themselves and other susceptible animals and human beings. The mongoose and blood sucking (Vampire) bat have been reported to act as a natural reservoir of rabies virus in South Africa and South America respectively and to convey the infection to domesticated animals and human beings; but in India the virus is usually maintained by wild carnivores and stray dogs.

**Cause.** The causative agent of this disease is a virus which passes through bacterial filters and is not visible even with the aid of the microscope. Desiccation, heat, sunlight and antiseptics adversely affect the virus, but glycerine acts as a preservative, as is the case with most of the viruses. The virus is destroyed by exposure to a temperature of 60°C. for half an hour or by the ordinary disinfectants.