SOME INSECT PESTS OF FOOD CROPS.

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In offering a paper of this description wherein it is proposed briefly to describe some of the commoner insects which attack food crops in the island, together with suggestions as to the measures which may be adopted for their control, it has been thought expedient to preface such notes with a few remarks on the factors which contribute to outbreaks of insect pests among our agricultural crops in general. An outbreak of insect pests is something of a mystery to the average cultivator. In certain parts of India, and in Ceylon too, there are not a few who attribute these attacks to some supernatural cause, and consequently, we see and hear of cultivators resorting to charms and mantrams to the deities invoking their protection from the devil and the Evil Eye. It is therefore for the Agricultural Instructors, and others who come in contact with our goiya, that this paper is specialy written, in the hope that they would endeavour to dispel these primitive ideas from the minds of our village cultivators and explain to them the real causes which lead to these sudden outbreaks of insect pests in their fields and plantations.

The causes may be enumerated as follows:—

1. The clearing of forests or the opening of virgin land for agricultural purposes. These operations bring about what is popularly known as a disturbance of the balance of Nature, that is, the climate of the locality may be greatly affected and there is a reduction in the numbers of birds and other animals. Now climate and birds are two of Nature's greatest assets in keeping a check on insect life. A change here means giving one insect an undue predominance over another, and it is when an insect increases its numbers to the detriment of man's interests that it is considered a pest.

2. The planting of extensive and adjacent areas of land under one crop, *e.g.*, paddy in the low-country and tea in the hills. Food is a limiting factor in the reproduction of insects. An unlimited supply of food is conducive to prolific breeding and this is exactly what is offered to some of our common pests like the Paddy Fly, the Coconut Caterpillar and the Tea Tortrix, to quote only a few.

3. The accidental introduction of foreign pests in imported vegetable matter. It is an axiom that a foreign pest is invariably a greater menace to a country than its indigenous ones. One has not to look far for examples. The Green Bug or Coffee Bug, *Coccus viridis*, which helped to destroy the coffee industry of this island, is said to have come from Brazil. The African or Kalutara Snail, is another striking example of an accidentally introduced pest which has come to stay in this country. These, and possibly many other pests and diseases, have been accidentally brought to the island with plants, in fruit, or in seed, imported for consumption, or for planting purposes, and they have come leaving their natural enemies behind them in the countries of their origin. Here, they have found conditions ideal for their propagation, with practically no enemies, and have therefore been able to breed unchecked in large numbers to our detriment, and we have what we

call a pest. To check these invasions we resort to legislation, which provides for the importation of certain plants from specified countries being prohibited, or for the inspection and treatment if necessary of imported plants at the port of entry.

4. The destruction of insectivorous birds. Insectivorous birds may be reckoned among the most important allies of the Agriculturist and even those which are not habitually insectivorous are so during the nesting period. Few people realise the considerable amount of harm that is done by the wanton destruction of our birds by sportsmen with their guns and schoolboys with catapults. Fortunately for this island the religious susceptibilities of a majority of its people do not permit of this ruthless destruction as is evident in Europe and America. But what is required is the encouragement of bird life in those plantations, where facilities for nesting are conspicuous by their absence.

Having realised the causes which lead to outbreaks of insect pests, reference may now be made to some of the preventive measures which may be adopted to check or lessen the severity of insect invasions to which food crops may be subject.

The following measures, which might be called Agricultural measures, are suggested :—

1. The selection of good seed before planting. Fresh seed and seed free of insects like weevils should be selected in order to obtain vigorous plants, plants that would be able to either resist insect attack or recuperate after an attack.

2. The determination of the best season for sowing a crop. A crop grown too late in the season might be heavily attacked by insects whereas one grown earlier in the season might just avoid the invasion.

3. Selection of immune or resistant varieties. There are some varieties of paddy in Ceylon which are said to be resistant to the Paddy Stem Borer. In Japan it was found that the varieties of paddy immune from the borer were unfortunately of an inferior quality. In the Philippines seven species of beans are said to be immune from the Agromyzid Fly. In Ceylon we have yet to find a species of bean which will be immune from this destructive fly. Black Gram is considered to be more resistant than Green Gram to the attacks of this same fly.

4. Adoption of a rotation of crops. This is a measure which requires no explanation as it is a sound agricultural practice and one that is known to everybody.

5. Application of manures suited to each crop. This is intended to give the plants more vigorous growth and help them to resist or survive an attack.

6. Clean Culture. Vegetable plots should always be kept free of weeds and wild grasses. Rotten fruits, old plants, and dead leaves, should either be burnt or deeply buried and not allowed to be scattered all over the the place. Flea-beetles, grasshoppers, and the moths of many destructive caterpillars, are attracted to weeds and grasses in which they lay their eggs. These weedy spots often prove to be the sources of insect infestation.

CUCURBITS.

Cucurbits, *e.g.*, snake gourds* and bitter gourds † are attacked by quite a variety of insects.

THE EPILCHNA BEETLES ‡—these beetles are round in shape dark red in colour, spotted with black dots, and are quite conspicuous on the green leaves on which they feed. Eggs are light yellow, cigar shaped objects which are laid in clusters on the under surfaces of the leaves. The larvae are spiny looking creatures and damage the leaves by nibbling small strips of leaf tissue giving the leaves a lace-like appearance. The beetles in addition to eating the leaves are also known to attack the flowers and even the rind of the gourds. These beetles if not checked at an early stage are capable of doing considerable damage.

Control.—Hand-picking of the insects in all its stages is an easy and practical measure of control as beetles, eggs, larvae, and pupae are all conspicuous on the leaves. The leaves might also be sprayed with a stomach poison like Lead Arsenate or Paris Green. Lead Arsenate can be obtained either as a paste or in a dry powdered form. As a paste 2 teaspoonfuls to a pint of water is a good spraying mixture, and if the powdered form is used one teaspoonful to a pint of water. If no spraying machine is available dusting with bags made of cheese cloth should serve the purpose. The dusting powder should consist of 1 part by weight of lead arsenate with 3 parts of powdered lime. Paris Green is another popular insecticide. As a spray $\frac{1}{2}$ oz. of Paris Green with 4 gallons of water to which a handful of lime is added makes a good insecticide. As a dust the proportion is 1 in 40 or 60 parts of wood ashes or slaked lime.

Vegetables are not grown so extensively in Ceylon as to warrant the outlay on spraying machines which are rather expensive. A garden syringe is a cheaper article and a very useful piece of apparatus to be kept in stock· quantities of either Paris Green or Lead Arsenate should be kept in stock. These insecticides are very useful when applied as a spray or a dust or in baits, for the control of insects like caterpillars, beetles, grasshoppers, and fruit flies.

THE AULACHOPHORA BEETLES § or Snake Gourd Chrysomelid is perhaps the most distructive insect pest of cucurbits. This is a small yellowish beetle with a black line running round the margin of its wing sheaths. It feeds on the leaves and oviposits in the soil close to the creepers. The grubs are slender and white with brownish ends and they feed on the roots and even tunnel up the main stems. When full grown they pupate in little earthen cells close to the plant. The combined attacks of both beetles and grubs result in the creepers being gradually killed out.

Control.—1. Capture all beetles when they first commence to appear. 2. Sprinkle wood ashes, to which a little kerosene has been added, round the plants to prevent the beetles ovipositing. 3. Dig round the creepers, especially near the collar, and pick out the grubs. Then mound soil round the creepers. 4. In case of a severe attack the leaves can be sprayed or

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* *Trichosanthes Anguina L.* † *Momordica Charantia L.*

‡ *Epilachna dodeca-stigma* Muls. and *Epilachna viginti-octo punctata* F.

§ *Aulacophora stevensi* Baly.

dusted with Lead Arsenate or Paris Green as for the control of the *Epilachna* beetles. 5. Leave a few creepers to serve as traps to which beetles might be attracted. These creepers should later be destroyed after they have served their purpose.

PLUSIA CATERPILLARS * are greenish in colour and are the commonest caterpillars found on the snake gourds. The moths of these caterpillars are very active at dusk and they lay their eggs on tender shoots and leaves. The caterpillars on emerging commence to defoliate the plants. They are invariably found on the under-surfaces of the leaves.

Control.—They can be hand-picked and destroyed.

THE SNAKE GOURD STEM-BORER † is the caterpillar stage of a beautiful day-flying moth with hyaline wings, a reddish brown thorax, and purple abdomen. The whole body and legs are fringed with tufts of brown, yellow, and black hairs. It lays its eggs on the stem of the snake gourd creeper after it is full grown. The grub, which is white in colour, is about ¾ of an inch in length. It tunnels in the collar of the creeper and at times even cuts it off at the base. This type of attack causes the creeper to wilt and die.

Control.—The only practical measure of control is to cut a slit in the stem and extract the caterpillars. Then earth up soil round the collar to encourage the growth of new roots.

FRUIT FLIES ‡—Eggs are laid on the fruits and the maggots on emerging tunnel inside causing the fruit to rot and drop to the ground. The maggots then crawl through into the soil where they pupate and later emerge as flies to carry on the same type of damage.

Control.—1. Wrap fruits in paper bags to prevent the flies from ovipositing on them. 2. Pick attacked fruits and destroy them by burying them deep in the soil, burning or immersing in water in order to kill the maggots inside.

BANDAKKAS §

The following caterpillars do considerable damage by feeding on the leaves. *Sylepta derogata* is a greenish caterpillar with a light brown head which lives within the folds of a leaf, and which it rolls up itself. *Prodenia litura* is a dark coloured caterpillar with yellow lines running longitudinally on its back and sides. It is a voracious feeder, and when full grown pupates in the soil. The moths on emerging lay their eggs in clusters on leaves of weeds and grasses. *Amomis erosa* is a pale green caterpillar with faint white lines along its back and sides. It pupates in a fold of the leaf.

Control.—1. Hand-pick and destroy all the caterpillars and pupae in folded leaves. 2. Spray with lead Arsenate or Paris Green as for the control of beetles on snake gourds.

POD BORERS.—The caterpillars of the following moths bore into the pods or fruits and feed on the seed, thereby causing considerable damage. The *Earias* ¶ spp. are the well-known boll-worms of cotton. The caterpillars which are small and green in colour, with spikes and black dots, emerge from the eggs which the greenish moths lay on flowers and pods. *Holiothis obsoleta* is a slender, pale green caterpillar, with whitish and dark green stripes on its back and sides, hairy in appearance, and it pupates in the soil.

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* *Plusia peponis* F. † *Melittia chalciformis* F. ‡ *Dacus cucurbitae* Coq. § *Hibiscus esculentus* L. ¶ *Earias fabia* Stoll and *Earias insulana* Boisd.

Control.—Hand-picking of the affected pods is the only practical measure of control. Spraying is useless because the caterpillars are always inside the pods.

THE AGROMYZA FLY.—Within recent years the maggot of an Agromyzid Fly has been observed to feed on the tissues inside the stems of bandakka plants and especially young plants. This type of injury causes a swelling of the stem and a premature flowering and stunting of the crop. It is not a very serious pest.

DYSDERCUS CINGULATUS or the Red Cotton Bug is a well-known insect. This bug is a pest of all Malvaceous plants, and the injury it causes consists in both adults and nymphs inserting their beaks into tissues of the fruits or seed, and sucking the sap from within. On Bandakkas they are noticed on the flowers and pods.

Control.—They can very easily be destroyed by making them drop into pans containing water or kerosene.

BEANS.*

Bugs and the Agromyza Fly appear to be the serious pests of beans. The following bugs congregate in numbers on the immature pods from which they suck the sap and as a consequence the pods shrivel up and die. *Loptoglossus membranaceus*, commonly called the Paddle Legged Bug, owing to the shape of its prominent hind legs, is of a dark brown colour with a reddish band running across its thorax. Its antennae or feelers too are conspicuously marked with alternate colours of black and red. The young nymphs resemble their parent but are wingless. *Riptortus* † is a smaller bug, brown in colour. In its younger stages it is invariably mistaken for the common red ant which it closely resembles. *Coptosoma* ‡ is a very small black bug—almost round in shape. Its creamy white eggs are laid in rows on the plants and the nymphs are brown or orange in colour.

All these three different bugs are injurious during both their nymphal and adult periods.

Control.—Adults can easily be captured with a hand-net while the nymphs can be dislodged and made to drop into pans containing kerosene and water.

APHIS OR GREEN FLY as it is also called, is a very common pest of beans especially during dry weather. These minute bugs, which are of a dark gray colour, cluster in numbers on the tender shoots and pods and suck the juices through their beaks which they insert into the tissues. They multiply very quickly, and are a great drain on the plants. They also discolour the

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* *Phaseolus* spp. † *Riptortus pedestris* F. ‡ *Coptosoma cribraria* F.

leaves. These aphids secrete a liquid substance called "honey dew" which attracts ants, and a black fungus or mould, especially when the honey dew drops on to the leaves. This honey dew and fungus together are another set-back to the growth of the plants because they hinder the leaves performing the functions of food assimilation.

Control.—Happily, aphids are always controlled by several kinds of parasitic and predaceous insects. Lady-bird beetles, a bright red in colour, with distinct black markings, are their chief enemies. Both beetles and the larvae feed greedily on the aphids. Other enemies are the maggots of a Syrphid Fly and the larvae of delicate looking insects called Lacewing flies. If the attack is severe, and the crop a valuable one, spraying with a contact insecticide like soap and water or tobacco wash should be resorted to. One pound of ordinary laundry soap to a gallon of water should be effective as aphids are very soft bodied insects. If this insecticide is not strong enough a tobacco wash might be tried. Tobacco wash is made as follows: Boil 1 lb. of tobacco waste in a gallon of water for half an hour. To this add a ¼ lb. of laundry soap. After the soap has been thoroughly dissolved, strain and dilute one part of the mixture with 7 parts of cold water before spraying.

THE BEAN FLY OR AGROMYZA FLY * is the worst pest of beans in Ceylon. This fly, which is very much like an eye-fly in appearance, deposits its eggs in the leaves and the maggots tunnel their way to the stem, where they feed on the tissues, and later pupate. The injury they do causes the young plants to wilt and die.

Control.—It is a very hard pest to control. No immune or resistant varieties of beans have yet been discovered. The cultivators have therefore to resort to cultural methods of control. 1. Badly attacked plants should be uprooted and burnt. 2. Earth up soil round the base of the stem to encourage the growth of fresh roots.

CHILLIES.†

Chillies grown at Peradeniya are known to be attacked by quite a variety of insects.

FLEA BEETLES, so called owing to their remarkable jumping habits, are a source of trouble to young chilli plants. These small brownish beetles, which breed in the ground, perforate the leaves of the chilli plant just after they sprout.

Control.—1. Dust the plant with fine wood ashes or with a mixture of Paris Green and wood ashes (1-60). 2. Sprinkling waste carbide between the rows of chillies has also been very effective in keeping down the beetles.

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* *Agromyza phaseoli* Coq.

† *Capsicum* spp.

3. Loosen the soil round the plants to expose the young stages of the beetles.

GRASSHOPPERS were at one time a serious pest and did considerable injury to a chilli nursery. Grasshoppers breed in grassy areas and it was found that the land round this particular nursery was allowed to run into weeds. The grasshoppers invaded the nursery at night and stripped the young plants of their leaves.

Control.—If grasshoppers are plentiful they can be captured by bagging them with hand-nets.

DISPHINCTUS * is a prettily marked bug, with a mosaic pattern of red and brown, rather small, but very active. Eggs are thrust into the tissues of the stems, and the young nymphs are very active, and reddish brown in colour. Both adults and nymphs suck the sap from young leaves and tender shoots causing them to shrivel up and die. Their mode of injury brings on a characteristic brown spotting on the leaves due to the punctures made by the bugs. This type of damage is very similar to that of Helopeltis † on tea.

Control.—They can be controlled by spraying with a dilute solution of any contact insecticide.

DISCUSSION.

MR. C. N. E. J. DE MEL spoke of his observations during a tour in Tangalle, an extensive vegetable growing area. He drew attention to the want of organization in the disposal of the vegetable products of that locality.

MR. M. R. M. JEBARATNAM offered a few remarks as a result of his work in the Batticaloa district during the outbreak of pests in coconut and paddy areas. He indicated what had been done to deal with outbreaks of the paddy swarming caterpillar, the paddy bug and the coconut caterpillar.

THE DIRECTOR OF AGRICULTURE in concluding the discussion on Mr. Austin's paper said that he was indebted to him for his detailed treatment of the subject. He indicated the necessity of studying the seasons of occurrence of the various pests. He knew from experience that it was possible to secure certain crops without any effect from pests during certain definite times. Cultivators in Ceylon knew very well the seasons when crops of paddy were immune from pests, particularly in the North where they endeavoured to defeat the attempts of the paddy bug. Outbreaks of pests occurred only when the seasons were not observed. He once more reminded them of the importance of studying the correct seasons for sowing the different food crops.

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* *Disphinctus humeralis* Wlk.

† *Helopeltis theivorah* Waterh. "Tea Mosquito."