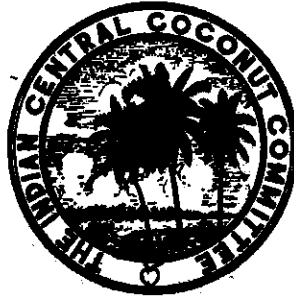


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THE INDIAN CENTRAL
COCONUT COMMITTEE



ANNUAL REPORT

OF THE

CENTRAL COCONUT RESEARCH STATION

KAYANGULAM FOR 1955-56.

SAHIA PRAKASINI PRESS, ERNAKULAM.

Summary Annual Report of the Central Coconut Research Station, Kayangulam, for 1955-56 (1st July 1955 to 30th June 1956).

ENTOMOLOGY

The Rhinoceros beetle, Oryctes rhinoceros.

General Survey:- Survey of the beetle was continued. In Travancore-Cochin incidence of its attack was very severe on either side of the new railway track from Quilon to Ernakulam where a large number of coconut palms had been felled and the stumps left behind. These stumps are serving as suitable sites for the prolific breeding of the beetle.

Biology:- Studies on the biology of the beetle in different breeding materials were continued. As reported earlier, cattle manure, decaying vegetable organic matter and rotting coconut logs were observed to be the breeding materials most suitable for the rapid development of the larvae. Saw dust mixed with oil-cake was a good breeding ground for the beetle.

Alternate hosts:- Under laboratory conditions the beetle could feed on areca palms.

Control of larvae:- Trials with the different insecticides Aldrin and Dieldrin against the grubs of the beetle were continued. The residual toxicity of Dieldrin in cow-dung was under investigation.

Control of adults:- The effect of different concentrations of Aldrin mixed with cow-dung against the adult-beetles was under study. Adult beetles were kept in these mixtures for periods of 24 hours after which they were transferred to fresh cow dung and the mortality counts after 7 days duration were recorded. 1 per cent Aldrin gave 100 per cent mortality while 0.01 per cent of the chemical gave 40 per cent mortality.

Field trials commenced earlier where in the leaf axils of coconut palms were filled with sand or clay or saw dust

mixed with different insecticides were continued. Observations were made at monthly intervals for fresh incidence of beetle attack. The insecticides tried were B. H. C., Chlordane and Folidol. While no appreciable difference was observed between the treated palms and controls in the case of Folidol, the presence of B. H. C. or Chlordane mixed with sand or clay appeared to be effective in checking infestation by the beetle. Folidol is now being tried at higher concentrations.

The palms in the beetle control field experiment in block I were kept under observation. All possible breeding places within this block and also outside in a belt of 200 yards were regularly sprayed with 0.01 per cent B. H. C. Trap pits treated with the insecticides were also maintained inside the block. The average incidence of fresh attack during the year was 2.4 per cent in the treatment block while it was 12.3 per cent in the control block.

Parasites and predators:- Studies on the biology of *Oxycetonia versicolor* which was observed to be feeding on the eggs of the rhinoceros beetle were continued. It was noted that the adults and grubs of *Oxycetonia* did not show any specific attraction or preference for *Oryctes* eggs but preyed upon them when they were present in the breeding materials.

An elaterid grub and adult were found feeding on the eggs and freshly hatched larvae of *Oryctes*. Some other Elaterids were also under trial.

The fly *Sarcophaga fusicanda* noted earlier was seen to breed only on diseased or dead grubs, pupae and adults and not on healthy specimens. This appears to be more of a saprophytic form than a parasite.

Infection by the green muscardine fungus *Metarhizium anisopliae* of *Oryctes* larvae was quite common during July-August, the natural infection ranging from 5-37 per cent. After the South-West monsoon the percentage of incidence went down and during the dry months from January-April it remained below 1 per cent. The symptoms of attack by the fungus on larvae were studied. Before being killed, the larvae showed change in colour

and brown patches appeared on the body. Soon after death the body became soft and pliable but after some time it became stiff and mummified and later on conidia of the fungus covered the entire surface of the body. The cultural characters of the fungus were studied with reference to pathogenecity. The bacterium isolated from dying larvae was also under investigation.

The Coconut Caterpillar, Nephantis serinopa:

Survey:- During the year under report the incidence of infestation by this pest on the West Coast was comparatively mild. Its activity was at its lowest in January and at its highest from April-June.

Biology:- The biology of *Nephantis serinopa* continued to be under investigation. Its life history under different ecological conditions and on different larval host plants was under study. *Nephantis* moths were observed to have greater longevity at lower temperatures. The moths could live up to 7 days without food and lay the average normal number of eggs. Eggs laid on the central shoots of coconut palms hatched as usual but the young larvae soon perished. Morphological characters of the eggs, larvae, pupae and adults were under detailed study.

Population studies:- Population studies of the pest in the coastal region between Neendakara and Ambalapuzha were in progress and the factors responsible for fluctuations of population were under investigation.

Control:- Laboratory trials with different concentrations of Basudin, Dieldrin, Endrin and Folidol against *Nephantis* larvae were in progress.

The field experiment to examine the effect of spraying coconut palms with 0.2 per cent DDT and BHC on pollinating insects and the setting of fruits was continued during the year. No significant difference in the setting of fruits was noticed in the sprayed and control palms.

Natural parasities of the pest: Record of natural parasites of the pest at Ayirenthengu, West of Kayangulam, continued to be regularly maintained. Among the

pupal parasites, the Chalcids, *Stomatoceros selcatisenttallum* and *Brachymeria nephantidis*, were present throughout the year. The Eulophid *Trichospilus pupivora* was not observed from April-June. *Xanthopimla punctata* and *Goryphus* sp. were present from July to October. The Bethyloid larval parasite *Perisierola nephantidis* was present throughout the year. Other larval parasites noticed were the *Microbracon brevicornis* and *Elasmus nephantidis*. The predator *Parena laticincta* was noticed during the rainy season.

Breeding of parasites: During the year under report 2,86,376 Eulophids, 15,608 Bethyloids, 2076 Elasmids and 6,890 Braconids were reared in the laboratory for supplying seed stock to the zonal parasite breeding stations in Travancore-Cochin and Andhra for liberation in infected areas.

The Palm Weevil - *Rhynchophorus ferrugineus*:

This pest is now assuming serious proportions and reports of damage caused by it are very much on the increase in India. High fecundity, longevity of adults and long flight habits appear to have helped in its spread.

Biology: Studies on its biology were continued both under laboratory and field conditions. It was observed that the adult weevils could lay eggs and the young larvae could effect entry into the heart of the crown without the aid of any external injury on the leaves or trunk of the tree. In grown up palms the weevils preferred to lay eggs in cuts and cracks but in the absence of cuts they oviposited in the soft petiole of the central shoot. The eggs hatch in about 3 days and the larvae thrive well on the succulent parts of the coconut palm. The average larval period was 2 months and the pupal period 15 days.

Control: Insecticidal trials against the larvae using different concentrations of Aldrin, Dieldrin, Endrin, Basudin, Folidol and a mixture of DDT and BHC were continued in the laboratory. Endrin, Aldrin and Dieldrin at 0.25 per cent was effective. Against the

adult Endrin, Dieldrin, Folidol and BHC and DDT at 1 per cent strength gave from 100-80 per cent mortality in 7 days.

The weevil control prophylactic field experiment where coconut palms were treated with 5 per cent BHC or Chlordane dust mixed with river sand in the leaf axils was continued. Observations made so far indicate that the treated palms have remained free from infestation. This is being tried out on a large scale. Infestation by the weevil was brought under control by injection with Pyrocone E (pyrethrins and piperonyl butoxide) if treatment was done before the growing point was destroyed by weevil attack.

Symptomatology:- Detailed study of symptomatology is being made in order to detect the earliest symptoms of beetle infestation so that it could be detected and control measures adopted at the proper time.

Search for the parasites and predators of the weevil was continued. An earwig (family Dermoptera) was found to be feeding on the eggs of the weevil. The biology of this predator is being studied.

Cockchafer, Leucopholis coneophora:

General: The sphere of activity of this pest was observed to be expanding. It has been reported from Trichur and South Malabar districts.

Biology: Life history studies were continued. The adults that had emerged in June 1955 continued to oviposit up to August. The eggs hatched within about 20 days. In the beginning the young larvae were feeding on the roots of grasses. When they grew older they started feeding on coconut roots till April. With the pre-monsoon showers they commenced to pupate. Mass emergence of beetles took place in the second week of June 1956.

Control: The Cockchafer control field experiment at Thazhakara continued to be under observation. Plots treated with 5 per cent Chlordane at the rate of 12.7

Kelos per acre remained free from infestation. A fresh experiment using 40 per cent Aldrin as the sole insecticide was started.

Search for natural parasites and predators of the pest was continued.

Termites:- Laboratory experiments with Aldrin against termites were in progress. A field experiment against termites in the coconut nursery was started using the insecticides BHC, Chlordane, DDT, Aldrin and Pentachlorophenol.

Coccids:- The Coccid control field experiment at Chempu in Vaikom taluk was continued. The coccids were observed to be colonised by the ant *Oecophylla smaragdina* and spraying with the insecticides BHC, Chlordane and Dieldrin was the treatment tried. In the sprayed palms reduction in the incidence of infestation by coccids was noticed.

Pests and stored copra:- Some of the pests of stored copra were under investigation during the year. The pests noticed were *Necrobia rufipes*, *Tribolium castaneum*, *Oryzaephilus surinamensis*, *Trogoderma granania*, *Corcyra cephalonica* and *Ephestia cautella*. Other pests of coconuts noticed during the year were *Parasa lepida*, *Conthella rotunda*, *Suastus*, *Diocalandra stigmaticollis*, *Gangara thyraxis*, *Coconympha inidarcha*, *Cyclodes omma*, etc.,

Programme of work for 1956-57

I. *Oryctes rhinoceros* L.

Biology, ecology, distribution, economic importance and population studies. Insecticidal control, use of repellants and attractants. Study of parasites and predators, including the entomogenous fungus and the pathogenic bacterium.

II. *Nephantis serinopa* Meyr.

General survey and seasonal occurrence in the important coconut growing regions of India. Biology, ecology

and epidermiology. Insecticidal control, and effect of insecticides on the beneficial parasites and predators and on the pollinating insects. Biological control, study of the life history of the parasites and predators.

III. *Rhynchophorus ferrugineus* F.

General survey, economic importance, distribution, alternate host plants, ecology and symptomatology of attack. Chemical control, curative and prophylactic. Parasites and predators.

IV. *Leucopholis coneophora* Burm.

Distribution, economic importance, biology and ecology. Control with chemicals and natural agents.

V. *Miscellaneous Pests.*

The biology and control of the minor pests of the coconut palm. Control of coconut rats and flying foxes.

PLANT PATHOLOGY

Leaf Disease:- Isolations from leaves of infested trees were examined and the usual fungal organisms were obtained. Routine inoculation experiments were conducted on healthy plants with these organisms to confirm earlier observations.

Nutritional deficiencies and incidence of leaf disease:- The preliminary sand culture experiment started during the previous year on coconut seedlings to study nutritional deficiencies in relation to leaf disease was continued. The plants are kept under observation.

Trials with fungicides:- Trials to assess the relative efficacy of different fungicides against the leaf disease of coconuts were continued. The fungicides under trial were Fermate, Copper Oxychlorides, Cuprous oxides, Colloidal Copper, Copper dusts and Sulphur. The trees are kept under observation.

Spraying with micronutrients:- This was continued on the experimental palms in block VIII. The micronutrients in the spray mixture were zinc, copper, boron, iron,

manganese, molybdenum and also magnesium. The application is done at monthly intervals as spray to the foliage. Preliminary observations show a favourable response in the experimental trees. The experiment is being continued.

Spraying Scheme - VI Extension:- The sixth extension of the spraying scheme was commenced with two Demonstrators from 1st April 1956. Spraying of coconut palms was done in the taluks of Cochin-Kanayannur, changanacherry, Kottayam, Quilon and Karthigappally. Work in the scheme was temporarily suspended from 31st May 1956 for the duration of the South-West monsoon. 16,547 coconut palms were sprayed in the scheme during April and May. Spraying will be resumed from 1st September, 1956.

Root (wilt) disease:-

Studies on rhizosphere microflora:- As suggested by the Achievement Audit Sub-Committee more kinds of culture media was used for evaluating the soil microflora by the dilution plate methods. The culture media tried were Waksman's peptone dextrose agar, Horne and Mitters agar, yeast extract agar, Osapek's Dox agar and Osapek's Dox agar with yeast. Of these Waksman's agar was found to be the best. The addition of Rose Bengal at the rate of 30 p. p. m. significantly increased the fungal flora obtained in the culture plates.

The rhizosphere microflora of root samples collected at depths of 1, 2, 4 and 6 feet in different seasons of the year was determined. The samples collected at different depths were classified as those above and those below the water table. Observations made so far indicated that under water logged conditions the rhizosphere microflora was considerably less.

Development and survival of *Rhizoctonia solani* and *R. bataticola* in relation to soil moisture.

The growth of the fungi *R. solani* and *R. bataticola* which are generally found in isolations from the roots of diseased coconut palms, in natural as well as autoclaved soil maintained at different levels of soil moisture was

under study. The soil moisture varied from 10 to 100 per cent of the water holding capacity of the soil. Both the fungi made fairly good growth in the sterile soil series. In natural soil *R. bataticola* made some growth while the growth of *R. solani* was almost nil as noted by colonisation of the fungus on autoclaved pieces of coconut roots when buried in the inoculated soil in flasks.

The survival of these two fungi in artificially infected pieces of coconut roots buried in soils maintained at different levels of moisture was also determined at monthly intervals for a period of six months. It was observed that *R. bataticola* remained unaffected by the different soil moisture and its percentage viability at the end of the experimental period remained very high. *R. solani* was adversely affected by high soil moisture.

Again the survival of *R. solani* and *R. bataticola* under field conditions on artificially infected pieces of coconut roots buried at different depths was determined. The viability of *R. solani* decreased with increase in depth and period of incubation while the results obtained for *R. bataticola* were erratic.

Infection experiments:- Healthy coconut seedlings established in large sized cement tubs had their sub soil water pH adjusted to 4 by addition of appropriate quantities of acetic acid. Some of the plants were inoculated with *R. solani*. These plants soon developed disease symptoms, their roots getting infected and rotten. On the control plants, where the inoculum had not been applied except for the yellowing of the outer leaves no other symptoms were developed.

Seedlings established in sterilised soil in large sized pots were inoculated with *R. solani*, *R. bataticola* and *Botryodiplodia theobromae*. No disease symptoms have been noticed. The staling products of *R. solani* were administered through the cut ends of roots to experimental palms under field conditions. No disease symptoms have developed.

Isolations from the roots of intercrops:- Study of the isolations from roots of intercrops growing in soil around healthy and diseased palms was continued.

The role of seednuts in carrying the disease from generation to generation:-

The performance of the coconut seedlings raised from mother palms in different stages of the disease continued to be under observation.

Manurial-cum-spraying trials:- This experiment was continued in block I. The maximum average yield per tree was obtained from the plots with N. P. K. plus lime plus farmyard manure.

VIRUS PATHOLOGY

Survey:- General observations were recorded of 1555 trees in blocks I, V, VI and VII to study the extent of natural infection in palms of different ages. Palms below 4 years of age rarely show disease symptoms. The most susceptible age group appeared to be between 7-20 years.

Symptomatology:- Detailed observations were continued on experimental trees to study the development of the disease. The earliest disease symptom noticed was a paling and wilting of the young and opened leaf. Premature nut fall might either precede or follow this. Flaccidity and the yellowing and drooping of the leaves followed later on. Generally it took about a year for the symptoms to get clearly defined. Reduction in yield was a natural sequence of disease incidence.

Virus Transmission trials:

Inoculation with leaf extract:- Inoculations with leaf extracts from diseased trees were conducted on healthy plants under field conditions by the carborundum method. In four of these sets of sap inoculated palms further evidence of disease transmission was noticed. No disease symptoms have developed in sap inoculation trails in palms below four and above 40 years of age.

Pin prick inoculation, leaf-insertion, root grafting and sap transfusion:-

The seedlings and older palms on which transmission trials were conducted by the above methods were kept under observation. No infection was noticed.

Insect Transmission Trials-

1. *Stephantis typicus*:- Insect transmission experiments with this insect were in progress. In some 7-15 years old plants in this experiment mild disease symptoms have been noticed. The plants are kept under observation.

2. *Oryctes rhinoceros* No infection was obtained in trails where the rhinoceros beetle was used for transmission.

3. **Other insects.** Other insects tried in this connection were *Phenice moesta fulgorida* and *Amblyspa* sp. The experimental plants are kept under observation. No disease symptoms have been noticed so far.

Host range studies:- Inoculation trials with leaf extracts of infected coconut palms on different host plants were continued. The plants used in this connection were banana, maize, groundnut, cowpea, black gram, cotton, chillies, tomato, cucurbits, brinjal, Petunia, *Crotalaria striata*, *C. juncea*, *Abutilon* sp., different varieties of palms, etc. The plants are kept under observation.

Insect population survey:- Collections are made at fortnightly intervals of insects that colonise coconut palms both during the day and the night time.

Virus disease in coconut gardens:- In the case of the yellow vein mosaic of *Abutilon* sp., a common weed in coconut gardens white flies, jassids and *Stephantis typicus* were tried as possible vectors for disease transmission. Successful transmission of disease was not obtained.

Weekly spraying with DDT 0.2 per cent on the experimental seedlings in block II and older palms in block VII were continued.

Programme of work for 1956-57

Leaf disease:

1. Comparative efficacy of different fungicides.
2. Effect of spray applications of micronutrients.
3. Sand culture experiments with deficiencies of N. P. K. and Ca. in relation to leaf infection.

Root (wilt) disease.

1. Studies on rhizosphere microflora.
2. Studies on fungi isolated from roots of intercroops.
3. Studies of fungi associated with root disease.
4. Infection experiments with different organisms.
5. Survival and development of fungi in relation to soil moisture.
6. Studies on the role of seednuts in carrying the disease from generation to generation
7. Effect of pH of sub soil water on root infection.
8. Cultural, manurial and spraying trials under field conditions.

Virus Pathology.

1. Symptomatology.
2. Survey of insect population in coconut gardens.
3. Virus transmission trials.
4. Host range studies.
5. Survey of virus diseases in coconut gardens.

PLANT PHYSIOLOGY

Study of Symptoms:- Detailed studies on visual foliar symptoms were continued to find out whether the different symptoms in the early and middle stages of the disease culminated into one particular type in the advanced stage. This work is in progress. The rate of deterioration due to disease incidence was also under study. It was found that in the case of middle aged palms after disease symptoms were first manifest deterioration due to disease was at a slow rate and that by judicious manuring and proper cultivation the trees continued to give economic yields of nuts for a long time.

Root sap studies:- Detailed studies of the root sap of 24 trees in different categories of the disease were completed. Data on the following were collected..

- (1) Percentage distribution of roots according to their pathological condition.
- (2) Percentage distribution of functioning roots with reference to the pH of root sap.
- (3) Rate of exudation of root sap as related to stage of infection.
- (4) Seasonal variation in the quantity of sap.
- (5) Variation of pH of sap of young plants in health and disease.

From the observations made it is seen that in a diseased tree many roots were unhealthy. The pH of root sap varied from 4 to 8.5. The pH of sap of a great majority of healthy roots was acidic while the sap from diseased roots was either neutral or alkaline. The exudation of sap from the diseased trees was comparatively less than that from healthy trees.

Anatomical studies:- The epidermal patterns of spathe, spike, perianth of male and female flowers, young fruit, petiole, lower and upper surfaces of leaves, rudimen-

tary leaf, etc. were studied and camera lucida sketches made.

Studies of root development:- Studies on the formation of roots and breathing pores of plants of different ages from a small seedling to very old palms were in progress. Observations carried out during the year on a large number of roots of healthy and diseased trees confirmed earlier findings that healthy roots when subject to injury were capable of producing branch roots which could function while a majority of diseased roots are not capable of producing branches. Aerial roots have been induced on the stems of trees showing root (wilt) disease symptoms for trials in administration of nutrients through these roots.

Micronutrient manurial experiments:- Micro-nutrient manurial experiments to find out the reaction of diseased trees to application of micronutrients was continued. The scheduled detailed morphological observations of the trees in this experiment were regularly recorded.

Plant injection trials:

1. Micronutrients:- The quarterly injections of micronutrients in five combinations were continued on the experimental trees. The trees are kept under observation.

2. Nitrogen:- Nitrogen as urea was administered to some trees showing intense physiological yellowing. Each dose was 5 gms. in 800 c. cs. of water. The trees in this treatment have responded favourably.

3. Chemotherapeutant 1182-F:- Chemotherapeutant 1182-F is a proprietary product of M/s. Crag Agricultural Company in the U. S. A. Its chemical name is 4-Chloro-3, 5-Dimethyl- Phenoxyethanol (3.81 per cent by weight). A dosage of 2 c. cs. in 400 c. cs. of water injected into a number of diseased adult palms and seedlings have shown a very favourable response in the experimental plants. Seedlings reacted quicker to the chemical than older plants. This is being tried out on 80 more plants in different categories of the disease.

4. Chelates:- A mixture of chelates of iron, copper, manganese and zinc is being injected to selected trees which are kept under observation.

5. Hormones:- To study the reaction of diseased trees to application of hormones the following hormones were administered through the cut ends of roots.

- a) B. Naphthoxy acetic acid.
- b) Phenyl acetic acid.
- c) 2-4, Dichlorophenoxy acetic acid.
- d) 2 Methyl, 4 chlorophenoxy acetic acid.

The experimental plants are kept under observation.

Deficiency symptoms in coconuts:- To study the foliar symptoms in coconut seedlings due to deficiency of one or more micronutrients sixty seedlings have been grown in large sized flower pots in sand culture and appropriate nutrients are being applied at regular intervals. The plants are kept under observation.

PROGRAMME OF WORK FOR 1956-57.

1. Study of the rate of deterioration due to disease.
2. Continuation of the micronutrient manurial experiments.
3. Injection trials.
4. Histological studies.
5. Study of deficiency symptoms.
6. Study of roots.

CHEMISTRY.

Soil survey of the Central Coconut Research Station, Kayangulam:- 81 soil samples collected earlier in connection with the detailed soil survey of this Station were analysed during the period under report.

Analysis of tissue samples:- Determination of major nutrients was made in 50 leaf samples collected

from healthy and diseased trees. Chloride was estimated in 160 samples. The results obtained confirmed the earlier observation that nutrients tend to accumulate in the leaf tissue of diseased trees. In addition to the above estimations the following micronutrients were also determined: Copper in 15 leaf samples, iron in 11 samples, manganese in 10 samples, zinc in 9, boron in 12 and molybdenum in 12 samples.

Seasonal foliar yellowing:— Observations of the depth of water table, pH of sub soil water and conductivity were regularly recorded in connection with investigations on the seasonal foliar yellowing in coconuts. pH and conductivity determinations made for 427 water samples.

Pot culture trials started last year, using 2-year old seedlings were completed during the year under report. It was found that plants subjected to partial water-logging with acidified water developed yellowing about 1 to 1½ months after the commencing of the experiments. The experiment is being repeated.

The influence of cover crop *Peuraria Phasoloides* on soil temperature, moisture, pH, etc.

This study was continued. Data for surface and soil temperature recorded daily showed that there was considerable lowering of surface and soil temperature in the plot under cover crop as compared to the plot without cover. Maximum lowering of temperature by 26.5°C. was observed for the surface temperature in the cover crop plot. Moisture determinations made showed that during the dry months of the year the moisture content of the cover crop plot was higher than that of the control plot without cover in the first and second foot layer of the soil. No significant difference was noticed in the pH or fertility status between the two plots.

Manurial trials:— The lime-potash manurial trials were continued with the modification that potash was applied in two doses to prevent possible loss by leaching. The trees are kept under observation. Manurial trials

with chilean nitrate on coconut seedlings and older palms to compare its performance with other nitrogenous manures like ammonium sulphate and groundnut cake were continued. From the data obtained so far no significant difference is noticed in the reaction of the experimental plants as regards the three manures used.

Sunn hemp as indicator plant:- Pot culture trials were in progress to study, with sunn-hemp as indicator plant, the effect of sodium on crop growth in potash deficient soils. The experiment consists of 15 treatments replicated five times. From observations made so far stunting of growth and yellowing of leaves of sunn hemp plants was noticed in pots containing sodium either as sulphate or as chloride and not in pots containing potassium. Pots containing higher doses of potassium gave better growth of plants than lower doses. The experiment is being continued.

Chromatography:- Chromatographic methods of analysis of soil and plant material are being standardised. Six soil samples were examined for cadmium according to the method and two leaf samples for amino acids. The soils did not contain cadmium. In the leaves five nin-hydrin reactive free amino acids were found. One of them was observed to be proline.

Standardisation of the Buchner funnel method for determining the moisture equivalent of soils was in progress.

Advisory:- 20 soil and 15 leaf samples collected from the plots in the Coconut Fertiliser Demonstration Scheme of Messrs. Parry & Co., Ltd., and Potascheme were analysed and suitable advice given.

Four soil samples, three samples of sub soil water and three samples of leaves from the diseased coconut areas of Razole taluk in East Godavary were analysed and reported upon.

Twelve coconut soil samples from Saurashtra, Kanjirapally, Nagercoil and Thazhakara and four manure samples were analysed for rendering advisory assistance to coconut growers.

Coconut and arecanut palms on the foreshore area in Perumanoor opposite the Cochin Naval Base were reported to have wilted as a result of entry of saline water and mud from dredging operations there. The site was inspected and samples of soil, sub soil water, etc., collected for analysis. Examination of the soil and sub soil water indicated that the wilting could be attributed to the toxic effect of a high concentration of salts in the soil and sub soil water. The injurious effect was less apparent in the case of coconut palms as compared with areca and other trees like jack, mango, etc.

Crop weather studies:- Meteorological and micro-climatic data continued to be recorded daily. During the period under report the total amount of rain received was 97.88 inches. The maximum temperature recorded was 98° F. in March and the minimum temperature 62.4° F. in January.

Programme of work for 1956-57.

1. Continuation of soil survey.
2. Influence of cover crop on the temperature, moisture, pH, fertility, etc. of coconut soils.
3. Manurial trials.
4. Analysis of tissue samples.
5. Studies on seasonal foliar yellowing in coconuts.
6. Investigations on the use of sodium chloride as a substitute for potash for coconuts.
7. Examination of soil and plant material for cadmium and strontium.
8. Advisory work.

Central Coconut Research
Station, Kayangulam.
Dated, 15-7-1956.

(Sd) K. P. V. Menon,
Director.