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RECENT ADVANCES IN COCONUT RESEARCH IN INDIA

THE Agricultural College, Vellayani, Trivandrum, was the venue of the first conference of the coconut research workers in India organized by the Indian Central Coconut Committee, Ernakulam. India is the second largest producer of coconuts, a commodity occupying an important place in international commerce. With the advent of the Indian Central Coconut Committee in 1945 and with the establishment of two Central Coconut Research Stations and seven Regional Research Stations in the different coconut-growing States of the country, coconut research has in recent years gained considerable impetus and it was therefore quite opportune that research workers engaged from all over India should meet and discuss recent advances achieved in their field of work. The Conference was held during December 21–23, 1959, and was attended by more than seventy research workers, representatives of the Kerala Department of Agriculture and the Agricultural College, and some prominent coconut growers. Prof. L. S. S. Kumar, principal of the Agricultural College, presided. Some forty-five papers were presented and discussed at the conference.

Eleven papers covered the subjects falling under the purview of agronomy and general plant nutrition. In the first paper, by Mr. M. M. Krishna Marar and Dr. K. M. Pandalai (Kasaragod), the results of observations made in some long-term (40-year) experimental plots on the coconut were presented. The more important of the conclusions drawn were that (1)

regular inter-cultivation and manuring are necessary to step up and maintain the yield at high level, and (2) regular inter-cultivation by itself is highly effective in increasing the yields even in the absence of manuring.

The same authors discussed in another paper the beneficial effects of nitrogen, phosphorus and potassium manuring on inducing flowering and bearing in adult non-bearing palms. Messrs. C. M. John and K. Jacob (Bangalore) reviewed the results of the extensive fertilizer demonstration scheme on coconuts carried out in growers' holdings on the west coast of India and established that manuring with the standard dose of 0·75 lb. nitrogen, 0·75 lb. phosphate and 1·5 lb. potassium together with 50–100 lb. green leaves per tree per year resulted in an increase of 35 per cent in terms of nuts, or 44 per cent in terms of copra, providing a net profit of Rs. 88·00 per acre. Miss K. Vijayalakshmi (Kasaragod) dealt with the various factors regarding moisture in soils of coconut plantations and outlined the various steps to be taken to conserve it. Messrs. T. Kailas Rao and T. Srirama Rao (Ambajipet) showed that for the alluvial soils of the coconut areas of Andhra Pradesh, sunnhemp is the most suitable green manure crop. The practices that have to be tackled when introducing coconut cultivation on a large scale in new regions such as Assam were discussed by Mr. P. R. Nath (Kahikuchi).

Certain aspects of the nutrition of the coconut palm were discussed by Dr. K. M. Pandalai and coworkers (Kasaragod). Dr. Pandalai showed that in the disorders or abnormal conditions such as foliar yellowing, chlorotic condition of the seedlings, petiole breaking, barren nut production, etc., met with in the coconut palm, there is a characteristic accumulation of nitrogen, phosphorus and potassium, etc., as compared with healthy tissues, suggesting some disturbance of optimum nutrient ratios, consequent inadequate metabolism and/or impaired translocation. Mrs. C. K. Thankam (Kasaragod) provided relevant data to justify the above general biochemical pattern of nutrient maladjustment in respect of barren nuts. Mr. P. L. Ramanandan (Kasaragod) dealing with the foliar yellowing condition of the palms, showed that it could be ameliorated to some

extent by balanced nitrogen, phosphorus and potassium manuring supplemented with micro-nutrients such as molybdenum, copper and boron. Mr. C. K. Balakrishnan Nambiar (Kasaragod) showed that, in coconut seedlings, growth as well as leaf composition was correlated to a large extent with the composition of the growth medium, and that unbalanced nitrogen, phosphorus and potassium supply decreased growth and vigour and produced characteristic deficiency symptoms. Mr. N. G. Pillai (Kasaragod) traced the changes in the mineral composition of the different parts of the nuts, such as husk, shell, kernel and nut water, in the course of development from the button stage to ripe nut.

Five papers dealt with subjects of botanical interest. Messrs. S. R. Gangolly, T. P. Gopalakrishnan and co-workers (Kasaragod) presented data to show that synthetic growth-promoting substances such as β-indole propionic acid, β-indole butyric acid in suitable concentrations can be used instead of coconut water along with 2,4-dichlorophenoxy acetic acid for arresting button shedding in the coconut and promoting satisfactory growth of nuts. In another paper Messrs. S. R. Gangolly, M. C. Nambiar, Rama Varma and K. M. Pandalai discussed the distribution of coconut pollen in the atmosphere in relation to weather factors such as humidity, maximum and minimum temperature, sunshine, etc. Mr. R. Gopinathan Nair (Kasaragod), in tracing the anatomical development of the coconut fibre, showed that the fibre strands begin to differentiate in the ovary wall of the female flowers four to five months prior to the opening of the spathes, and that they grow for the main part into typical fibrovascular bundles having a few xylem and phloem elements surrounded by a sheath of fibrous cells. Messrs. R. V. Pillai and K. Satyabalan (Kasaragod) in their paper described the seasonal variations in the yield and nut characteristics of thirteen exotic cultivars of the coconut, and showed the existence of inherent variations among them. Mr. Josy Joseph (Kasaragod) in his paper showed that F_2 progeny seedlings of $T \times D$ (open pollinated or control pollinated) were better than F_1 in vigour as judged by vegetative characters relating to growth.

As many as thirteen papers dealt with the different

aspects of the investigations on the diseases of the coconut palm. Mr. U. K. Nair and Dr. K. Radha (Kayangulam) presented data to show that manuring and spraying were generally effective in reducing the adverse effects of the leaf disease. Miss T. O. Prasannakumari, Dr. K. Radha and Mr. V. C. Kurian (Kayangulam) dealing with the efficiency of different copper fungicides for the control of leaf disease concluded that Bordeaux mixture, Kirti copper and 'Fungimar' were more effective than the others tried.

Dr. P. Shanta, Dr. K. P. V. Menon and co-workers (Kayangulam) presented four papers dealing with their investigations on the virological aspects of the wilt disease of the coconut palm. In the first paper they presented results that tend to support the virus hypothesis of the wilt disease. In their second paper they described the host-range of the virus, and showed that the virus can be experimentally transmitted to cowpea seedlings by sap inoculation. In another paper Dr. P. Shanta, Dr. K. P. V. Menon and Mr. K. J. Thommen (Kayangulam) adduced evidence to show that chlorosis and flaccidity of the leaves in the diseased coconut palms are only secondary symptoms brought about by the formation and accumulation of toxic materials in the leaves. Dr. K. Radha and Mr. T. S. S. Rawther (Kayangulam) reported negative correlation between the rhizosphere fungi and rainfall conditions in their studies on the influence of seasonal factors on the rhizosphere microflora with reference to the wilt disease in the coconut palm.

A series of seven papers on the chemical studies on the leaf and wilt disease of the coconut were presented by Messrs. E. J. Verghese, M. P. Sankaranarayanan, S. Robert Cecil, M. K. C. Nair and A. S. Mathew (Kayangulam). In the first two papers they reiterated the salient features of observations made on the incidence of the root and leaf diseases of the palms, and provided data which confirmed the earlier findings regarding the accumulation of major nutrient factors in the diseased tissues. Different aspects relating to the changes in the concentration under water-logged conditions, particularly of possible toxic agents such as ferrous iron, aluminium, organic acids, etc., which could injure plant tissue, were

discussed in the third paper. The results of soil survey of healthy and diseased coconut gardens to throw light on the influence of soil conditions in relation to the disease formed the subject of another paper. The ineffectiveness of lime, ash and Chilean nitrate to improve the condition of diseased trees was reported in two other papers by Messrs. M. R. Chettiar, E. J. Verghese, P. C. John, P. V. Channey and M. P. Sankaranarayanan. In the last paper of the series it was concluded that cadmium toxicity is not a factor associated with the disease condition of the coconut palm.

Six papers presented results of investigation on the pests of the coconut palm. Messrs. K. R. Mohan Rao and C. Seshagiri Rao (Ambajipet) described the different pests of the palm prevalent in the Andhra Pradesh, and gave an account of the biological method of control adopted by them against *Nephantis serinopa*. Mr. G. B. Pillai and Dr. C. Kurian (Kayangulam) in their work on the insecticidal efficiency of dieldrin concluded that 0·05 per cent is the optimum minimum concentration for use against *Nephantis serinopa*. Reporting the results of several insecticidal trials against *Rhynchophorus ferrugineus* F., Mr. K. Mathen and Dr. C. Kurian (Kayangulam) held the view that both larvæ and adults suffered 92 per cent mortality of grubs at 0·5 per cent and 100 per cent mortality of adults at 0·1 per cent, seven days after treatment, endrine giving best results.

The results of observation on the incidence of the rhinoceros beetle and the extent of damage done by it under field conditions were presented by Mr. C. P. Ramachandran and Dr. C. Kurian (Kayangulam). Detailed studies of *Perisierola nephantidis*, an ectophagous larval parasite of *Nephantis serinopa*, were reported by Mr. J. Antony and Dr. C. Kurian. Mr. K. V. Joseph (Vellayani), based on the work done by him, emphasized the need to exercise caution in the matter of using DDT for large-scale spraying in coconut areas because of the risk involves in adversely affecting the population of parasited and predators that normally help to keep pests under control in Nature.

Other papers were presented and discussed, and some were submitted only. All the papers submitted

for the Conference are being printed as a special volume of the *Indian Coconut Journal* (published by the Indian Central Coconut Committee, Ernakulam, South India).

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