

CFI caused maximum decrease in percentage of open staminate flowers.

1. Atsmon, D., Lang, A. and Light, E. N., *Plant Physiol.*, 1968, 43, 803.
2. Choudhury, B. and Phatak, S. C., *Indian Jour. Hort.*, 1959, 12, 143.
3. Galun, E., Jung, Y. and Lang, A., *Nature*, 1962, 194, 596.
4. —, — and —, *Devl. Biol.*, 1963; 6, 370.
5. Gautheret, R. J., *La Culture des tissue Gallimard. Paris*, 1945.
6. —, *Plant Tissue Culture, Sixth Growth Symposium*, 1947, 21.
7. Henderson, J. H. M., Durrell, M. E. and Bonner, J., *Am. J. Bot.*, 1952, 39, 467.
8. Moore, J. N., *Jour. Amer. Hort. Sci.*, 1970, 96, 387.
9. Negi, S. S. and Olmo, H. P., *Science*, 1966; 152, 1624.
10. Randhawa, K. S. and Singh, K., *Plant Science*, 1969, 1, 69.
11. Sankhla, N. and Sankhla, D., *56th Proc. Ind. Sci. Cong.*, Pt. III, 1969, p. 415.
12. Satyanarayana, G. and Rangaswami, G., *Curr. Sci.*, 1959, 28, 376.
13. Uma, M. C., Mehta, Usha, Illyas Mohammed, Jaiswal, V. S. and Mohan Ram, H. Y., *Proc. Sym. Biol. Land Plants*, 1972, 33.

## SIXTY YEARS OF COCONUT RESEARCH AND DEVELOPMENT IN INDIA

N. M. NAYAR\*

*Central Plantation Crops Research Institute, Regional Station, Vittal-574 243, Karnataka State*

**T**HE Indian Society for Plantation Crops and the Indian Council of Agricultural Research celebrated the Diamond Jubilee Year of Coconut Research in India from December 27, 1976 to January 8, 1977. Coconut research was first begun in India (and also in the world) in 1916 at Kasaragod, Nileshwar, and Pilicode under the old Madras Presidency. Today, Kasaragod is the headquarters of the Central Plantation Crops Research Institute, Indian Council of Agricultural Research. It is the main Institute in India researching on coconut. The Coconut Research Station at Nileshwar is under the Kerala Agricultural University and the Pilicode Station functions under the Kerala Agriculture Department.

The most notable achievements of six decades of coconut research has been the production of hybrids between Tall and Dwarf forms of coconuts and discovery that they are high yielding, early bearing and semi-tall as compared to local forms. Further, they bear better even when infected by the dreaded root (wilt) disease. A commemorative stamp brought out by the Posts and Telegraphs Department depicted a semi-tall, early bearing hybrid palm of coconut.

The coconut palm is best known as an oil yielding plant. Coconut oil ranks sixth in the world today in terms of production and fourth in terms of international trade among edible oils. India ranks third in the world after the Philippines and Indonesia in coconut production. In India, coconut ranks about the fourth in production among the vegetable oils.

Till about four decades ago, coconut oil was the leading edible vegetable oil of international trade. It was also among the cheapest oils. Today, it has become one of the most expensive vegetable oils. It is in this background that the present Symposium was organized. Incidentally, this was the first time that an international symposium was organized on this important and most useful plant.

The Symposium was attended by 320 scientists and delegates from all over India and most of the coconut growing countries of the world. It was inaugurated by Dr. M. S. Swaminathan, FNA, FRS (Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education), with a keynote address 'Coconut research—the next phase'. He identified the major R & D problems in coconut as breaking the yield barrier which has remained at best stagnant with 30-40 nuts annually. He also called for finding out a solution to the root (wilt) disease of Kerala State which is responsible for an annual loss of Rs. 300 million.

The Symposium was organized in 9 sessions in which 80 papers were presented, 46 from India and 34 from abroad. These sessions consisted of Genetics and Plant Breeding (10 papers), Agronomy and Soil Chemistry (10 papers), Biochemistry and Physiology (9 papers), Technology (7 papers), Basic Studies (7 papers), Diseases (5 papers), Diseases of Uncertain Aetiology (10 papers), Pests (7 papers), and Development Programmes in India and Other Parts of the Country (16 papers).

\* Chairman, Programme Committee, ISOCRAD.

The main emphasis of the papers, presented in the Genetics and Plant Breeding Session, related to the development of methods for identifying high yielding and prepotent palms based on characters of coconut seedlings in the nursery; and, the characteristics of dwarf forms of coconut and the need for intensifying studies on them for effectively utilizing them in varietal improvement programmes. The papers in Agronomy and Soil Chemistry emphasised the need to increase the productivity of coconut gardens by intercropping them with other crops as cacao or by mixed farming with fodder grass and legumes, raising milch cattle, and recycling cattle waste; and manurial and water requirement studies on coconut. The papers in Biochemistry and Physiology discussed biochemical changes during maturation and germination of coconut, vascular physiology of coconut palm, varietal differences in nutritive values of copra and glucose content of coconut water, and description of a method for more efficient fermentation of toddy. Perhaps the widest field was covered in the session on Technology in which the papers dealt with the methods of wet milling fresh coconut kernel, the 'solvol' process developed by an Indian firm for an integrated and total utilization of all parts of the coconut fruit from husk to coconut water, utilization of coconut husk as a cheap and durable roofing material, or for making utility items as coir, mattresses, brushes, etc., a review of the microbiological studies involved in retting of coconut husk, and production of activated carbons from fibre pith and coconut shell. In the session on Basic Studies, two papers elicited considerable interest. One presented data on floral biology and fruiting of coconut trees raised through embryo culture and the second reviewed the progress attained on vegetative propagation of coconut palm. Vegetative propagation in the coconut has assumed more relevance because of the recent success obtained in raising oil palm from tissue culture. The method offers great advantages for the improvement of coconut palm because of its long juvenile phase and its obligate seed propagation. Two other papers dealt with association of foliar asymmetry with latitude and origin of coconut.

The highlights of the Symposium were the two Sessions on Diseases and Diseases of Uncertain Aetiology. Understandably, because the coconut palm is affected by a number of diseases, several of uncertain aetiology. Several papers presented in the Symposium brought out that co-operative and systematic researches that are in progress in some of the centres are beginning to produce positive results and the scientists are "closing in" (to quote from

Dr. Swaminathan) on determining the aetiology of several of them. The participants hoped that similar efforts would be put forth on the root (wilt) disease of Kerala State also. On root (wilt), Maramorosch (Rutgers, USA) proposed that even though its aetiology was uncertain, its spread could be prevented by manipulating interactions between disease agents, plant hosts, and insect vectors. There are also two other diseases in India whose aetiology has not been properly determined, namely, Thattipaka disease of Andhra Pradesh and Thanjavur wilt of Tamil Nadu. Then, there are other diseases elsewhere in the world like the anabe, bud rot, red ring, hart rot, lethal yellowing and the kainkope disease which are responsible for several losses and are only little understood.

The session on Pests generally emphasised the need for adopting improved methods to control them. However, the serious damage being caused by the rhinoceros beetle (*Oryctes rhinoceros*) and leaf eating caterpillar (*Nephantis serinopa*) in many coconut growing countries of the world were pointed out repeatedly by several workers for initiating co-ordinated research efforts on them. The largest number of papers were presented in the Session on Development Programmes. More than anything else, it exposed the inadequacy of the present extension services in transferring the results of research available in research institutes and agricultural farms to the farmers. In this context, the organization of the coconut industry boards of Sri Lanka and Jamaica was commended for adoption by other coconut growing countries.

In the Plenary Session, the delegates were unanimous that this first international symposium on coconut research was highly successful in bringing together coconut scientists from all over the world. It decided, therefore, to form a permanent secretariat with its headquarters at Kasaragod, Kerala State, with representatives from important coconut growing countries of the world to maintain and strengthen the existing contacts and to organize similar symposia in future.

Another notable feature of the Celebrations was a two-day Travelling Seminar following the Symposium, with about 10 scientists each from the CPCRI, other laboratories in India and from abroad. The seminar discussed the diseases of uncertain aetiology in India. Though several decisions were taken, its main fall out appeared to be the consensus that the work now in progress at Kayengulam was basically on right lines, but researches particularly on viral and soil microbiological aspects required to be improved and strengthened.

The proceedings of the Symposium will be published by the end 1977 by Wiley Eastern Limited, New Delhi.