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Banana Research

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Introduction: Planned research on problems of economic importance in bananas is only of recent undertaking in India, as it started with the commencement of the Banana Research Scheme in Madras, Bombay and West Bengal States with financial assistance of the Indian Council of Agricultural Research. In a country which claims the origin of this important tropical fruit and which is unequalled in its extent of its varieties, banana research has not attained much headway. In this respect the results achieved at the Imperial College of Tropical Agriculture are widely known and particularly in systematic studies, the contribution of Cheeseman is an outstanding one.

Systematic Studies: This aspect has attracted most of the foreign workers and yet it is a problem which bristles with complications. The confusion in banana systematic studies orginated with the inclusion of certain indefinite and varying characters in the description of species by Linnaeus in *Musa paradisiaca* L., as having persistent male phase, culinary quality of the fruits and loose bunch with fruits held in lax manner and of *Musa sapientum* L., to include all edible varieties except the Cavendish group. There were a few other botanists who held the view that *Musa paradisiaca* is only a sub-species of *Musa sapientum*. Such theories have been dismissed by Cheeseman (3) as not well-defined nor botanical. He postulates that the cultivated banana varieties (triploids) of *Eu-Musa* section have originated from the wild species *Musa balbisiana*, Colla and *Musa acuminata*, Colla. It is further observed that many of the best dessert varieties like Gros Michel have more of the characters of *Musa acuminata*, while a few show relationship to both the species. *Musa sapientum* can be said to be the last group which has the combined characteristics of *Musa acuminata* and *Musa balbisiana*. Therefore the fruit quality of dessert bananas is traced to *Musa acuminata* and the characteristics of cooking varieties generally associated with *Musa paradisiaca* are now taken to be distinctive features of *Musa balbisiana*. However Cheeseman and other workers are for the present in favour

of retaining the specific name of *Musa paradisiaca* L. These two species *Musa paradisiaca* and *Musa sapientum* are best considered as type species and at present carry negligible significance in nomenclature and classification of banana varieties.

Taking the line of demarcation of the different sections of the genus *Musa*, Cheeseman's findings have not been accepted *in extenso* by others and may require revision. His distinction of various characters between *Musa balbisiana* and *Musa acuminata* may have to be regrouped. From the observations made at the Central Banana Research Station, Aduthurai, it is seen that the partitioning of the *Callimusa* section, at least for certain well-known members like *Musa coccinea* from the *Eu-musa* section, lacks precision. Even in the chromosome number of certain species Agarkar and Govindaswami (i) have differed from Cheeseman.

In South India systematic work on bananas received a good deal of attention by Jacob (4) and subsequently by Venkataramani (5). Jacob's observations and descriptions are no doubt valuable. However, his coining of new species as *Musa sapidisiaca* Jacob K. C comprising the cultivated varieties of South India, though appreciated by workers in Kew, at best recognises the natural hybridity of cultivated bananas, but does not indicate the correct specific status of the varieties. The second aspect of the problem peculiar to this country especially, because of different dialects and languages, is the bewildering array of synonyms in the nomenclature of varieties. This problem can be solved only by studying the varieties in different situations and all the varieties at one central place. This has been attempted at the Central Banana Research Station, Aduthurai and it has been possible to reduce 126 varietal names to 55 distinct varieties, based on specific distinguishing characters. So our main objective should be to have an exhaustive national collection of banana varieties of India and from foreign countries so that the studies can be pursued on more fruitful lines.

Hybridisation: Cytological studies on bananas have received much attention in the hands of foreign workers, in the last three decades. In Trinidad, Cheeseman and his colleagues initiated breeding work on new varieties along planned lines although he has not attained complete success in evolving a variety completely resistant to the virulent Panama-disease and at the same time possessing the economic characters of Gros Michel. This work is still in progress. In banana hybridisation, selection of suitable

male parents is an important question and in this country we have got a good number of bananas occurring in the wild state and in diversified forms. The aim should be to improve the keeping quality of the fruits, dwarfness or semi-tall nature and resistance to the Panama wilt and Bunchy top diseases. Especially in the Coromandel Coast, where cyclones are not infrequent, the evolution of semi-tall varieties of the popular varieties, *Monthan* or *Poovan* will be of great economic advantage. Initial studies at the Central Banana Research Station, Aduthurai proved that such a hybrid of intermediate characters is possible and an interspecific hybrid of *Monthan* x *Musa coccinea* was obtained. But the hybrid could not be utilised for further breeding because of female sterility and absence of pollen. In India cytological studies of banana received some attention at Poona (1) and Calcutta (2). However the studies were not pursued fully. In a country where wild species occur in abundance, there is a vast scope for research in evolving new varieties. The Western Ghats of Madras and Bombay states contain many wild bananas, showing large variations and forms of *Musa acuminata* especially and with such potentialities there is a real need for the continuation of systematic and cyto-genetical studies.

Sports in Bananas: Apart from hybridisation, obtaining varieties with desired characters in bananas is possible. Bananas are highly variable and unstable in character and mutations and abnormalities recorded in bananas are many. Since vegetative propagation is the rule in this fruit, perpetuation of such clones of desirable characters is possible and the degeneration and reversion of some characters are also equally possible. "*Pedda Pacha Arati*" is a semi-tall mutant of the dwarf variety, Mauritius and so also it is reported that the Australian varieties "*Mons Marie*" and "*William's Hybrid*" are the semi-tall mutants of the dwarf Cavendish. *Pedda Pacha Arati* has now become very popular in Malabar. Ecological variations are not rare in bananas. "*Sirumalai*" and "*Virupakshi*" are the well known eco-types of "*Vannan*" and the modifying influences of various environmental factors are being studied during survey tours under the Banana Research Scheme. Such variations also throw light on the acclimatisation and adaptation of certain varieties to suitable localities. In pursuance of that objective, the performance of different varieties is proposed to be studied at the various Agricultural Research Stations of our state. These studies will enable zoning of the varieties to different regions in Madras State.

Propagational Studies: Studies made at the Central Banana Research Station show that sword suckers of both *Monthan* and *Poovan* varieties flower and fruit earlier than broad-leaved suckers. Nursery and field investigations show that it is quite possible to use bits of rhizomes of parent plants as well as daughter suckers of bananas as useful material for propagation. The advantage of early and quick propagation by bits of rhizomes is almost negligible under Aduthurai conditions as the annual increase in area by fresh plantation is little for which fully developed banana suckers from the existing plantations are always available in excess. The real advantage will occur only when a superior variety is evolved or introduced which required easy multiplication and spread.

With regard to the selection of suckers, one more consideration arises viz., at what stage of the mother plant the suckers have to be allowed and separated for planting elsewhere. The studies on this aspect has just been initiated at the Central Banana Research Station, Aduthurai.

Plantation Practices: Among the plantation practices the manurial requirements of the crop is a vital problem. Past trials in this direction conducted at the various Agricultural Research Stations have not been on a co-ordinated scale. The results of the manurial trial in the wetland area of the Central Banana Research Station with the *Poovan* variety have shown that the best manurial dose per plant is given by the treatment in which $\frac{1}{4}$ lb. nitrogen is applied as cattle manure and $\frac{1}{4}$ lb. as ammonium sulphate in two doses, the first dose three months after planting and the second five months after planting, in addition to the basal dressing of 25 lb. cattle manure per plant. Under Aduthurai conditions of heavy clay soils there was no response to potash and phosphoric acid. As the next step with the above results, a trial at the Central Banana Research Station, Aduthurai is under way to determine the exact time of application of manures, especially ammonium sulphate and its influence on the flowering of the plant.

Besides the time of application of fertilisers and its quality, the method of application of manures deserves special attention in bananas. Usually the basin system of application is practised. However one disadvantage in that practice is that it may retard the root penetration and thereby the anchorage of the plant is impaired and consequently they become susceptible to wind havoc. To obviate this difficulty and to mechanise the manurial applications trench

manuring is sometimes adopted in foreign countries. Such a system, it is claimed, induces the roots to go deep. How far this system of manuring is suitable to our perennial system of cultivation has to be investigated.

The role of micro-nutrient elements in bananas has not been investigated so far. It is a common sight that the margins of the laminae of certain banana varieties show a scorched appearance and this feature has not been studied, though is quite possibly due to a deficiency in one or more of the trace elements.

To determine the manurial requirements of a crop, investigation in one or two centres will not be sufficient as the results are necessarily limited to identical soil types. A co-ordinated programme has to be chalked out to initiate such trials in representative tracts.

Diseases: Without the mention of Panama disease, a review of the research on bananas would be incomplete. Hybridisation work carried out in Trinidad to combat this disease has not yielded full benefits. Fortunately some of our important varieties 'Poovan' are highly resistant to Panama disease. But the problem does not end there because there are equally susceptible varieties like "*Rasthali*". It has also to be noted that Panama disease which was unheard of a few decades ago, is slowly making its appearance in some tracts of this country. As such, systematic and rigid enforcement of quarantine measures, coupled with the elimination of susceptible varieties in cultivation have to be adopted. From onwards, breeding to obtain disease-resistance in varieties have to be started on a planned scale before the disease commences to tell on our banana industry.

Hill bananas stand on a different footing and deserve special consideration. Research on the problems of hill bananas has not commenced and this lacuna in banana research needs immediate attention. Madura district of this State holds a monopoly in hill bananas and there is a well-organised industry flourishing there. An approach has to be made in good time to tackle the problems obtaining there.

The problem of marketing of bunches of banana has not received adequate attention as in other countries. The entire production is consumed within the country and nothing is exported. But in foreign countries, like the Carribean Islands, bunches are sent to European countries and Gros Michel is eminently suited for such

transport. However, such problems have not arisen in this country. But the wastage in marketing can be minimised by the correct stage of harvesting and packing the bunches properly. In Queensland banana covers of plastic film are found to be very useful in improving the quality of the fruit. Trials with Indian varieties should also prove useful and a beginning has been made in that direction at the Central Banana Research Station, Aduthurai.

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