Pepper Research - The Present and The Future

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In India research on pepper, dates back to 1950s when the Pepper Research Station, Panniyur was established by the then Madras Government. This Station was mainly intended to evolve better varieties and standardise agrotechniques for the crop. As a result of the sustained work at this centre the hybrid Panniyur-I was evolved, which yields 3 to 4 times more than the existing local varieties. Considering the importance of the pepper crop in the international trade and the foreign exchange of 344 million rupees that this crop earns to the country, the research support provided for this crop was felt inadequate and the ICAR sanctioned an All India Co-ordinated Spices and Cashewnut Improvement Project (AICSCIP) with headquarters at Central Plantation Crops Research Institute, Kasaragod, during 1971 which covered pepper as well. Subsequent to this, research work was intensified at Panniyur, Kasaragod and Vittal.

CURRENT PROGRAMMES

Eventhough India is reported to be the home of pepper, efforts made so far to collect the germplasm have been far from satisfactory. A detailed survey taken up at Vittal has enabled collection of 856 types occurring mostly in Karnataka and portions of Kerala. Of these 107 are cultivated and 749 are wild types. Tentative identification of the types shows that the collection includes in addition to **Piper nigrum**, species such as **P. brachystachyum**, **P. galeatum**, **P. longum**, **P. hatia**, **P. argyrophyllum**, **P. attenuatum** and **P. hookeri**. Of these, the wild types have shown wide variation in berry size, spike length (5 to 30 cm), percentage of dry to green pepper (30 to 40), percentage of female and bisexual flowers, non-volatile ether extract (6.6 to 25.7%) volatile oil (0.4 to 3.9%), piperine content (traces to 13.7%), crude fibre (3.1 to 19.03%), starch (33.9-45.8%) and crude protein (8.1 to 14.1%). Piperine content in one of the recent collections was found to be as high as 25.7% (Mathai, 1975).

Pepper is propagated by rooted cuttings and as such the genetic variability available is not normally released. In order to exploit this locked up variability, large number of seedlings from open pollinated seeds have been raised in the nursery and the seedlings are under study. Hybridisation involving different cultivars of diverse genetic base is also in progress.

Of all the diseases affecting pepper, the 'quick wilt' (Foot rot) and 'slow wilt' are the most destructive. Chemical control measures adopted so far are not found to be effective. Twentyfive cultivars of **Piper nigrum** L. screened against **Phytophthora palmivora** But 1, which is the casual agent of 'quick wilt' did not show any resistance. In the 'slow wilt' complex **Fusarium** sp., **Diplodia** sp. and **Rhizoctonia** sp. were found to be frequently associated with the root system of the affected plants. Besides, nematodes such as **Radopholus similis** Cobb and **Meloidogyne** sp. have been observed to be associated.

Nursery studies showed that nematode infestation is possible in the rooted cuttings raised for distribution. Fumigation of footing medium with methyl bromide at 500 g per tonne of soil was found to be effective in controlling the nematode population and this is now being followed in all the nurseries.

The incidence of flea beetle, **Longitarsus nigripennis** Mots causing hollow berry ('Pollu' in vernacular) had been estimated to cause a loss of about 15–20% berries. But in certain endemic areas the extent of loss may go up to 30–40%. Studies on seasonal abundance of 'pollu' beetle revealed that though the pest is present in the field from August to January-February the population

reaches its peak in October-November. The pest could be controlled by two sprayings with dimethoate O. 1% or quinalphos O. 1%, one in late July and the second in early October (Pillai and Abraham 1974) DDT is not at present recommended. The incidence of 'pollu' disease caused by **Colletotrichum necator** Masse, is also common in all the varieties. A combination spray of fungicide and insecticide is also being taken up for the control of hollow berry caused both by flea beetle and fungus. In general, the incidence of 'pollu' is more on vines under heavy shade. Regulating the shade is helpful in reducing the incidence. The grubs of the Cerambycid beetles, **Pterolophia annulata** and **Diboma** procera have been observed tunnelling into the pepper vines causing the death. Bionomics and control measures are under study (Dubey, Pillai and Nambiar 1975).

THE FUTURE

One of the reasons for our inability to be competitive in the international market is the high cost of production of Indian pepper. This calls for enhancing yields through moderate investments and adoption of newer techniques. For obtaining higher yield in a crop like pepper which requires a support to creep over, the advantage of using dead standards will assume great priority. Both dead wood and concrete poles should be tried under good management conditions. Since there are indications that pepper requires good light for its bearing, dead standards are likely to prove more useful. Critical data on the nutritional requirement and management practices of the crop are also to be gathered.

High yielding varieties with considerable plasticity to different diffused light conditions, are to be isolated since pepper is also grown as intercrop in coconut and arecanut plantations.

'Wilt' disease of pepper requires a multidisciplinary approach for its control. The role of nutrients, pathogens and their interactions on the incidence of the disease will have to be investigated.

So far no cultivated variety was found to be resistant to **Phytophthora** except that relative tolerance of Indian varieties like Balankotta were reported (Turner, 1971). However, resistance was located in some wild types like **P. colubrinum.** Incorporating resistance of this wild types to cultivated varieties should receive utm st priority in breeding programmes. Grafting of high yielding cultivars on root stocks of wild types was tried without considerable success under field conditions (Gaskins and Almeyda 1969; Garner and Beakbane, 1968). It has been reported that field plantings of **P. nigrum** grafted on to **P. colubrinum** alone survived (Albuquerque, 1968). Efforts may further be continued to find resistant root stocks with good degree of field performance. However, incorporating resistance to cultivated varieties will alone be the final answer to wilt problem since aerial vines are prone to the attack in the case of grafts.

When once a useful hybrid or a variety is developed, methods are now available to multiply them efficiently using even single-node cuttings (Hughes, 1966). It is thus possible to quickly multiply any econmic variety.

Reduction of growth has been observed in budded plants. It may be possible to make use of this to dwarfen the pepper so that the height of the vine could be reduced and harvesting and other operatibns made easier. This is particularly relevant in the case of high yielding variety like Panniyur-I which has very luxuriant vegetative growth. Dwarfing root stocks will, therefore, be of considerable advantage in this crop.

Of the world's consumption of pepper, about 45% is reported to be in the form of extracted oleoresins. In view of the extremely high food standards that are being developed by various consuming countries, extracted oleoresins are likely to be favoured over raw pepper. It will, therefore, be useful to have varieties having high oleoresin content. Investigations taken up the Central Plantation Crops Research Institute have indicated that there is variation in the accumulation of oleoresin according to the growth phase of the pepper berries. Maximum accumulation of oleoresin was observed in 7½ months old berries (21.05%) in Panniyur-I, while it was highest in 5½ months old berries (15.55%) in the local. Agro-techniques are also likely to influence the oleoresin content. Research work on these aspects will, therefore, have to be integrated with breeding and agronomic programmes.

Use of pesticides and fungicides in the crop and the residue that is likely to be left either in the raw pepper or in the oleoresin extracted will have to be moniteered and recommendations adjusted so as to

ensure that these chemicals do not pose any health hazard to the consumer. Pepper has also considerable pharmacological properties. In Ayurveda it finds a place in a number of preparations. Further investigations are called for in this direction also.

In conclusion it may be stated that the future research in pepper has not only be intensive but also integrated so as to evolve high yielding varieties with horizontal resistance to important pests and diseases, coupled with high quality characteristics.

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Pepper Research - Problems

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Today pepper is estimated to contribute up to 30% of the world's trade in spices of which Idnia's contribution is 22-32%. India is followed by Malaysia and Indonesia as the other leading producers. In 1974-75 the production of pepper in India reached an all time high of 28.75 Thousand tonnes of which more than 98% was accounted for by Kerala. About 85% of the produce is exported to the USSR, the USA, Italy and Canada.

India had a near monopoly in pepper trade in the past; but in recent years other countries have claimed a higher share because of lower prices they can afford. This has happened in spite of the fact that Indian pepper still enjoys an overall preference due to their quality

Though pepper has been under cultivation in India from time immemorial, research on pepper is only recent origin and, therefore, many fundamental as well as applied problems remain yet to be tackled.

The most important problem facing pepper industry in India today is low yields and consequent high cost of production. The productivity potential of pepper is indeed tremendous. The most intensive method of cultivation and which gives the highest yield is the one which appears to have been developed by the Chinese aud almost exclusively used by them in Banka and Biletong, in parts of the S. E Asian mainland and in Malaysia. The maximum annual yield in these gardens is reported to be as high as 7-8 tonnes/ha. As against this the annual yield in India is a miserably low 235 kg/ha. The cultivation of pepper in India is of the most primitive form. The only thing the farmer does is the planting of of pepper cuttings at the base of any tree in the homestead. Little attention is given to the crop subsequently. A more intensive form of cultivation, especially in Cannanore and Calicut districts of Kerala, is to grow the vines as a pure plantation on a shading standard like Erythrina indica. Even here the operations include only land clearing, digging round the vine once a year and shading and training in the first two years of planting. Practically no manuring is done. The traditional practice was to use virgin lands under forests on hill slopes. No replanting was practised. The situation is changing only now.

Many of the pepper cultivars grown in India are either chance seedlings or mutations, selected for desirable characteristics and maintained by vegetative propagation. These cultivars are known by the place of origin or by local names like 'Malligasara', 'Kalluvally', 'Uthirankotta', 'Karimunda', 'Poonjatanmunda', 'Narayakodi', and 'Kuthiravally' which indicate striking features of the plants.

The clonal method of propagation has made it possible to fix the vigour and other characters of the cultivars. Thus all the variability now found in the commercial varieties or cultivars may have been derived from a limited number of genotypes originally selected from chance seedlings, and it is not surprising that the variability in the cultivated type is very low in comparison to that in wild types. Variability in characters like berry size, spike length and nonvolatile extract, oil and piperine content is very wide among wild types. Because of the highly heterozygous nature of the cultivars, perpetuated through years of vegetative propagation, selfing undoubtedly offers very good scope for exploiting the locked up variability for selection. In the past the selection in pepper has been generally for higher percentage of oleoresin and piperin content of berries. But of late, there is an increase in demand for low pungency varieties especially from the East European countries.

There is thus an enormous amount of genetic variation yet to be systematically and critically