CONTROLLED CROSSING TECHNIQUE IN BLACK PEPPER (*PIPER NIGRUM* L.)

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ABSTRACT

The flowering in pepper coincides with the South-West monsoon and the continuous rain makes crossing work very difficult under field conditions. The chance of extraneous pollen contamination through rain water also is very high, since in pepper, pollination is aided by rain water. In order to overcome the above limitations, a crossing technique has been developed. The technique consists of inducing rooting in productive laterals and isolating the rooted laterals in earthern pots. The isolated plants are then transferred to indoor before flowering initiates.

Pollination could be done either by exploiting the protogynous condition present in pepper, or by emasculating the female parent in isolation. Pollination is carried out by applying an aqueous suspension of pollen to the receptive stigma by brush.

The advantages of the technique are that all operations are carried out under controlled conditions and that the hybrid nature of the seeds obtained can be assured. It is also possible to carry out the crossing work throughout the year, as the isolated laterals flower continuously under irrigation.

INTRODUCTION

Breeding programme in pepper has been in progress in India since 1953, with the establishment of the Pepper Research Station, Panniyur. Though a hybrid pepper Panniyur—I was evolved at the Station and released for cultivation in 1966, the mode of pollination employed was published only recently (Nambiar *et al.* 1978). The technique involves emasculation, isolating the emasculated spikes in butter paper bags and pollination. Emasculation is carried out immediately after the emergence of the spike from the sheath, by scooping out the anthers using a dissecting needle.

The unemasculated portion of the spike is trimmed off and the spike covered with paper bag. Pollen grains from selected male parents are collected by washing the spike with distilled water and collecting the washings. Pollination is carried out by applying the pollen suspension on to the emasculated spike using an ink filler or brush. The setting has been reported to be about 6-12%. This technique has been tried by the present authors also. But seed set has been comparatively poor.

Martin and Gregory (1962) described two techniques for emasculation and pollination in pepper which were also not very successful. In Sarawak, a pollination technique making use of the protogyny in the cultivar 'Kuching' has been developed (Dewaard and Zevan, 1969).

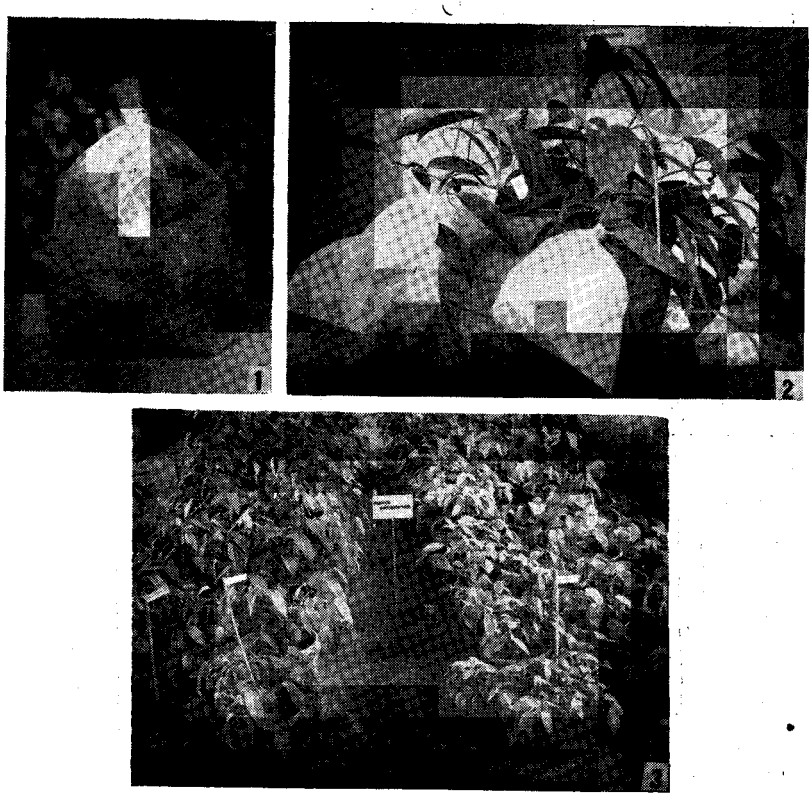
Flowering in pepper coincides with the South-West monsoon and the continuous rain makes crossing operations very difficult under field conditions. The chances for extraneous pollen contamination through rain water also is very high, since in pepper, pollination takes place through the medium of rain water (Anon. 1975). The process of emasculation, especially at inconvenient heights on the vine trained on to supports always causes injuries to the spike, and this is probably the main reason for the poor setting. Even a slight pressure or a pin prick on the spike causes the development of necrotic areas and subsequent damage to the spike (Martin and Gregory, 1962). In order to overcome the above limitations, a simple hybridisation technique has been developed at this station. The technique consists of isolating the fruiting laterals in poly bags or pots and carrying out the crossing operations under controlled conditions.

Pepper vine produces three types of aerial shoots terminal, runners and lateral branches. The first two are non-productive. The lateral branches have a sympodial growth habit, and they bear spikes on current year's flush, opposite a leaf. The usual flowering period is May-June, but flowering could be induced throughout the year by copious irrigation.

Materials and Methods

Well developed lateral branches were separated from the mother vines and kept in 500 ppm IBA solution overnight. Then the

laterals, together with all the leaves were enclosed completely in 250 gauge polythene bag of convenient size, with the base of the cutting surrounded by a moist rooting medium such as decomposed coir dust. The mouth of the poly bag was tied securely and bags kept in a cool place (Fig. 1). Sterilised potting mixture and coir dust were found to be better media as they reduced fungal infection



considerably. Rooting took place in about a month, when the bags were opened and kept as such for a week. The rooted cuttings were then transferred to pots of convenient size, kept in green house and supplied with liquid fertilizers for rapid growth and production of laterals (Fig. 2). These laterals started flowering soon after they got established and produced enough spikes in the ensuing flowering season. Using such rooted laterals a crossing

block has been set up at the Peruvannamuzhi farm of this station (Fig. 3).

For artificial pollination, wherever possible, protogyny was made use of. The spikes were bagged (or the plants were kept isolated) and as the stigma became receptive pollination was carried out. Pollination was continued daily, till the emergence of the anthers, when further pollination was discontinued and the rest of the spike containing unpollinated flowers was trimmed off. Wherever emasculation was found necessary, it was done at the time of emergence of the anthers, using a fine pointed needle.

For pollination, fully mature anthers were collected in a little quantity of water. The anthers were crushed to release the pollen grains. The pollen suspension was then applied to the spike by using an ink filler or a fine camel hair brush.

Results and Discussion

Rooting of the laterals was found to be easier during the summer months from January to April. During this period over 90% rooting was obtained in the present study.

The setting was comparatively poor (varying from 8-26%) when pollen suspension was prepared by washing the spikes containing dehisced anthers (Nambiar *et al.* 1978) and this was probably due to the low population of pollen grains in the aqueous medium. The setting percentage increased considerably when pollen suspension prepared by crushing mature anthers in water was used for pollination. In the present study up to 82% setting was recorded. A soft camel hair brush was found to be ideal for applying pollen suspension on to the stigma.

Shedding of the pollinated spikes was extremely common under field conditions, and this shedding was found to be even up to 80-90% under Peruvannamuzhi conditions. Spike damage during emasculation and bagging operations, infection and insect attack were probably involved in this shedding. Using the method of isolation and pollination under controlled conditions, this spike shedding was brought down considerably. Among the cultivars used for crossing, spike shedding varied from less than 10% (in

Cholamundi and Perumkodi) to 32% (in Arakkulam Munda and Kalluvally).

The advantages of this method are many: (*i*) most important is that all operations can be carried out under controlled conditions and that the hybrid nature of the seeds produced can be assured of. (*ii*) bagging, emasculation, pollination etc. can be carried out at convenient heights, and damage can be kept to the minimum; (*iii*) if individual plants can be kept isolated even bagging can be discontinued as the pepper pollen is not dispersed by wind or insects; (*iv*) crossing work could be carried out continuously, since the potted branches flower throughout the year under irrigation, and (*v*) increase in berry setting and reduction in spike shedding could be achieved.

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