

Commercial Utilisation of Hybrid Vigour in *Cumbu* (*Pennisetum typhoides* S. & H.) in Madras State*

by

R. VEERASWAMY¹ and V. SRINIVASAN²

Synopsis: A special project implemented in Madras State during 1959—'60 and 1960—'61 for the maintenance and multiplication of selected homozygous parental stocks possessing maximum combining potentiality and the commercial production of hybrid seeds resulted in the production and distribution of one and a half lakhs of pounds of quality hybrid seeds of *cumbu*. This paved way for an additional production of 2,108 tons of food grains valued at 7.5 lakhs of rupees.

Introduction: The utilisation of heterosis or hybrid vigour, on account of its pronounced beneficial effects on several economic characters, notably on the productivity of crop plants, has been recognised in recent years as an efficient technique in the methods of crop improvement. The phenomenal success of hybrid maize in America stimulated elaborate work on similar lines on a variety of crops in this country and elsewhere. In India, intensive investigations, both fundamental and applied, carried out at the Millets Breeding Station, Coimbatore have resulted in notable success in the exploitation of hybrid vigour in *cumbu* as a practical proposition and three hybrid strains viz. *cumbu* X. 1, X. 2 and X. 3 recording 30 per cent increase in yields over the local varieties were released for large scale cultivation (Krishna Rao *et. al.* 1951). These hybrids, by virtue of their outstanding performance, became increasingly popular and, as might be expected, there was an unprecedented sharp rise in the demand for hybrid seeds.

Hybrids retain vigour only for one season and as such to obtain maximum benefit, F₁ seeds alone are to be used. Hence, there is an imperative need for the production and distribution of hybrid seeds for every sowing season. A pioneer project of work financed by the Government of Madras for the maintenance of selected parental Germplasm materials by a process of progressive inbreeding and utilising them for large scale production of hybrid seeds of *cumbu* X.1, X.2 and X.3 came into operation in November, 1958. The achievements of the scheme are summarised in this paper.

Materials and Methods: The special work was undertaken during 1959—'60 on 40 acres at the Agricultural Research Station, Bhavanisagar and 10 acres in each at the State Seed Farms, Sathyamangalam, Kannamangalam and Veerakeralam in Coimbatore district. In 1960—'61, besides

* Received for publication on 2-6-1961. ¹ Assistant Millets Specialist, Sathyamangalam. ² Assistant in Millets, Sathyamangalam.

the above, a total area of 33 acres at the Central Farm, Coimbatore, the State Seed Farms at Mulluvadi, Papparapatty and Ayyalur and 110 acres of Seed Farms organised on the holdings of enterprising cultivators at 17 centres in Coimbatore district were brought under the scheme as supplementary planks for augmenting the production of hybrid seeds

Production of inbred seeds of parents: The maintenance and multiplication of selected homozygous parental stocks possessing maximum combining potentials, by a process of meticulous inbreeding, constitutes the bed-rock of this project. The parental cultures of the hybrids were multiplied by a system of selfing in ear-to-row plots, then in one cent nucleus plots and finally in larger isolated blocks. A quantity of 5,250 pounds and 4,860 pounds of homozygous parental seeds were produced during 1959-'60 and 1960-'61, respectively.

Production of hybrid seeds: The commercial production of hybrid seeds in *cumbu* is rendered feasible due to high natural cross-pollination of 80 percent which is brought about by the protogynous floral mechanism in which the stigmas mature three days earlier than the anthers of the same flower. Investigations carried out to evolve a practical technique for the large scale production of hybrid seeds in *cumbu* have proved that mixing and sowing the parents in equal proportion and harvesting the resultant bulk constitute the cheapest and yet the most efficient method open to the plant breeder dealing with this crop (Krishna Rao *et. al.* 1949). The hybrid seeds thus produced contain a certain percentage of selfed or sibmated seeds of the parental types but when grown under field conditions, the weaker parental seedlings get suppressed by the more vigorous and markedly superior seedlings of hybrid progeny due to natural interplant competition. At the time of thinning also, the weaker parental plants get removed leaving the more vigorous hybrids in the field and the population of hybrids thus left out is sufficient to provide a normal stand. Results of trials have confirmed that the yields obtained from such commercially produced hybrids are almost equal to the yields of the hand-pollinated hybrid seeds (Subramaniam and Ponnaiya 1959) thus testifying to the efficacy and reliability of the method adopted. This hybridisation technique involving the planting together of chosen parents in an isolated location and allowing them for natural crossing was adopted with great success in the scheme programme. Under the purview of the scheme, a quantity of 76,644 pounds and 80,769 pounds of hybrid seeds of *cumbu* were produced and distributed during 1959-'60 and 1960-'61 respectively and without exception the performance of the seeds was praiseworthy. In this context, it is to be mentioned that the seeds were sold at local market rates only, with no

extra cost to the farmer. The production achievement of hybrid seeds in both the years has exceeded the annual target of 63,000 pounds fixed for the scheme.

Practical Utility : The average seed rate of *cumbu* being 10 pounds per acre, the total quantity of 1,57,413 pounds of hybrid seeds produced and distributed has covered about 15,740 acres resulting in an additional production of 2,108 tons of food grains, the money value of the extra yield being 7.5 lakhs of rupees estimated at a modest rate of 300 pounds of extra yield or Rs. 48 per acre.

Conclusion : It is to be pointed out that in other advanced countries, production of hybrid seeds for agricultural purposes has now become a profitable commercial proposition based on an efficient system constituted by the federal scientific institutions, crop improvement associations and registered growers. In our country, until such time that reliable seedmen or co-operative units come forward to take up the production and distribution of hybrid seeds the laudable scientific results achieved will remain dormant without being transmitted to the cultivators, thereby delaying progress indefinitely. In the light of the practical achievements of the present scheme, it is suggested that the bottlenecks in large scale hybrid seed production may be surmounted and the pipelines of distribution cleared up and vitalised by the institution of similar projects, at least one for each major zone. It need hardly be emphasised that such a step would go a long way in quickly improving the general standard of production in *cumbu* and serve as a reliable and practical approach to the problems of increasing food production.

REFERENCES

- | | |
|--|---|
| Krishna Rao, P.
A. K. Kunhikoran Nambiar and
I. V. G. Krishnamurthi. | 1949 <i>Madras agric. J.</i> 36 : 526. |
| Krishna Rao, P.,
A. K. Kunhikoran Nambiar and
P. Madhava Menon. | 1951 <i>Ibid.</i> 38 : 95. |
| Subramaniam, A. and
B. W. X. Ponnaiya. | 1959 Final report on the scheme for the multipli-
cation and distribution of hybrid Bajra seeds.
(I.C.A.R.) |