

## What Next in Rice Breeding?

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As indicated by the title, the paper deals with only one important aspect of the subject chosen for the Symposium, "What next in Agricultural Research and Extension?" Before taking the next step and trying to keep track of the possibilities ahead, one has to look back and see what ground had been covered already, and what aims have been attained.

Work so far: Rice Research in Madras State was initiated in 1913, i. e. a little over four decades ago. Starting with genetical studies on the different characters of the rice plant, the work in early years drew within its orbit numerous investigations relating to the nature of the rice plant with reference to its growth and yield. As genetic knowledge progressed, a vast collection of genetic stock, so essential in breeding, also accumulated.

Improvement of the yielding capacity of the existing major varieties by 'Pure line selection' was the main object of the initial breeding programmes, which was later extended to the synthesis of economic characters by hybridisation.

Ninety-nine strains resulting from 'Pure line selection' and nine strains evolved by hybridisation are now under distribution from the Paddy Breeding Station, Coimbatore and six other Agricultural Research Stations. Notable examples of successful hybridisation are the 'blast' resistant strains, Co. 25, Co. 26 and ADT. 25.

These 108 strains, capable of yielding 10 to 15 percent increases on a modest estimate, have now covered 40 percent or two and a half million acres out of the total area of  $6\frac{1}{2}$  million acres under rice in the State. Production now stands at three million tons of rice. Out of our population of 35 million, 70 percent or  $24\frac{1}{2}$  million are classed as rice-eating and the present production is found to be just sufficient to maintain them at a ration of 12 ounces of rice per day.

Taking all possible vicissitudes into consideration, double the quantity has to be aimed at which would mean that our production has to be stepped up by another three million tons. If the improved strains spread throughout the remaining 60 percent of the area also and if we

put the extra production at 100 lb. rice per acre, we may just produce an additional 1,75,000 tons.

This itself is probably the bright side of the picture. It is to be remembered that it is practically impossible at this stage of rice breeding to cover the extra area with strains. We have to reckon with a sizeable proportion of our lands subjected to drought and inundations as also saline and alkaline regions, for to which special strains are needed. Even in the matter of 'blast' resistance, we have only long duration strains at present. Short and medium duration strains resistant to 'blast' are yet to be evolved. We have also to eliminate loss from lodging, from premature sprouting of the seeds in short-duration varieties, due to their non-dormant nature.

We may now consider these various aspects separately.

*Resistance to drought:* It is estimated that an area of 3,70,000 acres is affected by drought every year to varying extents. The damage is caused in the early stages of crop growth in Malabar and South Kanara. Elsewhere it occurs in all stages. The average yield now obtained may be put at 500 lb. per acre but in certain seasons next to nothing is obtained by way of yield. The problem of evolving drought-resistant strains is not without hope, considering that there are already varieties showing moderate resistance. Besides, progenies are also available which are extracted from crosses between wild and cultivated types and between different dry types themselves. Rigorous testing of these materials remains to be done. It may be mentioned here that except probably what is claimed by Russian workers, no standard scientific method has as yet been evolved as an aid in breeding for drought resistance. Continued trials under natural conditions would appear to be the only feasible procedure at present.

*Resistance to lodging:* There are several areas in our State where lodging of rice crop in the pre-harvest stages, affects both the yield and quality of the produce. About six lakh acres of the first crop area in Malabar and South Kanara and about nine lakh acres in the other districts run the risk of being affected by lodging of the crop. It is estimated that a loss of 20 per cent is sustained by lodging and this over an area of 15 lakh acres as indicated above, is by no means negligible.

Some preliminary work in understanding the problem of lodging has already been done. The straw character of the existing varieties is found to vary considerably, resulting in different types of lodging. Non-lodging varieties have thick, persistent leaf-sheaths while lodging itself is to a great extent influenced by cultural practices. Genetically, the character appears to be governed by single factor difference.

The need is therefore felt for more elaborate studies relating to morphological and anatomical features of selected varieties, cultural features affecting lodging, as well as a thorough study of the root system. The problem is as important as it is many-sided; it is one that has a State-wide significance.

With the evolution of non-lodging strains, the problem of crop submergence can also be solved to a very great extent, barring of course, the typical deep water areas for which a character like 'stiff straw' has to be combined with certain other features as well.

There is still another important feature that has a close bearing to this problem of lodging. It is the dormancy of seeds. The grains of most of our short duration strains lack this character, with the result that if the ripening crop is caught in continued wet weather, the grains sprout on the plant itself. The damage caused is sometimes considerable. In fact, but for this drawback, most of our cultivators would be growing short-duration strains wherever conditions permit. Induction of dormancy in short and medium duration strains remains to be done on an extensive scale. Many of the existing varieties from cross progenies have also to be watched for this character. TKM. 6, a hybrid strain of short duration evolved from Tirurkuppam is a recent find which has this quality of dormancy to a remarkable degree.

**Resistance to salinity:** Saline and alkaline areas present problems peculiar to them. The cumbersome method of 'Kaipad' cultivation (Malabar district) in which the entire field is dug and patterned into regular mounds of sods to get the deposited salt washed down by monsoon rains, is perhaps the most ingenious cultural artifice that could be thought of. Nevertheless, a suitable strain would change the picture both in economy and in production.

In the case of other areas such a cultural practice is not feasible as the monsoon rains are scanty. There are, of course, the varieties SR 26 B and *Tellathokavadlu* which show a certain amount of tolerance. They need further improvement.

The next step will lie in the direction of making an extensive survey to collect resistant types from all over the country. Here again, it may be difficult to simulate, in a laboratory, conditions existing in the respective localities. What is required is an intensive hybridisation scheme and actual field trial of the progenies for a number of years.

**Resistance to disease:** Mention has already been made about the 'blast' resistant strains, Co. 25, Co. 26 and Adt. 25. These strains belong to the long duration group. Isolation of such resistant strains

of short and medium duration is the logical sequel to what has been recorded already. With this object, a scheme is now being worked and within the next five years suitable strains must be forthcoming.

A point to be noted in breeding for disease resistance is that more virulent 'strains' of the pathogen are found to develop as years go by. This makes the breeder's task all the more difficult. The only way out is to make the breeding itself a continuous process.

**Conclusion:** Broad indications of the work that lies ahead have been given without detailing theoretical concepts or technical procedure. Each aspect may well form a lifetime study by itself and unfold a number of ancillary problems in its course. Given the will and the facilities, success must come stage by stage and every stage will be a further landmark in the progress of rice-breeding in our State.

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