SESSION I
Genetics, Plant Breeding, Physiology and General Papers

Emasculation of Rice by Vacuum Extraction

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ABSTRACT

Emasculation by vacuum extraction was compared to the conventional procedure which employs forceps. The vacuum system was found to be superior in efficiency and convenience and comparable in effectiveness (percent seed set). The technique has been adopted exclusively for hybridization work at IRRI.

Our crossing work has expanded greatly during the past few years (Fig. 1). During 1973, over 2000 were accomplished and half of them were either topcrosses (IF_1 hybrid/line or variety) or double-crosses (F_1 hybrid/F_1 hybrid) which require a large number of hybrid seed.

We consider this high-volume capability essential to our breeding operations for several reasons (Coffman and Kush, 1973). First of all, it enhances the chances of desirable recombination due to the expanded volumes of hybrid material and the perpetuation of heterozygosity through multiple crossing (Topcrosses and double-crosses). Secondly, it facilitates diversification which is basic to any breeding program which expects to cope with the challenges of nature and changing agronomic practices. Finally, it allows for the phenomenon of "combining ability"; entire crosses may be discarded if they do not perform well because there will be many other available that were made toward the same objective.

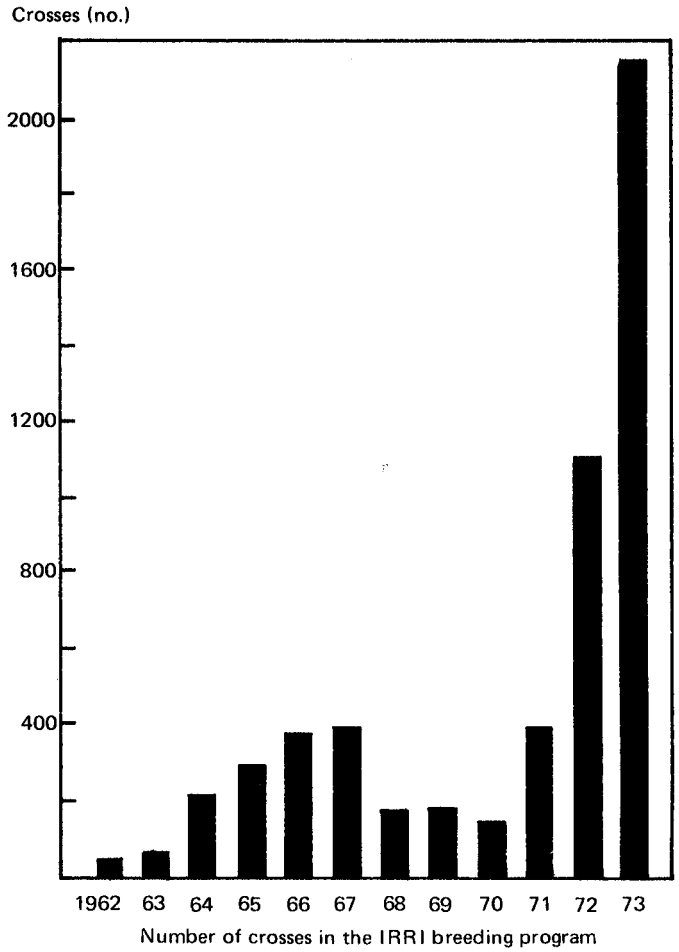

Fig. 1. Crosses accomplished in the IRRI breeding program.

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Crossing is a time-consuming and laborious procedure. The most tedious and limiting factor of the total operation is emasculation or the process of extracting the anthers from the floret. This is conventionally done with fine forceps. We investigated vacuum extraction as an alternative method for this operation.

REVIEW OF LITERATURE

Methods of emasculation were reviewed by Poelhman (1959). Emasculation can be accomplished by destruction of the pollen by heat, chilling or alcohol before the anther dehisces. Mechanical removal of anthers is another method. A modified clip method of emasculation was developed at IRRI (Anonymous, 1963). Florets were clipped with surgical scissors and anthers removed by fine pointed forceps after 3:00 p.m. Emasculated florets were pollinated the following morning by dusting.

For period of years from 1962-1971 some 2,000 cross combinations were made by this method. It has been found effective and successful. At least six IRRI varieties were named from these crosses and still others are under evaluation.

Mulimbayan (1936) reviewed the use of vacuum as an emasculation technique in rice and cited Van der Meulen (1933) of Java, who patterned the technique from Kirk (1930). Kirk used vacuum extraction in sweet clover. Mulimbayan (1936) using a fine pointed jet glass nozzle spent more time sucking anthers after clipping the florets than using forceps and finally gave up the idea, largely because of some mechanical problems.

Erickson, J. R. (1970) emasculated florets by clipping the upper 1/3 of the glumes before 10:00 a.m. or after 3:00 p.m. The anthers were extracted with fine glass nozzle connected to an air pump producing 0.1 milliliter of vacuum and displacement of 25 1/min of free air.

MATERIALS AND METHODS

The florets were clipped obliquely with surgical scissors to expose the anthers. The anthers were removed by the use of fine pointed glass tubing (disposable capillary pipette), bent to an angle of 90° and connected to a vacuum source by Tygon tubing. A test tube was installed between the source and the extraction tip to trap the anthers. The vacuum was adjusted to produce a suction of 20" Hg. Additional extractors may be added, depending on the capacity of the vacuum source.

The efficiency of the vacuum method was compared with our normal procedure of removing the anthers with forceps.

RESULTS AND DISCUSSION

The vacuum system was superior in efficiency when compared to the forcep procedure (Table 1). Our long term average for seed set using forceps for extraction is about 40 percent. The vacuum system compared favorably with this (Table 2).

Table 1. Comparative efficiency of vacuum extraction and forceps for emasculation

Technique	*No. of florets emasculated per man*			
	1st hour	*2nd hour*	*3rd hour*	*Mean*
Vacuum	504	412	340	419
Forceps	330	276	194	267

Table 2 Seed set on 74 varieties emasculated by vacuum extraction

No. of florets emasculated	*Total seed set*	*Percent seed set*
88,077	36,190	41.08
13,115*	5,639*	43,00*

*IRRI Annual Report for 1964, 1965. Using forcep for emasculation.

We found that the vacuum-system was less tiring for the technicians as compared to using forceps. We also found that inexperienced people were able to use the vacuum extractor with a minimum of instruction and experience. Most are able to use it effectively on the first attempt because the procedure entails only the touching of the extractor tip to the clipped floret. Using forceps on the other hand, an inexperienced person would require several weeks of practice to reach a reasonable level of competence. This is because the stigma is easily damaged by the forcep and precision is required in removing the six anthers from the floret.

CONCLUSION

We found the vacuum extractor to be superior to forcep emasculation in terms of efficiency and convenience and comparable in terms of percent seed set. We have adopted it exclusively for our hybridization work at IRRI.

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Coconut Varieties in the Philippines

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ABSTRACT

Investigations aimed at verification of distribution and characterization of domestic coconut populations revealed four distinct varieties, namely: (1) Typica, (2) Javanica, (3) Nana (Coconino) and (4) Spicata.

'Typica' is characteristically tall, late-bearing, protandrous and boled. Forms under the 'Javanica' variety are dwarf, early-bearing, without bole, and either self- or cross-pollinating. 'Nana' (Coconino) is dwarf, early bearing, self-pollinating and bears small fruits. The variety 'Spicata' is distinguishable from the other varieties for having unbranched inflorescence or rarely with one or two spikes. Femaleness is most and maleness least expressed.

Various forms still exist under each variety and types can even be identified in some of these forms.

INTRODUCTION

Variety is a general term denoting a single strain or a group of strains which distinctly differ in structural or functional characters from one another or a group of the same species which can be depended upon to reproduce itself true to type. In coconut, problems have been encountered in varietal identification due to its wide distribution and also because of the lack of genetical purity as a result of cross fertilization. Cross-pollination prevailing in coconut gives rise to highly variable progenies. Hardly ten percent of the palms exhibiting the allogamic characteristic in a coconut plantation reproduce true to type. In the Philippines, studies showed that a wide genetic diversity in coconut exists. Variations within recognized varieties were even noted.

VARIETY

Criteria for coconut varietal identification advanced in 1949 (Narayana and John), came up with three main classifications, namely: (1) Typica, (2) Javanica, and (3) Nana (Coconiño). The same classification was used in some local investigations. A fourth variety (Spicata), described by Jacob (1941) as cited by Menon and Pandalai (1958) was noted in the Philippines.

A. Variety 'Typica'

Palms of the variety 'Typica' are characteristically tall, late-bearing and exhibit non-simultaneous maturity of male and female flowers, the male maturing ahead of the female (protandrous). Local forms within this variety are allogamous (highly cross-pollinated) with enlarged or swollen bases called "bole". Under normally favorable environment, this variety flowers in six-seven years from transplanting. In monoculture farming (purely coconut) a 9-meter spacing in a triangular scheme could be adopted for better economic return.

1. *Laguna* – This is typical of the commercial form, a mature nut weighing approximately 1.26 kg. A ton of copra requires about 4,620 nuts. Constituting this form are still several types:
   a. *Limbajon* – Visayan term for palm bearing reddish or deep orange nuts at younger stage of fruit development.
   b. *Pula* -- This shows deep-orange

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