Studies on Multiple Pistillate (Polycaryoptic) Male Sterile Rice

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Double Rice were crossed to the cytoplasmic male sterile rice HR 1619 A having the WA cytoplasm. The F1 plants which showed male sterility were crossed again with the parental multiple pistillate lines. The multiple pistillate cytoplasmic male sterile (MPCMS) lines having semi-dwarfness could be selected from the backcross progenies. The number of panicles per hill and the number of florets per panicle of the MPCMS lines were not of difference from those of the cytoplasmic male sterile (CMS) lines with normal pistils.

The multiple pistillate genetic male sterile (MPGMS) lines could be selected from the F1 of the cross IR 36 ms/Double Rice. The less number of panicles per hill and the less number of florets per panicle were observed in the MPGMS lines than in the genetic male sterile (GMS) lines with normal pistils.

The average seed set percent of the multiple pistillate male sterile lines in cytoplasmic or in genetic male sterile rices was statistically not higher than that of the male sterile lines having normal pistils. The larger variation of outcross rate was observed in the multiple pistillate male sterile rices than in the normal pistillate male sterile ones. The outcrossed seed percent of the MPCMS and MPGMS lines ranged from 1.1% to 34.8% and from 0.4% to 40.5%, while that of the CMS and GMS lines from 1.2% to 21.3% and from 1.5% to 36.7% respectively.

INTRODUCTION

High heterosis has been reported in rice, but the low level of hybrid seed production is the most difficult problem in hybrid rice breeding. The cytoplasmic male sterility has been used for hybrid rice seed production. In order to increase the seed set rate of the cytoplasmic male sterile rices, GA has been sprayed after cutting the flag leaf or rope is used for promoting pollination. However the outcross rate of the male sterile rices is still less than 30%.

Heu and Suh found the polycaryoptics (multiple pistillate) rice WX 154. Suh et al. identified another polycaryoptic rice Double Rice. They bred the multiple pistillate cyto-
plasmic male sterile rice by combining the male sterility of V20A and the polycaryopsis of the rice cultivar WX154.

The author attempted to breed the multiple pistillate male sterile rice by combining the multiple pistils of Double Rice and the cytoplasmic male sterility of the WA cytoplasm and the genetic male sterility of IR36 ms. After selecting the multiple pistillate lines in cytoplasmic and in genetic male sterility, the outcross rate of these lines was compared with that of the normal pistillate male sterile lines in order to study the possibility of utilizing the multiple pistillate male sterility for hybrid seed production in rice.

MATERIALS AND METHODS

A rice cultivar Double Rice having multiple pistils was crossed to a Korean semi-dwarf line HR1619-6-2-1-2-2 and the multiple pistillate (MP) lines with semi-dwarfness were selected from F3 of this cross. These MP lines were crossed to the cytoplasmic male sterile line HR1619 A, which has the WA cytoplasm. After identifying the F1's sterility, the MP lines identified as maintainer were crossed again to the male sterile F3s and the multiple pistillate cytoplasmic male sterile (MPCMS) lines were selected from the progenies of these crosses. (Fig. 1)

The MPGMS lines with semi-dwarfness were selected from the F4 progeny of the cross IR36 ms / Double Rice. The selection processes are in Fig. 2.

In order to compare outcross ability and some agronomic characters of the multiple pistillate male sterile lines and the normal pistillate male sterile ones in cytoplasmic and in genetic male sterility, these male sterile rices were planted in two rows alternatively between the rows of the cultivar Suweon 294, which have almost same heading date as these male sterile rices. Each treatment was replicated three times in a randommized complete block design. The number of panicles per hill, number of florets per panicle, outcrossed seed set percent and seed weight per hill of the multiple pistillate and the normal pistillate male sterility in cytoplasmic and/or in genetic rice were compared.

RESULTS AND DISCUSSION

Selection of the MPCMS lines
Seven multiple pistillate (MP) F3 lines