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Progress of Rice Improvement through Recurrent Selection

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ABSTRACT

Improved rice varieties play an important role in increasing rice production, through raising and/or stabilizing rice productivity. Thus, it is urgent to develop improved rice varieties. Selection method is an important step in rice improvement. Implementation of recurrent selection in rice improvement was aimed to increase the efficiency and insurance in the success of improvement. Since 2004, Indonesian Institute for Rice Research has applied recurrent selection in breeding program. Promising lines of earliness and high yield potential were developed in relatively short time. A number of advanced lines has been produced and will be further evaluated, and a number of populations has been selected and used as base populations for recurrent selection in rice improvement program.

Key words: breeding, earliness, high yield rice, improvement

INTRODUCTION

To increase rice production, four important inputs are needed, e.g. water, fertilizer, pest control and improved variety (Poehlman, 1987). The first three: water, fertilizer and pest control relate with cultural practices that provide more suitable environment in which rice grows. The fourth, rice variety relates with inherent ability of the rice plant to produce within the environment provided. In other words, more productive plants and greater rice production can be achieved by improving the environment for rice growth and the heredity of the rice crop, but the use of improved varieties has the advantages because it is simple and minimize the environmental hazard.

Improved rice varieties play an important role in increasing rice production. Variety itself could contribute 5% of increasing of rice production, while irrigation and fertilizer contribute 16% and 4%, respectively. In combination of variety, irigation and fertilizer could contribute 75% of increasing of rice production (Fagi *et al*., 2003). World rice production increased from 257 million tons in 1966 to 560 million tons in 1990 due to the large scale adoption of high-yield semi-dwarf varieties such as IR8 and IR5 (Khush, 1995a) and rice production of Indonesia and Vietnam doubled (Khush, 1995b). The first self-sufficient of Indonesia in rice in 1984, was due to the wide spread of adoption of semi-dwarf high yielding rice varieties, such as IR8, IR5, Pelita I-1 and Cisadane (IBS, 1985). Increasing of rice production at about 5% in 2007-2008 was also the results of adoption of high yielding varieties, such as Ciherang, Cigeulis and Memberamo (Indonesian Ministry of Agriculture, 2009).

Methods of selection usually applied in rice breeding in Indonesia are pedigree, bulk and a modified bulk-pedigree. These methods depend on the natural accumulation of desired characters from the parents into a plant/line. Recurrent selection is systematic selection of desirable plants from a population followed by recombination of the selected plants to form a new better population (Fehr, 1987). This method provides opportunity to breeders to accumulate the desired characters into a plant or line through repeated crosses/hybridization among selected plants. Therefore, the method is more effective to develop rice with desired characters, such as high yielding varieties. This paper reported the progress of application of recurrent selection in rice improvement in Indonesia.

MATERIALS AND METHODS

Since 2004, a number of populations were selected to be used as base populations for recurrent selections. A thousand plants per populations were planted in distance space of 25 cm x 25 cm. Populations were observed for their performance in agronomic characters. Some populations that showing good segregations in plant type were selected to be used as base populations. Selected plants among the populations that having good agronomic characters were selected crossed to each other as shown in Figure 1. This procedure was

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