Abstract

Rice (*Oryza sativa* L.) is one of the most important world's cereal crops, providing staple food for nearly one-half of the global population. Weedy rice (*Oryza sativa f. spontanea*) is distributed over a wide range of rice growing environments, and seems to possess a wide variation in characteristics. Some weedy rice strains are similar to wild rice in that they have a red pericarp, black hull, light seed weight, high degree of seed dormancy and high degree of seed shattering, but some strains are similar to cultivated rice. Weedy rice was reported in Sri Lanka for the first time in mid 1990's in Ampara district and has now become common in almost all the rice growing ecosystems in the country. Though weedy rice is considered as one of the most problematic biotic constraint in rice cultivation, it is an important resource for breeding and for studying the evolution of rice. However, a limited number of reported researches on this aspect are found in Sri Lanka. Therefore, the present study was conducted to reveal the distribution and phenotypic and genetic variability of weedy rice in Sri Lanka.

Firstly, the variation of the accessions from the rice fields of highly infested with weedy rice from districts namely, Ampara, Matara, Anuradhapura, Polonnaruwa, Kurunegala and Putlam were assessed *in-situ* by considering five characteristics (plant height, number of tillers, number of panicles per plant, panicle length and leaf length). The locations were chosen from a wide geographical range and the weedy rice plants were randomly selected from the infested rice fields keeping the distance between individuals about 5 m. Secondly, weedy rice accessions collected from 30 locations of different agro-ecological regions were transplanted at the research field to observe their genotypic effect using 13 quantitative and four qualitative characteristics. The experimental design used was Randomized Complete Block Design with three replications. In addition, density and distribution pattern of weedy rice populations in Matara district in 2009 and 2010 were studied to obtain a better understanding over the situation. Germination ability of 100 filled seeds of weedy rice was observed for 5, 10 and 15 days after harvesting.

According to the distribution map of weedy rice in Sri Lanka, many rice growing areas have been infested with weedy rice, while Ampara and Matara recorded a higher infestation. A high *in-situ* morphological variation in weedy rice was observed among locations. Weedy rice density was considerably high in Thihagoda, Kirinda-Puhulwella and Kamburupitiya areas recording more than 15/m^2 weedy rice plants in Matara district in

2009 and however all the locations showed a drastic reduction of weedy rice population in 2010.

High phenotypic and genotypic variability and heritability estimates for all the characteristics were recorded in the *ex-situ* study. The highest phenotypic and genotypic coefficients were estimated for shattering percentage. The genetic advance as percent over mean was high for plant height at the booting stage, tiller number and number of panicles per plant, shattering percentage, number of filled seeds per panicle and total seeds per plant indicating additive gene action for those characteristics.

A considerable level of variability was recorded for a number of morphological characteristics. The correlation studies indicated that plant height, seed length, panicle length and the number of filled seeds per panicle had significant positive association with 1000 seed weight ($p<0.05$).

Principal component (PC) analysis revealed that the first three PCs explained 81.1% of the total variation, while the first PC explaining 31.45%. Number of tillers and panicles per plant, number of filled seeds per panicle, total number of seeds per plant, seed length and 1000 seed weight were the major determinants of the phenotypic diversity in the weedy rice collection. The cluster analysis placed all the accessions into six groups. Clustering was not associated with the geographical distribution. Accessions were mainly grouped due to their morphological differences. There was high germination ability (>85%) in weedy rice accessions among all the locations for 5, 10 and 15 days after harvesting.

Great attention should be paid to prevent dissemination of weedy rice seeds which reduce the quality and quantity of rice grain and to carry out possible management practices in the farmer fields. Accessions which possess vigorous growth habit and competitive ability, higher 1000 seed weight with no shattering have potential to utilize in the enhancement of cultivated rice varieties.