POPULAR ARTICLE

Evaluation of Genetic Variability in aerobic rice (*Oryza sativa* L.)

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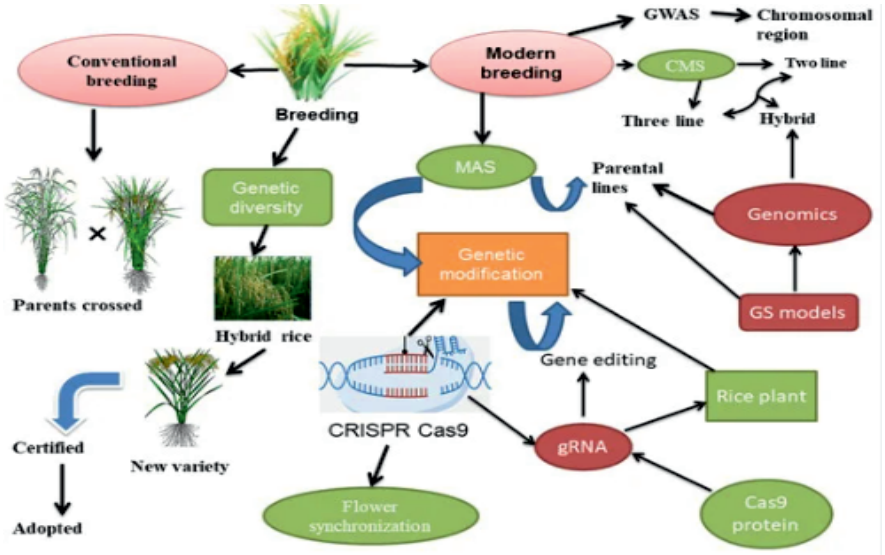

FIGURE 1. Source of Nutrient in Vegetables

KEYWORDS: Genetic Variability, Grain Yield, Heritability.

Abstract

The experiment was conducted to evaluate the variability parameters of aerobic rice genotypes. The nine plants yield related characters from which the observations are recorded. Among the yield, characters studied the number of panicles, the weight of the panicle, number, and weight of the grains along with grain yield recorded a high amount of PCV and GCV. The high magnitude of heritability and genetic advance as per mean was found in many yield-related characters. This result reveals that the above drought and yield-related traits can be effectively enhanced through an easy phenotypic selection.

INTRODUCTION

Rice (Oryza sativa L.) is considered one of the staple food of the human population in the world. It is unique in its ability to grow in all kinds of hydrologic environments. It will be cultivated in four diverse ecosystems viz., lowlands of irrigated and rainfed areas, Upland rainfed areas, and deep watered conditions. The amount of water for irrigation is becoming scarce due to decreasing resources, declining water quality, and increased competition from urbanization and industrialization. This looming water crisis threatens the sustainability of production. Thus, there was an urgent need for evolving water-saving techniques. (Barker et al., 1999; IRRI, 2009: Sunil and Sankaralingappa, 2014). One such new water-saving technique is aerobic rice where paddy seeds are direct sown in non-puddled, non-flooded, and unsaturated soil as a crop like wheat with complementary irrigations and fertilizer applications. Aerobic rice does not involve the raising of the nursery, puddling of the field, and flooding the planted field continuously with ponded water. (Bouman, 2001) The aerobic rice breeding program for tropical rice has been initiated at IRRI, Manila, and India in 2001 and 2007, respectively (DRR, 2012). Any Crop improvement program mainly requires a high amount of variability for genetic characteristics and those characters are may be expected to be heritable. Those characteristics can be improved through clear knowledge of it.

Experimental Materials and methods

An experiment was conducted in Jaya Agricultural College in 2022 using 25 rice genotypes by adopting RBD design with 3 replications, and the trial was conducted in non-puddled, non-flooded, and nonsaturated (aerobic) fields as required for aerobic rice cultivation. In each genotype, dry seeds were dibbled at the rate of two seeds per hill on this non-puddled dry field in 1 row of 3-meter length with a 20 and 10-centimeter spacing between rows and plants respectively. The observations were recorded for the following yield characters viz., Days to 50% flowering, the height of the Plant, Number of panicles, length of the panicle, the weight of the panicle, number of grains, fertility of spikelets and weight of the grain and grain yield. The record-ed observations were analyzed statistically using a method given by Sukhatme and Panse (1967). The variability parameters were estimated as per Lush (1940, Sivasubramanian and Menon (1973), Johnson *et al.* (1955), and Burton (1952).

Experimental Results

Genetic variability is considered an as important attribute of any plant population, and its estimate becomes vital for realizing reaction to selection because the improvement in the breeding program depends on its level of magnitude. The higher amount of variability will be the chance for utilization of that specific character in a selection programme. The analysis of variability was carried out and it reveals the existence of a high amount of significant difference among the genotypes for all the traits. ANOVA for 9 characters studied was significant (Table 1). The variability parameters of 25 genotypes for the 9 traits studied are presented in Table 2. Following characters recorded a high phe-

-notypic coefficient of variation for the number of panicles (24.00 percent), panicle weight (38.59 percent), Number of grains (21.05 percent), the weight of grains (21.39 percent), and grain yield (27.87 percent). The earlier studies made either in aerobic or water stress conditions, such a high amount of genetic variability was also observed for the Number of panicles by Mini and Mohanan (2009), Abarshahr et al. (2011), and Shet et al. (2012); for panicle weight by Manna et al. (2006) and for Number of grains Babu et al. (2012), Idris et al. (2012) Shet et al. (2012). All these authors as well as Haider et al. (2012) and Osman et al. (2012) Bhargava et al. (2021), Gnaneswari et al. (2023), Lakshmi et al. (2022), Muthuramu, S and S. Sakthivel (2018), Quadri et al. (2023),obtained high Genotypic Coefficient of Variance estimates for the grain yield. The earlier and present findings offer scope for improvement through a selection programme for the above-mentioned yield component traits as well as grain yield for aerobic conditions. The moderate and low PCV was recorded in plant height (16.05 percent), length of the panicle (10.71 percent), spikelet fertility (13.20 percent), and Days to 50 % flowering (7.35 percent) respectively. The Number of panicles (23.15 percent), panicle weight (38.26 percent), Number of grains(20.16 percent), the weight of grains(20.38 percent), and grain yield(26.73 percent) recorded high genotypic coefficient of variation followed by the traits like plant height(15.79 percent), length of the panicle(10.30 percent), spikelet fertility(20.91 percent), and Days to 50 % flowering(7.17 percent) recorded moderate and low GCV respectively. As reported by Mini and Mohanan (2009) and Singh et al. (2010) under water stress conditions and Shet et al. (2012) under aerobic conditions, the present study conducted under aerobic conditions also recorded a moderate GV for plant height, length of the panicle, and spikelet fertility, revealing a significant possibility for desirably improving these characteristics through a selection program. Days to 50 % flowering exhibited only a low amount of genetic variability by recording GCV estimates of less than 10 percent. result was in agreement with the findings of Murthy et al. (2011), Shet et al. (2012), and Sathya and Jebaraj (2013) under aerobic conditions.

Heritability estimates in the present study were generally of high magnitude exceeding 60 percent for eight characters studied. The magnitude of high heritability and the genetic advance was found for plant height (96.80 and 32.00 percent), Number of panicles (93.09 and 46.02 percent), length of the panicle(92.53 and 20.41 percent), panic-le weight(98.29 and 78.14 percent), Number of grains(91.69 and 39.77 percent), spikelet fertility(76.89 and 20.91 percent), the weight of grains (90.78 and 40.00 percent) and grain yield(91.97 and 52.80 percent). Manna et al. (2006), Sharma and Sharma (2007), Mini and Mohanan (2009), Abarshahr et al. (2011), and Osman et al. (2012) in water stress rainfed or upland conditions and in aerobic conditions also reported a similar combination of the high amount of heritability and genetic advance for the above traits. High genetic variability and high heritability and genetic advance would provide the most reliable depiction of the response estimated from a selection program for the improvement of traits according to Burton (1952).

CONCLUSION

It is inferred from such an analysis that four yield-related traits (viz., Number of panicles, the weight of panicle weight, Number of grains, and weight of grains), and grain yield, recorded a high amount of genetic variability along with high heritability and genetic advance. This result reveals that the above drought and yield-related characteristics could be effectively enhanced through a simple phenotypic selection programme and genotypes with superior performance for yield with drought tolerance could be effectively selected from the genotypes studied for aerobic cultivation.