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Evaluation of F₁ hybrids of rice (*Oryza sativa* L.) and their parental lines to develop short-age rice varieties adaptable for low country wet zone of Sri Lanka

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Abstract

As the staple cereal in Sri Lanka, the demand for rice is increasing significantly. To meet this accelerating demand, hybrid rice production has become a promising strategy to increase rice production amidst erratic weather changes. In this study, the F₁ generation of five single crosses, At 311/Rathal, Ld 253/R2 13, Bg 314/ At 313, Ld 253/ At 362, and At 313/ Bw 312 along with their eight parental lines (At 311, Rathal, Ld 253, R213, Bg 314, At 313, At 362 and Bw 312) were used to evaluate their agro-morphological characteristics related to yield and crop duration parameters to develop short duration high yielding hybrid rice varieties suitable for the Low Country Wet Zone of Sri Lanka. The field experiment was laid following the Single Seed Decent Method with two replicates at the Rice Research Station, Labuduwa, Sri Lanka during Yala 2022. Data were recorded on twenty different important agro-morphological characteristics. The differences among the F₁ hybrids and their parental lines were analyzed through ANOVA and mean comparison was carried out using Duncan's Multiple Range Test (DMRT). The heterosis of the F₁ crosses was calculated using the mid-parent values. The findings revealed that all the F₁ hybrids required fewer days to reach heading (60-69 days) and flowering (65-74 days) compared to their corresponding parental lines. Three crosses, namely At 311/Rathal, Ld 253/R2 13, and At313/Bw312, reached the heading stage in only 60-66 days, indicating their potential to be used in the development of short-duration varieties. There was negative heterosis for days taken to maturity in three of the F₁ crosses (At 311/Rathal, Ld 253/R2 13, and Bg 314/At 313) which is usually desirable for developing short-duration varieties. All hybrids showed higher tillering capacity (7-15) than their respective parental lines. The highest yield per plant (40.95 g) was recorded from At 313/ Bw 312 cross while At 311/ Rathal cross also showed a higher grain yield (33.25 g). Further, all the F₁ crosses showed very strong positive heterosis values for important yield-determining parameters in rice such as the number of effective tillers (25%-106%), seeds per panicle (5%-41%), thousand-grain weight (7%-37%) and yield per plant (95%-171%). Considering the above yield determining and crop duration attributes, At 311/Rathal and At 313/Bw 312 crosses were identified as better performing F₁ hybrids among the five crosses that have the potential to utilize for developing short durational high yielding varieties in the future rice breeding programmes. However, further studies are required to confirm the stability of these crosses in successive generations.

Keywords: F₁ hybrids, Heterosis, Parental lines, Short duration rice varieties

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