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Anther culture potential of aromatic rice varieties and their F1 hybrids with local germplasm

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Aromatic rice has high consumer preference due to its distinct fragrance. Anther culture is a vital in vitro technique utilized to fix homozygosity in crop improvement rapidly. This technique has been successfully used in *japonica* rice. However, integrating anther culture in indica rice breeding is difficult due to its innate recalcitrance to the process. When indica varieties are hybridized with aromatic rice, the resulting hybrid genotypes have a mixed genetic background and may be more responsive to anther culture. In this study, F1 hybrids were produced through reciprocal crosses in which at least one parent was an aromatic variety. Pusa Sugandh, Pusa Basmati, Basmati 370, At 306, At 309, At 405, At 311, At 313, Ld 253, Ld 376 and Bw 18-1541 were used as the parent varieties. Anthers of hybrids from successful crosses and their parents were subjected to anther culture. Out of 8 reciprocal crosses, only 6 were compatible and produced seeds to generate F1 hybrids. For callus induction, 3 previously reported modified N6 media formulations were investigated (Modified N6 – 2 mgL⁻¹ 2,4-D, N3 - 2 mgL⁻¹ 2,4-D, 0.5 mgL⁻¹ BAP, and N6NDK - 1 mgL⁻¹ 2,4-D, 2.5 mgL⁻¹ NAA, 0.5 mgL⁻¹ kinetin, 0.5 gL⁻¹ L-proline and 0.5 gL⁻¹ L-glutamine). After 6 weeks, induced calluses (approx. 5 mm diameter) were transferred to the MS regeneration medium (1 mgL⁻¹ BAP, 1 mgL⁻¹ kinetin, 1 mgL⁻¹ NAA). The increase in callus growth was measured after 10, 20 and 30 days and observations on regeneration were recorded. Data were analyzed by one-way ANOVA, using RStudio version 3.2.2022. Among the 3 media formulations tested, callus occurred in only the N6NDK medium. Six genotypes (three hybrids and three parents) showed callus induction; Bw 18-1541 x At 405, At 405 x Bw 18-1541, Pusa Sugandh x At 306, Bw 18-1541, At 405, and At 306. The local rice line, Bw 18-1541 had a significantly higher (p≤0.05) average callus induction percentage (22.21 \pm 4.16%) compared to other genotypes. A significant difference (p \leq 0.05) in callus growth was only observed at 10 days. Bw 18-1541 had significantly higher (p≤0.05) callus growth at 10 days (6.42 ± 0.72 mm) compared to others. After 30 days, most calluses developed necrotic regions, with one from At 405 x Bw 18-1541 producing an albino shoot. Analysis of callus induction and growth data highlights At 405 and Bw 18-1541 as promising candidates for anther culture. Further investigation on morphogenesis is required to enhance the success of the promising genotypes.

Keywords: anther culture, aromatic rice varieties, *indica* rice, hybridization, reciprocal crosses