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Rice Tissue Culture: Achievements and Future Prospect-A Review

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Plant Tissue Culture techniques have tremendous advantages for crop improvement program, therefore, a number of research using plant tissue culture tools had been initiated in the last couple of years with a satisfactory result towards variety development. Initially, mature seeds of the *Japonica* rice variety "Khoshihikari" were cultured on callus induction medium (CIM) containing modified MS medium with 0.3g/l casamino acids and 2.88g/l proline. It resulted five different types of calli initiated from scutellum of mature seeds. Type III calli with cream coloured and globular size (1-2mm) showed better callus proliferation compared to types IV and V. One-week dipping period (6-7 days) of calli in the same medium showed further initiation of more calli from the scutellum as well as enlargement of the sizes of the calli pieces. As a result, an incredible number of somaclones were formed from all explants (100%).

In another experiment a number of improved double haploid lines (DHLs) were developed from anthers of advanced *indica* breeding line, BR802-78-2-1-1under salt stress(5.0 g/l NaCl) when added to callus induction medium. The percent plant regeneration as well as production of green plants increased under this stress. At least eight types of DHLs with a wide range of differences were unbelievably obtained, including a type similar to the parent, BR802-78-2-1. A comparative analysis showed that all theanther culture (AC) derived DHLs had plant height lower than the parent. The exhibition of two important indicators of grain yield, namely, effective tillers of 100% having only 4 and 3% grain sterility in AC156 and AC192, respectively. The spikelet number per panicle was 306 and 294 with long-bold and long-slender grain in AC156 and AC192, respectively. The physical characteristics and performance of the AC lines revealed the potentiality of the doubled-haploids in fixing segregating populations.

On the other hand, better regeneration ability of Nonabokra, Koshika and TKM 11 was observed with high concentration of Na_2SO_4 when added to the CIM. Regeneration ability was also enhanced three-ten folds from Na_2SO_4 stressed callus compared to the control i.e. without Na_2SO_4. Further more, vigorous rooting was observed in the regenerated plants obtained under same salt stress.

An effective method was also developed to recover green plants from albino shoot primordia derived from anther culture of Hobigonj Boro (Hbj B) IV and Hbj B VIaromatic varieties. Three crucial factors were identified for the albino shoot primordia during the change into green plantlets in culture. In the first instance, components of M10 induction medium resulted in callus size (range 0.2–0.4 cm long) and height of shoot primordia (range 2–3 mm) as a beginning of regeneration. Immediate transfer of shoot primordia (2–3 mm long) from M10 medium to regeneration medium followed by continuous incubation under fluorescent light (100-lux, 25±1°C) triggered albino shoot primordia to turn green in 2–3 days. All (100%) albino shoot primordia initiated from Hbj B VI and 79% from Hbj B IV in M10 medium changed to green plantlets upon transfer to regeneration medium. Subsequent culture and subculture of green plantlets showed rapid formation of many new healthy green plantlets.

An *in vitro* cultur ability study in 6 (six) indica and japonica rice varieties were carried out using three different explant types-mature seed, young panicle and immature embryo. Generally, compact, nodular and cream coloured calli showed better regeneration ability. The regeneration ability of *indica* and *japonica* varieties interacted with explant type and variety and media combinations. Immature embryo of BR5 showed better regeneration in both MS and modified MS (K) media compared to other indica and japonica variety (Taipei 309). Higher number of regenerated green plants were obtained in MS medium from immature embryo of BR5 and BRRI dhan 29 and in K medium from BRRI dhan 32. Media-explant interaction showed better regeneration in K medium from immature embryo of BR5. Similarly, explant-variety interaction also showed better regeneration in immature embryo of BR5 variety. Thus, it is concluded that BR5 could be used as a check variety instead of japonica, Taipei 309 for future study.

Biography:

A. K. M. Mohiuddin, Ph.D. is Professor of the Department of Biotechnology and Genetic Engineering of Mawlana Bhashani Science and Technology University, Bangladesh. He was Dean of Life Science Faculty, Chairman of the Department as well as Director of Mawlana Bhashani Research Centre. He has recently been selected as Member of Executive Committee, Bangladesh Association of Plant Tissue Culture and Biotechnology, University of Dhaka, Bangladesh. He was participated in 31 different national and international training and workshop programs as trainee especially in Malaysia, Thailand, Italy and Japan. He has extensively visited over 12 countries in Asia and Europe for performing academic and research activity together with a number of universities and research institutes of Brunei, Malaysia, India, Nepal, Japan, Italy, Singapore and Thailand. He was Visiting Research Fellow and Visiting Scientist of Japan International Research Centre for Agricultural Science. His previous research background was built on rice, muskmelon, cucumber and sugarcane biotechnology. He has published 26 research articles in peer reviewed national, international and ISI indexed journals and presented research findings in about 35 national and international seminar, symposium and conferences.