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Micropropagation studies in *Solanum melongena* L. (Solanaceae): A Review

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Abstract

Micropropagation is the art and science of plant multiplication *in vitro*. It can be defined as the production of miniature planting materials by vegetative multiplication. This method can be considered as an alternative method to conventional method of propagation with the objective of enhancing the rate of multiplication. Micropropagation helps in producing disease free plant materials. Phytohormones or plant growth regulators play an important role in tissue culture. Many studies revealed the role of hormones in plant tissue culture and how they affect the growth of plantlets. Brinjal (*Solanum melongena* L.) belongs to the Solanaceae family a native to the South East Asian region and first domesticated there over 4000 years ago. It is one of the most important vegetables worldwide. This review gives the details of micropropagation studies in *S. melongena* as well as effect of phytohormones on micropropagation.

History of plant tissue culture :

Plant tissue culture is the aseptic culture of cells, tissues, organs and their components under defined physical and chemical conditions *in vitro*. It is an important tool in both basic and applied studies as well as in commercial application. It owes its origin to the ideas of the German scientist Gottileb Haberlandt at the beginning of the 20th century. The earlier studies focused on root cultures, embryo cultures and they led to the first true callus/tissue cultures[22]. Murashige and Skoog[11] modified White's nutrient medium and supplemented with kinetin and indole acetic acid (IAA). A four or five fold increase in yield was observed in this modified medium for *Nicotiana tabaccum*. It was because of the both organic and inorganic components of the medium[11]. Classical plant hormones (auxins, cytokinins, gibberellins, abscisic acid and ethylene) and other plant growth regulators play an important role in plant tissue culture[4]. In the biodiesel plant *Jatropha curcas* L. it had been reported that rooting was effectively achieved on MS medium supplemented with IAA at 1.0 mg/l [9]. In another work on *Scoparia dulcis*, the callus produced large number of

shoots when subcultured on MS medium with 0.5 mg/l BAP+0.1 mg/l NAA. In vitro raised shoots rooted on half strength of MS medium with 1.0 mg/l IBA+1.0 mg/l NAA [8]. In *Cymbidium* orchids MS medium supplemented with 0.1 mg/l NAA and 0.01 mg/l Thidiazurin (TDZ) was optimal for callus formation[23]. MS medium supplemented with 4 µM Benzyl Adenine (BA) was an excellent medium for multiple shoot induction in *Sarcostemma brevistigma* Wight & Arnott. from the nodal explants[21]. When the leaf explants of *Ocimum basilicum* L. were cultured on MS medium supplemented with 1.0 mg/l 2, 4-D calli were initiated. These calli further transferred to MS medium supplemented with BAP 1.0 mg/l, NAA 1.0 mg/l and Kinetin 0.5 mg/l for somatic embryogenesis[7]. The shoot tip explants of *Tinospora cordifolia* (Willd.) Miers Ex Hook. F&Thoms. showed maximum multiple shoot induction when cultured on woody plant medium supplemented with 2.0 mg/l BAP. Also *in vitro* rooting was achieved on half strength MS medium supplemented with 1.0 mg/l IBA[18].

Economic importance of S. melongena :

S. melongena is an important vegetable crop belongs to the night shade family Solanaceae. It is rich in antioxidant compounds and have hepatoprotective properties[2]. The roots and boiled fruits of *S. melongena* can be used as antirheumatic, digestive tonic and for veterinary purposes. Fruits possess high nutritive values as a vegetable. The plant is used for treating various skin diseases and infections and to relieve excitements in nervous diseases[5]. *S. melongena* varieties have an antioxidant activity and the phenolic compounds[13].

Micropropagation of S. melongena :

Many studies have been conducted about the micropropagation of *S. melongena*. The main objectives of such studies are to increase the rate of proliferation of the shoots with the aid of plant growth hormones. In a study conducted by using cotyledons and nodes as explants, the best regeneration was observed on MS medium supplemented with 2 mg/l BAP and 1 mg/l kinetin. The cotyledons showed highest shoot regeneration efficiency[1]. It was found that cotyledonary leaf is the best explant for multiple shoot regeneration. High frequency direct organogenesis of shoots was achieved from cotyledonary leaf in MS medium supplemented with 1.0 mg/l BAP and 1.0 mg/l Kinetin[16]. In another study the callus of *S. melongena* showed maximum proliferation when MS medium supplemented with 0.6 mg/l 2, 4-D was used[14]. When the cotyledon and mid rib of *S. melongena* L. were used as the explants for callus induction, the best results were obtained in MS medium containing 2.0 mg/l NAA + 0.05 mg/l BAP[15]. The leaf and shoot explants cultured on MS medium supplemented with 0.5 mg/l NAA showed best shoot regeneration (25 shoots per explant) and multiple shoots were observed on MS basal and MS medium supplemented with 1.0-6.0 mg/l NAA[20]. Shoot buds of *S. melongena* L. were regenerated from the root explants when cultured on MS medium supplemented with 0.45 mM thidiazuron (TDZ) and 13.3 mM 6-BAP[3]. Optimum shoot induction in *S. melongena* was observed when the leaves and

cotyledon explants were cultured on MS medium supplemented with 0.2 µM TDZ[10]. A number of studies have been conducted in the area of protoplast culture of *S. melongena*. One of such studies revealed that yield and cell division of protoplasts were best when suspension cultures initiated from embryogenic callus cultures were maintained in 2 mg/l 2, 4-D [6]. It had been reported that shoots can also be regenerated from protoplasts of brinjal via organogenesis. Protoplasts had been regenerated from hypocotyls of *in vitro* germinated seed[12]. The best result for protoplast callus regeneration was obtained when 1-3 mg/l zeatin is used. Protoplast from leaf tissue also could regenerate through organogenesis[17]. In a tissue comparison study conducted by it had been observed that the highest percentage of dividing protoplasts was obtained from petiole material of in vitro grown plants. Leaf lamina or stems were not as good[19].

References :

1. Bhat S. V, A. S Jadhav, B. D Pawar, A. A Kale, V. P Chimote and S. V Pawar (2013) *The Bioscan 8:* 821-824.
2. Concellon A, M. J Zaro, A. R Chaves, and A. R Vicente (2012) *Postharvest Biology and Technology. 66:* 35-41.
3. Franklin G, C. J Sheeba, and G Lakshmi Sita (2004) *In vitro Cellular and Developmental Biology - Plant 40:*188–191.
4. Gaspar T, K Claire, C Penel, H Greppin, D. M Reid, and T. A Thorpe (1996) *In vitro Cellular and Developmental Biology – Plant 32:* 272-289.
5. Gbile Z. O, and S. K Adesina (1988) *Annals of the Missouri Botanical Garden 75:* 862-865.
6. Gleddie S, W. A Kelker, and G Setteffield (1986) *Canadian Journal of Botany 64:* 355-361.
7. Gopi C, and P Ponmurugan (2006) *Journal of Biotechnology 126:* 260-264.
8. Hassan S. A. K. M, F Afroz, L Shamroze Bari, J Liton Munshi, M. A Akter Jahan, and R Khatun (2008) *Plant Tissue Culture and Biotechnology 18:* 75-83.
9. Kalimuthu K, S Paulsamy, R Senthilkumar M Sathya (2007) *Plant Tissue Culture and Biotechnology 17:* 137-147.
10. Magioli C, A.P. M Rocha, D.E de Oliveira, and E Mansur (1998) *Plant Cell Reports 17:* 661–663.
11. Murashige T, and F Skoog (1962) *Physiologia Plantarum 15:* 473-497.
12. Nishio T, T Sato, and K Takayanagi (1987) *Japan Journal of Breeding 37:* 389-396.
13. Okmen B, H. O Sigva, S Mutlu, S Doganlar, A Yemenicioglu, and A Frary (2009) *International Journal of Food Properties 12:* 616–624.
14. Philip Robinson J, and S Saranya (2013) *International Journal of Current Microbiolgy and Applied Sciences 2:* 299-306.
15. Rahman M, M Asaduzzaman, N Nahar, and M Bari (2006) *Journal of Biosciences 14:* 31-38.
16. Sarker R. H, S Yesmin and M. I Hoque (2006) *Plant Tissue Culture and Biotechnology 16:* 53 -61.

17. Saxena P. K, R Gill, and A Rashid (1987). *Scientia Horticulturae 31:* 186-194.
18. Sharma H, B. D Vashistha, N Singh, and R Kumar (2015) *International Journal of Recent Scientific Research 6:* 2714-2718.
19. Sihachakar D, and G Ducreux (1987) *Plant Cell, Tissue and Organ Culture 11:* 179-188.
20. Taha R M, and M Tijan (2002) *South African Journal of Botany 68:* 447-450.
21. Thomas D. T, and S Shankar (2009) *Plant Biotechnology Reports 3:* 67-74.
22. Thorp T.A (2007) *Molecular Biotechnology 37:* 169-180.
23. Tuong Huan L. V, T Takamura, and M Tanaka (2004) *Plant science 166:* 1443-1449.