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Review Article

MICROPROPAGATION PROTOCOLS OF *MELIA DUBIA* CAV-REVIEW

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ABSTRACT
Melia dubia belonging to family Meliaceae is a deciduous multipurpose plant species. It is distributed in most parts of Indian subcontinent. Its wood is used in the preparations of paper, plywood, packing cases, building construction, decorative frames, agriculture implements, match boxes and other furniture. It is having anti-termite property and adaptable to various climatic conditions. Tribals use this as an astringent, anthelmlintic and known to have a rich source of bioactive compounds, which can be used in different types of medical systems like Aurveda, Siddha, Unnani and Homeopthy. Because of its multipurpose application nature in the present paper a review was noted with the micropropagation work done till now which will be of great use to the future researchers.

Keywords: *Micropropagation, Melia dubia.*

INTRODUCTION
Melia dubia Cav. belonging to Meliaceae is one of the important medicinal plant. It is distributed in South East Asia and Australia. In India it is seen at an altitudes of 600-1,800 m, and is present in Assam, Sikkim, Bengal, Khasi hills, Odisha and Western Ghats (Gamble, 1992). In India approximately 1800 plant species are used in different types of medical system, like Ayurveda, Homeopathic, Siddha and Unani. Herbal medicines are having increasing demand due to their promising role in health care system all over the world (Valentine *et al.,* 2013; Kalia, 2018). Meliaceae members are having medicinal applications as to treat fever, asthma, eczema, anthelmintics, leprosy pain, skin and colic disease (Kokwaro, 1976; Govindachari, 1992). It is a large deciduous to semi evergreen, tree growing to a height of 25m with thick brown bark. It flowers January to March and fruiting is from November to February. All parts of this plant especially its timber is used in farming purposes and also used as fuel (Amarashekara, 1995). All parts of this plant are used in medicinal preparations. This plant is having antioxidant, antifeedant, hepatoprotective, anti-inflammatory, antimicrobial, anti urolithiatic, Anticancer, Larvicidal, Ovicidal, Analgesic and antidiabetic activities (Koul *et al.,* 2000; Jyothi and Ramjaneyulu, 2007; Malarvannan *et al,* 2009; Samdani and Rana, 2010; Rohini and Arya, 2011; Rao *et al.,* 2012; Chanthuru *et al.,* 2014; Karthikeyan *et al.,* 2014; Khadse and Kakde, 2014; Senthil *et al.,* 2014). *Melia azedarach* and *Melia dubia* are synonyms so included the work of *M. azedarach* in the present paper.

Micropropagation Protocols
Chennaveeraiah *et al.,* (2006) first reported the micropopagation of *M. dubia*. They have sterilized the selected axillary buds containing nodes as explants obtained from the in vivo grown seedlings. For sterilization they have used detergent (Labolene-5% (v/v) and later disinfected with 70% ethanol for 30 seconds (sec). Finally treated with mercuric chloride ($HgCl_2$) (0.1%) for 3 min (minutes). Thus sterilised nodes were inoculated on MS medium (Murashige and Skoog, 1962) containing BAP (6-benzyl amino purine) (2mg/l) + TIBA (2,3,5-tri-iodo benzoic acid) (1mg/l) and reported shoot development after 15 days of culture. When subcultured on the same medium after 12 days they observed 15.3±1.89 shoots with sorbitol (3%) as carbon source. On further subculturing on the same medium shoot number increased. For root initiation they have used half strength (1/2) MS medium with soilrite mix consisting of, Peat: Perlite: Vermiculate in 1:1:1 ratio. They used IBA (Indole-3-butyric acid) (1mg/l) as rooting hormone. Rooted plantlets were later transferred to soilrite mix with a combination of Peat (3): Perlite (1) v/v. After acclimatization, reported 61% survivability of new plantlets.

Al-Mallah and Salilh (2006) have attempted for the micropropagation of *M. azedarach*, leaves and their petioles. They have surface sterilized the selected explants using $HgCl_2$ (0.1%) and treated for 5 min. Rinsed with sterile water and then treated with sodium hypochlorite (3%) for 30 min and washed with sterile water thoroughly. Callus was initiated on MS medium containing BA (Benzyladenine) (1.5mg/l) and in a combination of BA (1.0 mg/l) + IBA (4.0mg/l). They have reported 30% shoot formation.
Ram *et al.,* (2012) attempted for the *in vitro* propagation of *M. dubia* using the seedling explants.
They have sterilized the seeds washing with tap water for 5 min and treating with teepol (1:1 v/v) 10 min. Then treated with bavistin for 5 min, washed thoroughly with double distilled water 3-4 times. Later disinfected with 70%, ethanol for 40 sec and finally with 6% (v/v) of sodium hypochlorite for 20 min. Rinsed 5-6 times with sterilized double distilled water (dd H_2O). These seeds were placed on the MS medium. Nodal segments were used as explants and placed for shoot induction on medium containing BAP (0.5mg/l). They have recorded 8.49±0.25 shoots per explants and 3.63±0.51cm shoot length. For shoot elongation and improved shoot formation BAP (0.5mg/l) + GA_3 (Gibberelic acid) (2.5mg/l) were used. With this improved combination they have reported 9.82±0.8 shoots and shoot length of 4.95±1.0 cm. These shoots were later placed for rooting on half MS medium containing IBA (0.3mg/l) and recorded root length of 5.6 ±0.48cm. Rooted shoots were washed and placed in a mixture of sterilized compost, sand and soil mixture in thermocol cups. These cups were place in mist chamber for 6-8 weeks under controlled temperature 25±3ºC and 80±5% relative humidity. Then transferred to polybags containing sand (1): vermicompost (1): garden soil (1) v/v, for 4-6 weeks. Finally these bags were placed in the open nursery.
Ram *et al.,* (2014) reported in vitro studies using mature explants of the same plant. They have sterilized the nodal segments first dipping in Tween-80 solution for 15 min and treated with 0.1% (w/v) of Bavistin for 10 min. Rinsed 5-6 times with dd H_2O. Surface sterilized with 70% v/v ethanol for 50 sec, followed by treatment with $HgCl_2$ (0.1%) for 8-10 min. Finally rinsed 5-6 times with sterile water. For shoot inductions explants were placed on the MS medium containing different concentrations of cytokinins like BAP and KN (kinetin) and found BAP (2.22 µM) to be better with high percentage of bud break. With this concentration of BAP they have tested combination of NAA (Naphthalene acetic acid) and IAA (Indole-3 acetic acid) individually. Reported BAP (2.22 µM) + NAA (0.54 µM) to be best among all. But finally BAP alone was found to be best for shoot regeneration. For rooting they used IBA (2.47 µM) and recorded 98% rooting. Plants were acclimatized to field conditions. For the genetic stability performed, RAPD analysis and found the clones to be monomorphic.

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