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Review Article

Micropropagation of *Caralluma adscendens* (Roxb.) R.Br.-Review

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Abstract: *Caralluma* genus plants are mostly edible succulents, consumed as famine food and have lot of medicinal properties. These plants belong to family Apocyanceae, and are perennial herbs. They are mostly distributed in Africa, Asia and South East Europe. Most of these plants are endemic, rare or threatened species. Due to overexploitation these are rapidly disappearing from their natural habitats. *Caralluma adscendens* (Roxb.) R.Br. belonging to this Genus is having important Phytochemicals like Glycosides, phenols, saponins etc., which are having role as antiviral, antimicrobial, anti-inflammatory, antidiabetic properties. All these plants mostly grow in dry areas. *C. adscendens* is less explored and the present review is very much useful for knowing about the work reported by various scientists till date.
Keywords: *C. adscendens*, medicinal properties, phytochemicals.

Introduction

Caralluma genus is comprised of xerophytic plants. These belong to family Apocynaceae and host perennial, herbs to subshrubs. They are distributed in the dry areas and with less water resources and are mostly edible. These species are having a number of useful phytochemical constituents which can be used in traditional medical preparations. Their significance is due to their applications of being antioxidants, anticancer, hepatoprotective, anti-inflammatory, antimicrobial, antieczemic, antimalarial, antifungal and antidiabetic nature (Qui *et al.,* 1997; Ramesh *et al.,* 1998; Aruna *et al.,* 2009; Abdel-Sattar *et al.,* 2009; Waheed *et al.,* 2011; Rauf, 2013; Adnan *et al.,* 2014). This genus is distributed mostly in the Asia, South East Europe and Africa. Phytochemical reported in this genus are phenols, glycosides, alkaloids, saponins and flavonoids.

Caralluma adscendens (Roxb.) R.Br. is also an edible plant used as vegetable and used in the preparations of pickles. *Caralluma fimbriata* is the synonym of *C. adscendens*. So in the present review we have included the investigations of both. This plant also has important phytochemicals like pregnane glycosides, saponins, flavones glycosides etc., *C. adscendens* is having antioxidant, anthelmintic, antiproliferative, antioxidant, antimicrobial properties (Vajha *et al.,* 2010; Noorulhuda *et al.,* 2013; Reddy *et al.,* 2013; Maheshu *et al.,* 2014; Packialakshmi *et al.,* 2014; Vajha *et al.,* 2014).

Micropropagation studies

In vitro propagation in this plant was first reported by Aruna *et al.,* (2009) using nodal explants of mature shoots. They have sterilized the shoots under running tap water for 5-10 minutes (min) and treated with Tween 20 (1% v/v) for 5 min. Rinsed with sterile double distilled water and then treated with ethanol (70%) for 60 seconds (sec). Later after washing treated for 5 min with mercuric chloride ($HgCl_2$) (0.1% w/v) and rinsed thoroughly with sterile double distilled water. These explants were later placed on MS medium (Murashige

and Skoog, 1962) supplemented with various growth regulators like BA (6–benzyl adenine), 2iP (6-γ,γ-dimethylallylaminopurine), KN (Kinetin), ZN (Zeatin); growth additives as CH (casein hydrolysate), CM (Coconut milk) , YE (Yeast extract) and antioxidants such as PVP (polyvinyl pyrrolidine) CA (citric acid), AC (Activated charcoal) in various combinations.

They have reported highest shoot regeneration within a month on MS medium containing BA (8.87µM). Growth additive combinations and combinations with other growth regulators did not enhance this shoot number. The response order of shoot regeneration with other cytokinins was BA > 2iP > Zeatin > KN. The number of shoots formed with BA (8.87µM) were 2.72±0.14 shoots/explants with 80% response and a shoot length of 2.48±0.03cm. For rooting these shoots they have tried NAA (Naphthalene acetic acid). Among the tested concentrations of NAA half strength MS (1/2 MS) with NAA (0.54 µM) was found to be best. Completely formed plantlets were latter acclimatized by transferring to pots containing peat moss (1) : Farmyard manure (1): Soil (1) and covering with polythene covers for maintaining high humidity. These pots were watered with ½ MS macro salts for 2 weeks and later transferred to earthen pots. Maintained in these pots for 2 weeks and then transferred to soil. Thus acclimatized plants showed 65-70% survival rates.

Rajaram *et al.*, (2012) attempted for the in vitro regeneration of internodal segments of *Caralluma fimbriata* on MS medium. They have sterilized with running rap water 5-10 min followed by treatment with Tween 20 for 15 min. Later treated with Bavistin (0.1% w/v) for 10 min rinsed several times with distilled water and treated with sodium hypochloride (0.5% v/v) for 15 min. Rinsed with distilled water and then treated with $HgCl_2$ for 5min. They have used different combinations of 2,4-D (2, 4-dichlorophenoxyacetic acid) and NAA combinations for callus induction. They found 2,4-D (1.0mg/l) most suitable when supplemented individually. Later they have transferred this callus to MS medium containing different combinations of BAP, 2,4-D and NAA. They have reported 2,4-D (0.5mg/l+ BAP (4.0mg/l) produced green compact organogenic callus. In this combination they have reported 6.2 shoots/explants. For shoot elongation they have used GA3 (0.1mg/l) and shoot length was improved to 6.55 cm. These shoots were rooted on ½ MS + NAA (0.5mg/l). For acclimatization they have used garden soil and vermicompost (1:1). They have reported 82% of survival rate after transferring to the green house.

Dharmar and Michael (2016) reported the shoot regeneration of *C. adscendens* using nodal explants. They have sterilized and inoculated the nodal segments on MS medium fortified with KN (1mg/l) and reported 2.0±0.7 shoots/explants and an average shoot length of 2.98 ±0.3cm. They have attempted a combination of IAA (Indole-3-acetic acid) along with KN but could not improve the shoot number. Thus obtained shoots were rooted on the IAA (1.0mg/l) to be best. Plantlets were acclimatized and transferred to pots containing peatmoss, garden soil and farmyard manure (1:1:1) ratio. Hardened plants were transferred to field with 73% survival rates.

Naik *et al.*, (2017) attempted for the *in vitro* shoot regeneration using nodal explants. They have sterilized the selected explants and washed with running tap water for 15 min. Later rinsed with Tween-20 for 5 min and washed with distilled water. Then treated with 30% ethanol, for 3 min. Washed with sterilized double distilled water properly. Finally, treated for 5 min with $HgCl_2$ (0.1% w/v). Explants were washed thoroughly and inoculated on MS medium containing different growth regulators like BA and KN for shoot induction. Among the tested concentrations BA (2.0mg/l) + KN (0.5mg/l) + IBA (0.2 mg/l) produced maximum shoots of 2.60±0.17 and with a shoot length of 3.88±0.20 cm. They have also tried for callus

culture and found 2,4-D (2mg/l) and NAA (1.5-2mg/l) to be best. They observed globular embryos on callus within 3 weeks. The combination of BA (1mg/l) + IAA (0.2mg/l) + NAA (0.1mg/l) produced 2.8±0.21 shoots. For rooting they have used NAA to be most suitable at a concentration of 0.1mg/l with 5.4±0.27 roots and a root length of 5.78±0.19cm. Well-developed plants were acclimatized in pots containing Cocopeat alone, Cocopeat + soil and Cocopeat + sand. After 20-25 days of growth they were shifted to forest soil in green house and transplanted after 4 weeks to green house.

Conflicts of interest: The author declares no conflicts of interest.

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