

synthesis of novel, small molecule antiangiogenic agents are underway in modern medicinal chemistry (Quigley and Armstrong 1998).

Secondary metabolites, such as flavonoids, alkaloids, phenolic acids, lignans, lignins and tannins, are well known free radical scavengers with multiple biological effects, including anticancer and antimicrobial properties (Rachova et al. 2004; Zijuan et al. 2009). Since the secondary metabolites often have a complex stereo structure with many chiral centres which may be essential for the biological activities, many of these cannot be synthesized economically on a commercial basis (Rajendra and D'Souza 2000).

Plant tissue culture techniques are employed to produce large quantities of secondary metabolites, thereby isolating the active components from the callus without exploiting its natural resources (Lee et al. 2011; Arumugam et al. 2011). Based on the medicinal properties and literature survey, there are no reports for plant tissue culture and antiangiogenic properties of *L. aspera*. Therefore, this study was designed to carry out the *in vitro* propagation of *L. aspera* from its leaves, nodes, internodes and seeds.

16.1.1 PLANT DESCRIPTION

Plants of genus *Leucas* have been widely employed by traditional healers to cure many disease conditions, which imply that this genus has immense potential for the discovery of new drugs or lead molecules (Hemendra et al. 2011).

Leucas aspera (Willd.) Linn, belongs to Lamiaceae family and is a branched herbaceous plant, which is herb erected (ht 15–60 cm), stout and has a hispid acutely quadrangular stem and branches. Its leaves are shortly petiolate or sessile, linearly lanceolate or linear, obtuse, pubescent (8.0 cm long, 1.25 cm broad) crenate margin; its petioles are 2.5–6 mm long; its flowers sessile small, white, axillary whorls or dense terminal; its bracts are 6 mm long, acute, linear, bristle-tipped, ciliate with long slender hairs; its calyx are variable, tubular (8–13 mm long); curved, contracted above the nutlets, the lower half usually glabrous and membranous, upper half ribbed, hispid; its mouth is small, very oblique, not villous, with small teeth that are triangular, bristle-tipped, ciliate, its upper tooth being the largest. Corolla (1 cm long, tube 5 mm long) are pubescent above, annulate in the middle; its upper lip (3 mm long) is densely white-woolly; lower lip about twice as long, middle lobe rounded, obviate, lateral lobes are subacute and small. Fruits nutlets are 2.5 mm long, brown, oblong, smooth, their inner face angular and outer face rounded (Kirtikar and Basu 1975; Hooker 1984).

16.1.2 MEDICINAL USES OF *L. ASPERA*

The plant is used traditionally as an insecticide and antipyretic, the leaves are used for psoriasis, chronic rheumatism, chronic skin eruptions, snakebites, gastrointestinal disorders and respiratory tract disorders (Kirtikar and Basu 1991). The leaf extract has been shown to exhibit antiplasmodial activity against chloroquine-sensitive strains of *Plasmodium falciparum* (Bagavan et al. 2008). Anti-inflammatory activity of various aerial parts has been reported; the flowers can be used as stimulants, diaphoretics, aperients and insecticide (Goudgaon et al. 2003).