

Plant tissue culture is a technique of culturing plant cells, tissues and organs on synthetic medium under an aseptic environment and controlled conditions of light, temperature and humidity. There has been an increasing interest in developing *in vitro* propagation techniques for establishing multipurpose clones of selected plants from within highly variable natural populations (Sinha 2000). Plant tissue culture technology holds great promise for micropropagation, conservation and enhancement of the natural levels of valuable secondary plant products and to meet pharmaceutical demands (Harisaranraj et al. 2009). Accumulation of phytohormones to the culture medium redirects the growth and differentiation of somatic cells (Skooq and Miller 1957; Arjun 2011). Novel cell production and isolation in cultured plant cells can arise in two diverse developmental pathways of organogenesis or somatic embryogenesis (Arjun 2011).

Antioxidants are substances that, when present in low concentrations compared to those of an oxidisable substrate, cause significantly delays or prevent the oxidation of a particular substance (Halliwell and Gutteridge 1999). The generation of free radicals or reactive oxygen species (ROS) during metabolism and other activities beyond the antioxidant capacity of a biological system gives rise to oxidative stress (Zima et al. 2001). Oxidative stress plays a role in heart disease, neurodegenerative disease, cancer and the aging process (Astley 2003). Plants containing chemical compounds (such as ascorbic acid, carotenoids and phenolic compounds) exhibit antioxidant properties. The addition of antioxidants to foods would help the human body reduce the losses from oxidation disturbance (Arjun 2011). Proline acts as a signalling molecule and influences defence pathways, regulates complex metabolic and developmental processes and offers additional opportunities for plant improvement (Laszlo and Arnould 2009). In addition to its role in protein synthesis and the plant cells' response to environmental stresses, circumstantial evidence suggests that proline may also play a role in development as a metabolite and as a signal molecule (Mattioli et al. 2009).

Sesbania is a folk remedy for catarrh, bruises, eye problems, dysentery, fevers, smallpox, headaches, sore throat, sores and stonatitis. It is also used for the treatment of bronchitis, anaemia, inflammation, leprosy, gout, ophthalmia, and rheumatism and as a potent antidote for tobacco and smoking-related diseases (Ghani 1998). The leaf juice of *S. grandiflora* was deemed safe for oral consumption and exhibited no gross behavioural changes, except for an increase in urination. Its leaf juices are used as antiurolithiatic activity against calcium oxalate stones and free radical scavenging properties (Doddola et al. 2008). Shareef et al. (2011) reported that its seed oils have a very good potential for edibles and industrial purposes, as well for maintaining nutritional balance like other commonly used vegetable oils.

19.1.1 AIM AND OBJECTIVES OF THIS STUDY

Based on its medicinal properties, there is no comparative study report of *in vitro* calli and *S. grandiflora*. An *in vitro* tissue culture technique was selected, the effects were standardized, and a suitable medium for multiple shoots production from *in vitro* seedling explants was chosen to increase the biomass yield of calli on plant growth regulators (PGRs) and different explants. The total phenol, proline and