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DETRIMENTAL FACTORS IN THE REGENERATION OF INDIAN SANDALWOOD *(SANTALUM ALBUM LINN.)*: ANALYSIS WITH TWO CASE STUDIES

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ABSTRACT: Indian sandalwood (*Santalum album L.*), is known for its natural regeneration but regeneration of this species has been observed to be under threat due to various kinds of ecological pressure. In Bangalore sandalwood provenance (Karnataka) having tropical conditions excellent germination of sandalwood was observed, but the damping-off induced powdery mildew was observed to cause significant damages on their survival. In Marayoor sandal provenance (Sandalwood reserves in Kerala), a study undertaken revealed that both exotic and indigenous weeds of herbaceous vegetation that form the pioneer floor communities in the forest floor causing catastrophic disturbances to natural regeneration of sandalwood. In exposed soil areas as well as in the collection of soil on tree holes and cavities and in areas where the weeds were removed mechanically regeneration of sandalwood was observed.

Keywords: *Santalum album*, regeneration, powdery mildew, exotic weeds

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INTRODUCTION

Santalum, the plant genus of the family Santalaceae includes economically important species, which are xylem-tapping root hemi-parasites with high valued aromatic heartwood (USDA, 1990). There are about 18 species under the genus *Santalum* and they are mainly found in India, Indonesia, Australia, Timor, Hawaii etc., in which the commercially valuable sandalwood species are *S. album* Linn*., S. yasi* Seem*., S. austrocaledonicum Vieill., S. macgregorii F.Muell, S. spicatum (R.Br.) A.DC., and S. lanceolatum* R.Br. (Subasinghe, 2013). Among these, the Indian sandalwood, *S. album*, is the most appreciated in the world, for its fragrant heartwood and oil used for incenses, soaps, creams, perfumes, carvings, paintings, and religious worships for over 4000 years and is associated with Indian culture and heritage. It is one of the oldest perfumery substances and being indigenous to India but is found in, Australia, Pacific islands, Juan Fernandes islands, 600 miles off the coast of Chile and South of Japan (Harbaugh and Baldowin 2007). Sandalwood occupies a pre-eminent place among the forest crops of India which are of great economic value (Sundararaj, 2008). Sandalwood has been categorized as 'vulnerable' by the International Union for Conservation of natural and natural resources (Arunkumar et al*.,* 2019). The production of sandalwood in India is decreased annually at the rate of 20 percent since 1995. The maximum quantity of 27,930 kg sandalwood oil has been exported in the year 1997-98 which has been reduced to only 10 Kg in 2015-16 (Export/import data bank version 7.1 tradestat, GOI, MoC&I). Natural and anthropogenic factors can be attributed to the depletion of sandalwood resources (Dhanya et al., 2010). Limit to natural regeneration of sandalwood in natural forests include recurrent annual fires, lopping of trees, the spread of spike disease, the proliferation of weeds, and introduction of monoculture plantations of eucalyptus that have altered the ecology of natural sandalwood ecosystems (Ananthasubramonian and Bacha, 1977). Kirdat et al. (2019) reported the sandal spike disease of sandalwood associated with aster yellows (AY) phytoplasmas as a prime threat to sandalwood