ABSTRACT
Tyrosinase is a copper-containing enzyme, which is widely distributed in animals, plants and microorganisms. The enzymes showed considerable structural similarity independent to the kingdom they belong. Tyrosinase is a key enzyme in melanin biosynthesis, involved in determining the color of mammalian skin and hair. Increased activity of the enzyme can lead to hyperpigmentation resulting in distressing aesthetic values. The inadequacy of current conventional methods to inhibit tyrosinase activity safely encourages the need to seek new potent tyrosinase inhibitors in cosmetic and therapeutic applications. In the current study we report the effectiveness of hot water extract of Pterocarpus santalinus bark against the melanin producing system of Bacillus cereus. The extract had shown to inhibit melanin production in bacteria dose dependently. Therefore, our results suggested that P. santalinus extract possesses antimelanogenic/antityrosinase activity, which could be utilized as a safe depigmentation agent.

KEY WORDS: anti-tyrosinase, red sandalwood, melanin, bacteria
santalinus bark extract inhibited melanin production in B16F0 melanoma cells (Hemachandran et al., 2016). Many bacteria were known to produce melanin via L-DOPA (Solano, 2014) which had shown similarity with the human melanogenic pathway. The tyrosinase in humans too shares structural similarity with the bacterial counterpart (Bacillus megaterium) (Nokinsee et al., 2015). So we consider a high melanin producing Bacillus cereus could be utilized as a model system in evaluating the anti-melanogenic/anti-tyrosinase activity of P santalinus extract, which could substantiate the earlier findings in in vitro conditions. To our knowledge this is the first report on anti-melanogenic activity of P santalinus against B. cereus melanin biosynthesis machinery.

Bark from a home grown Pterocarpus santalinus tree of 17 years old and having a diameter of 121 cm was used in the study. Dried bark was pulverized to the fine powder form. This was then subjected to hot water extraction according to Sukhdev et al., 2008. Prepared extract is added to the melanin production medium (Yabuuchi and Ohyama, 1972) at a concentration 1- 5 mg/mL. Melanin producing bacteria Bacillus cereus strain BTSNGIST5 (unpublished data) was then inoculated to the melanin production medium. After 5 days the produced melanin concentration was determined spectrophotometrically at 400nm (Turick et al., 2002). Melanin produced under different concentration of P santalinus extract was compared to the control to determine its anti-melanogenic potential.

The anti-tyrosinase activity of P santalinus extract was evaluated against bacterial tyrosinase and it showed profound inhibitory effect to tyrosinase activity in a dose dependent manner which was evident from decrease in melanin production by B. cereus. (Fig.1) In control flasks were extract was not added the melanin produced was 120.08 ±1.04µg/mL and was black in color, while addition of 5 mg/mL of extract decreased the melanin production to 35.41±1.14µg/mL. A significant 70% decrease of melanin production was observed here which confirms the anti-tyrosinase activity of P santalinus extract against B. cereus tyrosinase enzyme.

Due to its significant tyrosinase inhibitory potential, the extract can be utilized to explore into metabolism of melanin in B. cereus in place of commonly using inhibitors like Kojic acid (Sajjan et al., 2010). Though the common melanin produced in bacteria is via homogenisate i.e. Pyomelanin (Solano, 2014). The melanin inhibitory activity of the extract exhibited in the present study in B. cereus revealed the melanin belongs to the subtype, DOPA melanin or eumelanin.

Cytotoxicity in in vitro conditions (Hemachandran et al., 2016) and acute and sub-acute toxicity studies in rats (Azamthulla et al., 2013) of P santalinus extract revealed that the extract is less toxic and can be utilized for cosmetic and therapeutic applications. Thus our investigation concluded that hot water extract of P santalinus can be utilized as a depigmentation agent, which could contribute for the replacement of toxic synthetic as well as non-synthetic tyrosinase inhibitors. This research supports the recent findings in vitro and affirms that P. santalinus extract can be an effective anti-tyrosinase compound irrespective of the enzyme source. We strongly suggest the use of P santalinus extract in cosmetics and for therapeutic applications after in vitro trails.

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**References**


