Study of Antioxidants and Nematicidal Activities of *Styrax Benzoin* Extracts

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ABSTRACT

INTRODUCTION

Natural products from minerals, plants, and animals are the source for treating human illnesses. Therapeutic plants are openly in demand and their acceptance is increasing with time. Many dry resin, from the plants like *Styrax benzoin*, has a pleasant smell when burned and is a good source of incense. Ancient people thought this aroma could drive evil spirits away. In religious ceremonies Muslims, Christians and Hindus burn benzoin resin for fragrance, aromas and incense. *Styrax benzoin (S. benzoin)* belongs to family *Styracaceae*. It is commonly referred to as loban, gum benjamin tree, luban jawi, al-jawi, *Sumatra benzoin* (3), benzoin resins and benzoin trees. Trees in the *Styrax* species are native to the Northern Hemisphere, such as East and Southeast Asia and South America, where they occur in warm temperate regions. The resin was commonly used by different civilizations in ancient times to treat respiratory infections and skin diseases. Its active constituents are used in the preparation of traditional, allopathic medicine and traditional Chinese medicine. It has been used to treat asthma, bronchitis, pneumonia, sore throats, cough and tonsillitis. It is used as disinfectant, antiseptic and expectorant in pharmaceutical preparations. It is also applied to heal wounds (5). It helps to increase physical strength, endurance and energy (6). It work as a tonic for the heart beat by giving the warm feelings and improves the circulation of blood, relieve arthritis and rheumatism's aches and pains (5). It calms the digestive tract and relieve the discomfort of urinary tract (6). Due to its antioxidant and organoleptic activities it is valued for flavor in the food industry. It has reported that bactericidal, antiviral and fungicidal activities of benzoin are due to its constituents like benzoic acid, benzaldehyde and benzyl benzoate (5).

Coniferyl benzoate, benzoic acid, p-coumaryl benzoate, cinnamyl cinnamate, vanillin and siaresinolic acid are the primary constituents of benzoin resin (1). Benzoin has also reported contained flavonoid and tannins bearing antibacterial activities (4).

OBJECTIVES:

To identify constituents responsible for nematicidal property of *S. benzoin* and study its chemical constituents. To scientifically evaluate the folkloric medicinal properties of *S. benzoin*.

METHODOLOGY

Extraction

Powdered resin/loban (520 g) was extracted with hexane only for once and evaporated under fuming hood to acquire yellow gummy substance (LH 13.27 g). The marc was extracted several times (six) with ethyl acetate until extract becomes light in color. All the extracts were combined and evaporated under fuming hood to give reddish brown residue LEA (190 g). Marc was further extracted with MeOH for several times (six) until extract

becomes light in color. All the extracts were combined and evaporated under fuming hood to give whitish powered residue LM (15.38 g).

Antioxidant activity

7 mM solution of ABTS in 25 mL EtOH was dissolved in 25 mL of 2.5 Mm solution of potassium persulfate and left for incubation for 16 hours at ambient temperature in the darkness. Then dilute (0.1-0.2 mL ABTS in 3 mL H2O: stock 1.2 mL ABTS in 30 mL H2O) to obtain the absorbance (0.7 ± 0.02) 734 nm. Prepare 100 ppm stock solution of sample. Antioxidant property of the samples were tested with the use of the UV spectrophotometer. The reaction mixture was prepared by taking 2 mL sample (of different concentrations 100, 70, 50, 30, 10, 1, 0.1, 0.001 ppm) and 3.5 mL ABTS solution. The absorbance was measured at 734 nm keeping 06 min in darkness.

Percent inhibition was calculated by using following formula:

$$\text{Inhibition [\%]} = \text{ABTS}_{\text{Abs}} - \text{sample}_{\text{Abs}} \times 100/\text{ABTS}_{\text{Abs}}$$

The IC_{50} value was calculated by using formula:

$$X = Y - C / m$$

Where,

Y = 50, C = Intercept and m = Slope

Nematicidal activity:

Mortality Test

Meloidogyne javanica egg masses were obtained from infected roots of greenhouse grown eggplants (*Solanum melongenosa* L.). Egg masses were pricked from the knots formed on the roots of infected egg plants using a fine needle and placed in sterile water. After hatching, number of juveniles were maintained around 40 – 60 / mL in each cavity block. 50 µL of plant extract (10,000, 1000 and 500 ppm concentration in DMSO) was added in each cavity blocks containing 2 mL of sterile water. Three replicates of each treatment were made. Negative control was sterile water. Observations were taken after 24, 48 and 72 hours. Nematodes were considered dead if they did not move when probed with a fine needle.

Hatching Test

Eggs were extracted using 2 % sodium hypochlorite solution. The eggs were washed under tap water using 100 (149 µm pore size) and 400 (37µm pore size) mesh sieves. The residues collected on 400 mesh sieve were separately transferred into distilled water forming egg suspension. 1 mL of egg suspension + 950 µL of sterile water +50 µL of plant extracts were added in each cavity blocks and kept at room temperature with three replicates of each treatment.

CONCLUSION

In current research work plant *Styrax benzoin* have been studied for its antioxidant and nematicidal activities.The methanolic extract of *S. benzoin* (LM) showed significant antioxidant and nematicidal activity against different extracts of it.

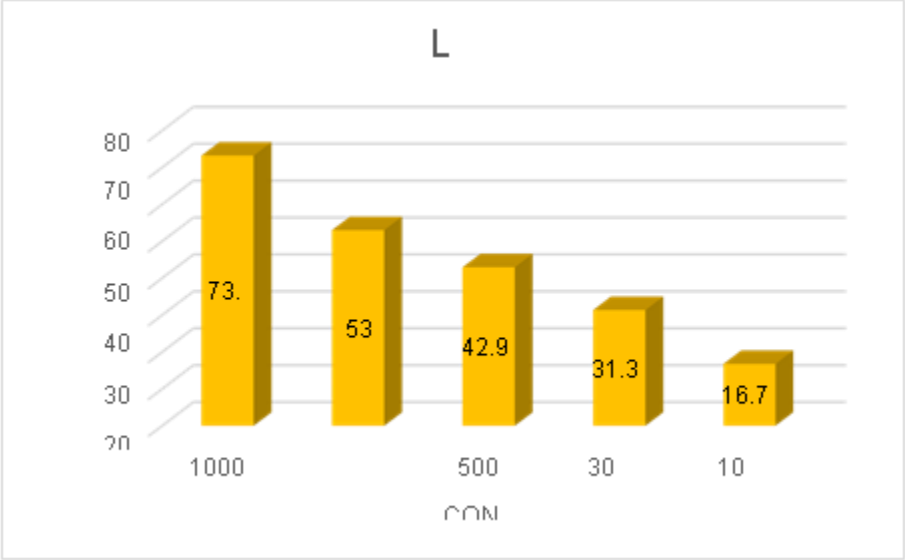

Figure. Antioxidant activity of Methanolic extract (LM) of Styrax benzoin

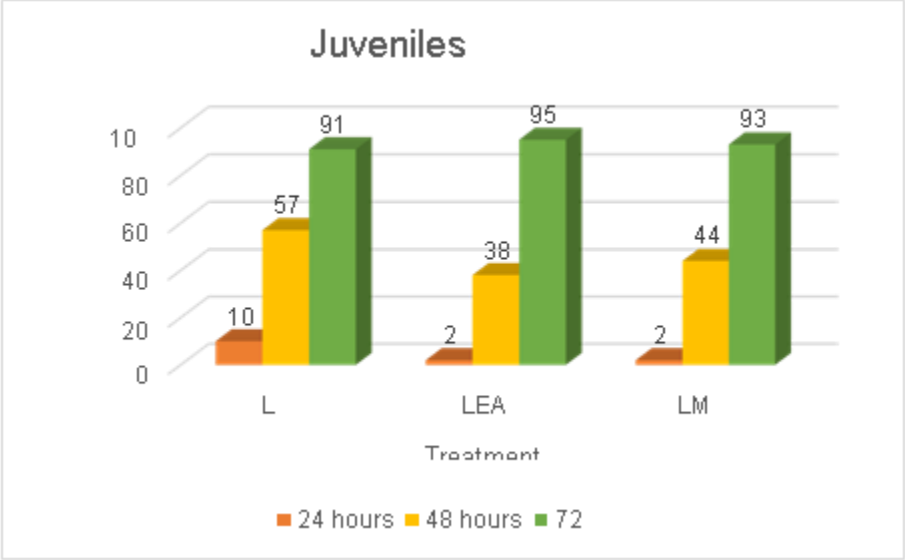

Figure. Effect of Styrax benzoin Extracts on Meloidogyne javanica Mortality

REFERENCES

1. Du, J., Singh, H. and Yi, T. H. (2016). Antibacterial, anti-biofilm and anticancer potentials of green synthesized silver nano particles using benzoin gum (Styrax benzoin) extract. Bioprocess Bio systems engineering. 39, (12), 1923-1931.
2. Hacini, Z., Khedja, F., Habib, I., Kendour, Z. and Debba, Z. (2018). Evaluation of antibacterial and antioxidant activities of three types of benzoin resin. European Journal of Chemistry 9 (4), 408-411.
3. Siregar, R. V., Suryanto, D. and Yurnaliza. (2019). Antibacterial Ability of Endophytic Bacteria Isolated from Kemenyan (Styrax benzoin L.). IOP Conference Series: Earth and Environmental Science. 305, 012054.
4. Sharif, A., Nawaz, H., Rehman, R., Mushtaq, A. and Rashid, U. (2016). A review on bioactive potential of Benzoin Resin. International Journal of Chemical and Biochemical Sciences. 10, 106-110.
5. Wilson, R. (2002). An introduction of Fourty-four essential oils. Aromatherapy: Essential Oils for Vibrant Health and Beauty, 51-53.