



ISSN: 2321-9122

www.biosciencejournals.com

EJBB 2015; 3 (2): 26-29

Received: 07-02-2015

Accepted: 25-02-2015

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Comparative analysis of antioxidant properties of jasmine species by hydrogen peroxide assay

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Abstract

Jasminum is a genus of shrubs and vines belonging to the olive family (Oleaceae). It contains around 200 species which are native to tropical and warm temperate regions of the Eurasia, Australasia and Oceania. Jasmines are cultivated throughout the country. In the present study eight different varieties of *Jasminum* namely *Jasminum grandiflorum*, *Jasminum sambac* cultivar variety, *Jasminum aungustifolium*, *Jasminum sambac* wild variety, *Jasminum sambac* cultivar variety, *Jasminum auriculatum*, *Jasminum humile* and *Jasminum officinale* were collected from different places in and around Bangalore like GKVK, FRLHT and local nurseries and the antioxidant property of the plant was determined by Hydrogen peroxide method using methanol and ethanol solvents. The samples showed similar type of antioxidant activity with methanol and ethanol solvent. All the eight samples had antioxidant capacity. *Jasminum Sambac* cultivar variety showed the maximum antioxidant property whereas *Jasminum humile* and *Jasminum Sambac* wild variety showed the least antioxidant property and this may be as the cultivar variety are usually grown in nutritive soil with regular supply of nutrients.

Keywords: *Jasminum*, Antioxidant, Hydrogen peroxide Assay

1. Introduction

India has variety of medicinal plants which have been present from many generations and have a great mass of popular remedies. These plants are even commonly used even today. Some chemical compounds from these plants have been purified and been commercialized by the pharmaceutical industries. In India, Jasmines are cultivated throughout the country. However, the largest area under Jasmine flower production is in Tamil Nadu followed by Karnataka. The annual production of jasmine concrete is more than 15 tones in India.

Jasminum is a genus of shrubs and vines belonging to Oleaceae. It contains around 200 species which are native to tropical and warm temperate regions of the Eurasia, Australasia and Oceania. These plants are widely cultivated for the characteristic fragrance of their flowers. These plants are useful in treating diseases of the mouth and teeth, especially for toothache^[1]. The flowers and leaves are largely used in folk medicine. Flowers of *J. sambac* are useful to women when brewed as a tonic as it aids in preventing breast cancer and stopping uterine bleeding^[2].

The antioxidant and antimicrobial potential of plants have attracted the attention of scientific community from ancient times. The antioxidants have been useful in retarding oxidative deterioration of food materials especially those with high lipid contents^[3] and also have showed that they have the capacity to protect the living cells from oxidative damage that occur due to formation of free radicals and reactive oxygen species during most of the metabolic activity.

Several studies have demonstrated that plants produce potent antioxidants and represent an important source of natural antioxidants^[4, 5, 6]. The majority of the active antioxidant compounds are flavonoids, isoflavones, flavones, anthocyanins, coumarins, lignans, catechins, and isocatechins. In addition to the above compounds found in natural foods, vitamins C and E, β -carotene, and α -tocopherol are known to possess antioxidant potential^[7,8]. Recently there has been an upsurge of interest in the therapeutic potentials of medicinal plants as antioxidants in reducing free radical induced tissue injury^[9].

Literature study shows that essential oil and methanol extract from *Jasminum sambac* have invitro antimicrobial and antioxidant activities which could support the use of the plant by traditional healers to treat various infective diseases [10]. Another study shows that Jasmine flowers, applied to the breasts showed suppression of puerperal lactation comparable to Bromocriptine, with significant reduction of serum Prolactin (greater than bromocriptine) and Jasmine flowers seem to be an effective and inexpensive method of suppressing puerperal lactation and can be used as an alternative in situations where cost and non availability restrict the use of bromocriptine [11]. On the other hand, studies on chemical constituents in roots of *Jasminum sambac* shows that it contains dotriacontanoic acid, dotriacontanol, oleanolic acid, daucosterol and hesperidin [12]. The lipid peroxidation has been broadly defined as the oxidative deterioration of polyunsaturated lipids [13]. Determination of lipid peroxidation content was carried out indirectly by means of derivatizing MDA with TBA at high temperature and acidic condition. The hydroxyl radical is highly reactive and can damage biological molecules. When it reacts with polyunsaturated fatty acid moieties of cell membrane phospholipids, lipid hydro-peroxides is produced [14].

Hydrogen peroxide occurs naturally at low concentration levels in the air, water, human body, plants, microorganisms, food and beverages. It is widely used as a bleaching agent in the textile, paper and pulp industries. Human beings exposed to H₂O₂ indirectly via the environment are estimated as 0.28 mg/kg/day with intake from leaf crops contributing most to this exposure. Hydrogen peroxide enters the human body through inhalation of vapor or mist and through eye or skin contact. In the body, H₂O₂ is rapidly decomposed into oxygen and water and this may produce hydroxyl radicals (OH[·]) that can initiate lipid peroxidation and cause DNA damage.

Materials and Methodology:

Sample Collection:

The samples for the present investigation were collected from different places in and around Bangalore like GKVK, FRLHT and few nurseries. These samples were collected in ziplock plastic bags and were brought to the lab for further investigations. The different species used for the present study were *Jasminum grandiflorum* (Jajji Mallige), *Jasminum sambac* cultivar variety (yelu suddina mallige), *Jasminum aungustifolium*, *Jasminum sambac* wild variety (Gundu Mallige), *Jasminum sambac* cultivar variety (suji mallige), *Jasminum auriculatum*, *Jasminum humile* (Yellow Jasmine) and *Jasminum officinale* (Sanna jajji mallige).

Solvent Extract:

The leaf samples belonging to the Genus *Jasminum* were dried at 45°C and then the dried samples were ground into fine powder using a blender. 50 gms of the powder was added to 500ml of different solvents like Methanol and Ethanol. Extraction was done using a Soxhlet apparatus. Distillation of the crude extract was carried out for individual samples separately with the solvents and the filtrate was collected and it was concentrated by evaporating the solvent to get a final stock. These crude samples were used for studying the antioxidant properties of the samples.

Hydrogen Peroxide Assay:

The ability of the Jasmine extracts to scavenge hydrogen peroxide was determined. A solution of hydrogen peroxide (40mM) was prepared in phosphate buffer (pH 7.4). Extracts (100, 200, 400, 600, 800, 1000 µg/ml) in the methanol solvent were added to a hydrogen peroxide solution (0.6ml, 40mM). Absorbance of hydrogen peroxide at 230nm was determined 10 minutes later against a blank solution containing the phosphate buffer without hydrogen peroxide. The percentage of hydrogen peroxide scavenging of both Jasmine extracts and standard compounds were calculated:

$$\% \text{ Scavenged } [H_2O_2] = [(A_C - A_S) / A_C] * 100$$

Where A_C is the absorbance of the control and A_S is the absorbance in the presence of sample of jasmine extracts or standards.

Results:

The different species of Jasmine like *Jasminum grandiflorum* (Jajji Mallige), *Jasminum sambac* cultivar variety (yelu suddina mallige), *Jasminum aungustifolium*, *Jasminum sambac* wild variety (Gundu Mallige), *Jasminum sambac* cultivar variety (suji mallige), *Jasminum auriculatum*, *Jasminum humile* (Yellow Jasmine) and *Jasminum officinale* (Sanna jajji mallige) were collected for determining the antioxidant activity.

In ethanolic extract it was found that most of the samples showed better antioxidant activity when compared to the standard. The antioxidant activity for hydrogen peroxide assay was carried out with different concentration and it was found that the activity showed gradual increase in the property with the increase in the concentration of the sample. *Jasminum Sambac* cultivar variety showed the maximum antioxidant activity whereas *Jasminum Sambac* wild variety showed the least antioxidant property and this may be as the cultivar variety are usually grown in nutritive soil with regular supply of nutrients. *Jasminum Sambac* wild variety and *Jasminum humile* showed antioxidant property lower than the standard (Figure 1).

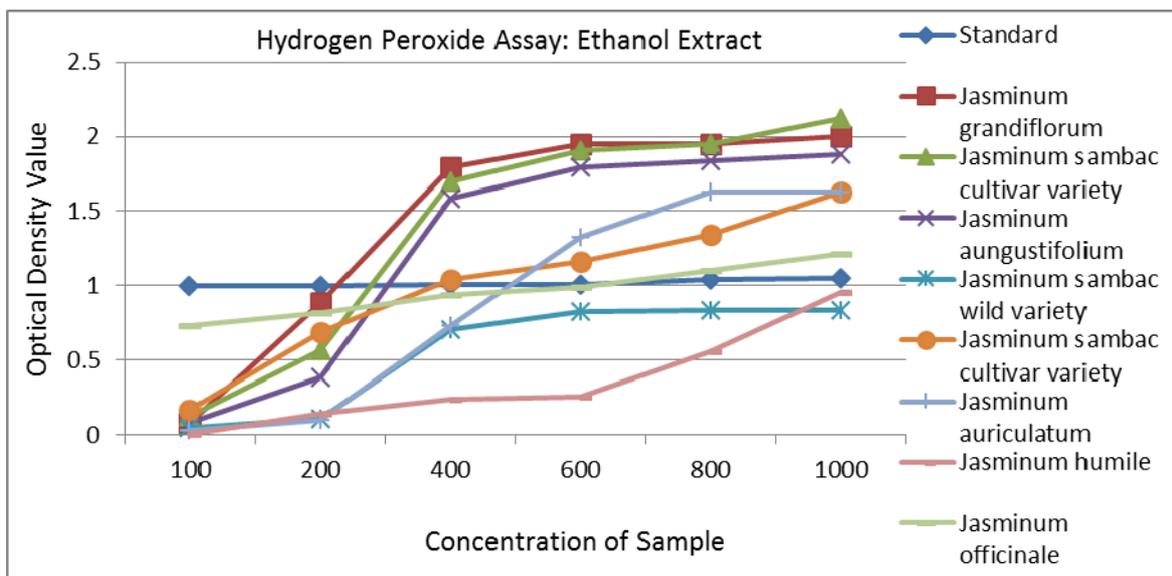


Fig 1: Hydrogen peroxide Assay by ethanolic Extract

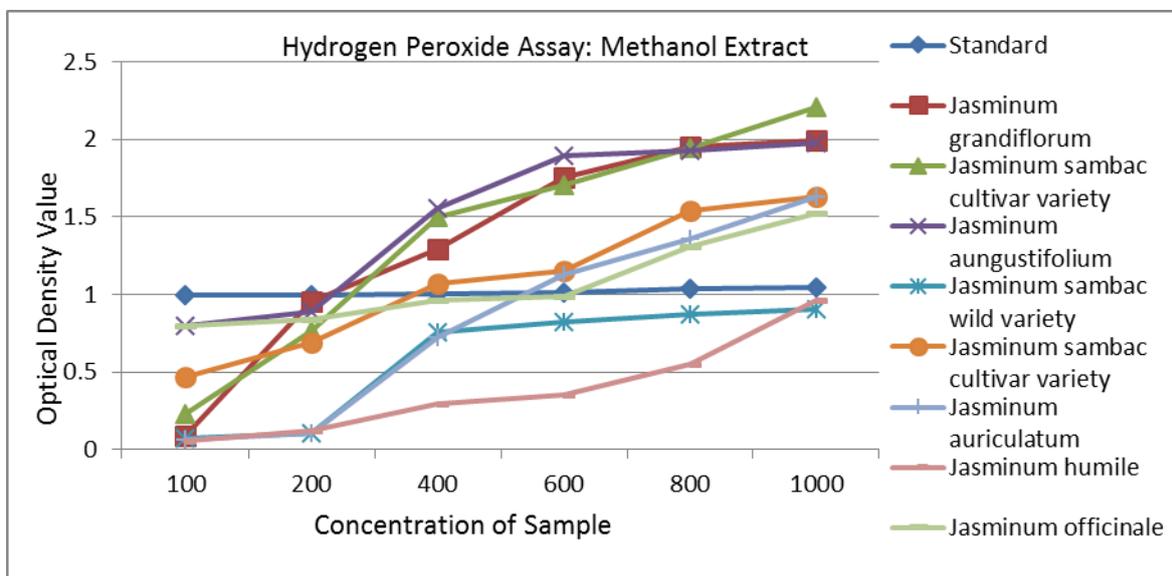


Figure 2: Hydrogen peroxide Assay by Methanolic Extract

The antioxidant activity of the samples extracted with methanol solvent was determined and it was found that all the samples had antioxidant property which makes them commercially important. The *Jasminum Sambac* cultivar variety showed the highest antioxidant activity even with methanolic extract along with the other samples. *Jasminum Sambac* wild variety and *Jasminum humile* showed lower antioxidant capacity when compared to the standard (Figure 2).

Discussion:

The phytochemical screening and anti-lipid peroxidation effect of *J.sambac* had been investigated by many researchers and it has been showed that there was presence of alkaloids, flavonoids, terpenoids, carbohydrates, proteins, phenols, tannins, saponins and phytosterols. The methanolic extract of the *J.sambac* flowers showed anti-lipid peroxidative effect which was found to be similar to that of all standards used.

[15] investigated analgesic and cytotoxic activities in animal

models from ethanol extract of the dried leaves of *Jasminum sambac* (L.) and they found that the extract produced significant ($P<0.001$) writhing inhibition in acetic acid-induced writhing in mice at the oral dose of 250 and 500 mg/kg of body weight comparable to the standard drug diclofenac sodium at the dose of 25 mg/kg of body weight. The crude of ethanolic extract also produced the most prominent cytotoxic activity against brine shrimp *Artemia salina*.

[16], carried out pharmacognostical examination of morphological and microscopical characters and phytochemical investigations of *J. grandiflorum* leaves including determination of loss on drying, ash values and extractive values. The preliminary phytochemical screening of powdered drug was also carried out. The qualitative chemical examinations revealed the presence of various phytoconstituents like alkaloids, phytosterols, saponins, carbohydrates, phenols tannins and flavonoids.

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