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PETAL SENESCENCE IN JASMINE FLOWERS (*JASMINUM SAMBAC*) DURING STORAGE BY USING DIFFERENT PACKAGING MATERIALS AND PRE-TREATMENT: ROLE OF PHENOLICS

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Abstract: Petals are an excellent model system for the study of fundamental aspects of senescence. The need of present study was felt with the aim to study the changes taking place during petal senescence in jasmine flowers during storage using Pre-treatment of 4% boric acid for jasmine flowers and packaging materials namely, Gunny bag, polyethylene (PE) of 200 gauge micron thickness with no ventilation. Estimation of total phenols was studied from first stage to senescent stage of in jasmine flowers. The amount of total phenols had a increasing trend with progressing stages. This increase of phenols might have created an internal environment suitable for the senescent change which leads the flower towards senescence.

Keywords: Jasmine flower, Packaging material, Pre-treatment, Total phenols, Senescence.

INTRODUCTION

Flowers are the wonderful creations of god that serve as the reproductive organs of flowering plant. It is in most cases the organ with the shortest period of longevity. Senescence of whole flower is very complex, so often researchers concentrate mainly on changes occurring during the senescence of petals (Desai *et al.,* 2012). Petals seem to be an excellent model system for the study of fundamental aspects of senescence. The whole natural period from maturity to senescence and death is much shorter in petals than in leaves. Petal senescence is an irreversible process that leads to cellular breakdown and death (Sacher, 1973).

Jasmine (*Jasminum sambac*) belongs to the family "*Oleaceae*", which is one of the oldest fragrant flowers cultivated by humans and known to be the native of subtropical regions and taken to other parts of the globe. The term jasmine is derived from an Arabic word "Jessamine" and in Persian language it is called as "Yasmin" or "Yasmyn" which means

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fragrance (Bailey, 1947). Jasmines are widely grown in warm parts of Southern Asia, Europe, Africa and the Pacific region. It is the national flower of the Philippines adopted by its government in 1937 and in 1990, Indonesian government across the world, adopted as the national flower. Although more than 2,000 species are known, 40 species have been identified in India, and 20 species are cultivated in South India (Bhattacharjee, 1980). The best known species among jasmines is *J. sambac* and several varieties of this species *viz*., Arabian or Tuscan, Jasmine Grand duke of Tuscassy, *Motia, Mogra, Mallige* and *Kodai Mullai* (Bhattacharjee, 1980) are commercially cultivated. 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 flowers in India is worth more than ` 120 million (Dadlani, 2004).

Packaging is a tool for controlling flower quality in the distribution chain. Apart from preventing mechanical damage, the package serves as a barrier between the conditions inside and outside the package. It protects the flowers from unfavourable outside conditions and enables a micro-climate to develop inside the package (Nowak *et al.,* 1991). The main principles of packaging towards long storage life and keeping quality are to lower the rate of transpiration, respiration and cell division during transportation and storage. Since flowers are delicate and highly perishable, they need great attention through advanced technologies in packaging to keep them fresh to consumer's satisfaction. Hence, the ideal packaging technology needs to be developed for jasmine flower (Bhattacharjee, 1997).

Increased recognition of the importance of phenolic compounds in plant metabolic activities is well known. Phenols such as p - coumaric acid with one - OH group strongly enhances IAA destruction (Nitsch and Nitsch, 1962). IAA oxidase and peroxidase decompose the IAA (Schaffer et al., 1967). Polyphenols can be oxidised by peroxidase and Polyphenol oxidase. Phenols are the antioxidants that have the ability to protect plant tissue against oxidative damage.Most of the metabolic abnormalities in living organisms are caused through the production of deleterious active oxygen species (AOS) such as singlet oxygen, superoxide radical, hydrogen peroxide, hydroxyl ion and free hydroxyl radical (1O2, •O−2, H2O2, OH− and •OH) which are invariably produced during normal metabolism and exposure to stresses (Singh *et al*., 2009a). The present study focuses on the estimation of phenolic compounds during senescence of petals of jasmine flowers.

MATERIALS & METHODS

Fresh jasmine (*J. sambac*) flowers were procured in the morning hours at farmers field of Raichur district. Gunny bag, polyethylene (PE), Pre-treatment with 4 per cent boric acid + packaging in polyethylene (PE) of 200 gauge micron thickness, and 240 mm × 140 mm size without vents were used for packaging of flowers. The selection of packaging material was confirmed by conducting several preliminary experiments for storage studies. The experiment was carried out with four treatments in CRD under ambient condition with three replications.

Flowers were packed after pre-treatment with 4 per cent boric acid in different packaging materials of 200 gauge thickness and stored at ambient condition. The physical, physiological, visual and sensory parameters were determined for the stored jasmine flowers daily upto fourth day after packaging. Packaging materials and their treatments are given below

T_1 - Open tray (control)

T_2 - Packaging in gunny bag

T_3 - Packaging in polyethylene (PE)

T_4 - Pre-treatment with 4 per cent boric acid + packaging in polyethylene (PE)

The term phenol includes a large group of organic aromatic compounds having one or more hydroxyl groups on the benzene ring. They are known to provide resistance to the plants and are easily oxidized by phenol oxidizes to quinines which are highly reactive and toxic to the pathogens. Phenol content of the flowers was estimated as per the procedure given by Malick and Singh (1980).

Total phenolic content (TPC) of samples were determined using the Folin–Ciocalteau Reagent (FCR) according to AOAC (2005). Five grams of jasmine flowers was weighed accurately and the jasmine flowers were ground thoroughly in a mortar with pestle with 80 per cent alcohol. Again it was passed through the muslin cloth. The process of extraction was repeated once more. The filtrates were pooled and filtered through Whatman No. 41 filter paper and made upto a known volume with alcohol. The prepared ethanol extract of the sample (30 ml) was added to 1.0 ml of freshly diluted Folin-Ciocalteau reagent.

Two grams of sodium carbonate dissolved in 100 ml 0.1 N NaOH solution was then added to the mixture and mixed thoroughly. The test tubes were placed in a boiling water bath for exactly one min, the tubes were cooled and make up to a suitable volume. The absorbance was measured at 650 nm against a blank of distilled water using a spectrophotometer (Make: Systronics; Model: PC based double beam spectrophotometer 2202,). Catechol was used as

an equivalent standard. Standard curve of catechol was used to estimate the concentration of phenols. All analyses were performed in triplicate. Expressed as µg equivalent of pyro-catechol/g of sample.

Statistical Analysis: The data obtained were analyzed statistically by the means of three replicates for each stage and the standard error was computed. It was also statistically examined by the one way Analysis of Variance (ANOVA) at 0.01% level of significance.

RESULTS AND DISCUSSION

Table (1) shows the Effect of pre-treatment and packaging materials on total phenols of the jasmine flowers under ambient storage condition was determined and the data presented in Table1. There was a significant difference in the phenols content of packaged, pre-treatment and non packaged (control) jasmine flower.

After one day of packaging, open tray (control-T_1) and gunny bag (T_2) recorded maximum amount of total phenols with 36.42 and 32.2 µg/g respectively. The jasmine flowers packed in polyethylene (T_3) and pre-treated with 4 per cent boric acid packed in polyethylene (T_4) samples were found to have lower levels of total phenols (24.66and 22.68µg/g).

However, on 4th day, there was a significant effect of packaging material and chemical treatment on the phenol content of the flowers was noticed. The jasmine flowers packed in polyethylene (T_3) and pre-treated with 4 per cent boric acid packed in polyethylene (T_4) samples recorded significantly lower levels of total phenols (53.74 and 50.9µg/g) of packing, respectively). The flowers placed in open tray (control-T_1) and gunny bag (T_2) were recorded higher total phenols content of 61.8 and 59.21µg/g of sample, respectively.

Effect of pre-treatment and different packaging materials on total phenols of fresh jasmine flower during the storage period is presented in Fig. 1. Total phenols content of the jasmine flower increased at a faster rate day after day during storage. After one day of packaging, open tray (control-T_1) and gunny bag (T_2) treatments recorded maximum amount of total phenols of 36.42 and 32.20 µg/g, respectively. The jasmine flower packed in polyethylene (T_3) and pre-treated with 4 per cent boric acid and packed in polyethylene (T_4) treatments were found to have lower levels of total phenols (24.66 and 22.68 µg/g) respectively.

However, on day four, there was a significant effect of packaging and chemicals on the phenols content of the flowers. The jasmine flowers packed in 200 gauge polyethylene (T_3) and pre-treated with 4 per cent boric acid and packed in polyethylene (T_4) recorded significantly lower levels of total phenols with 53.74 and 50.90 µg/g respectively. Whereas open tray (control-T_1) and gunny bag (T_2) treatments recorded higher total phenols content of

59.21 and 61.80 µg/g respectively. These results are closer to the values reported by Karuppaiah *et al.* (2006) and Nirmala and Reddy (1992) in *J. sambac*.

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FIGURES AND TABLES

Figure-1 Shows the effect of pre-treatment and packaging materials on total phenols in jasmine flowers

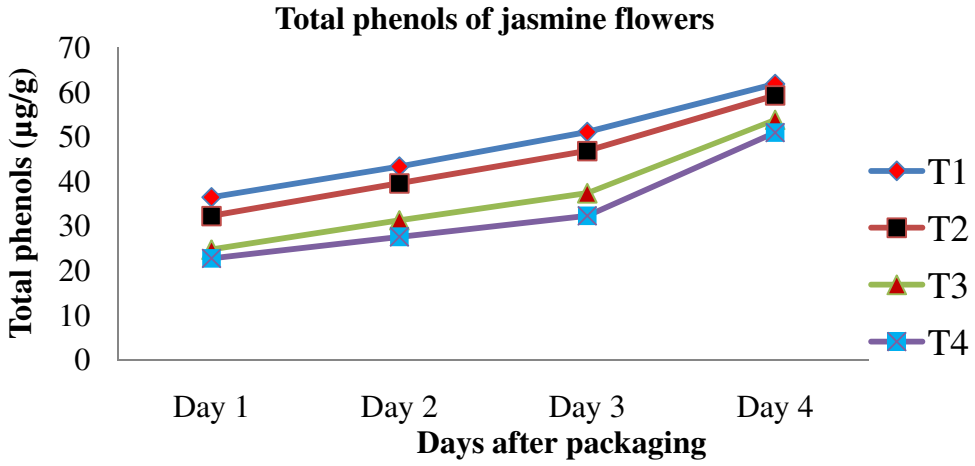

Table 1. Effect of pre-treatment and packaging materials on total phenols (µg/g) of jasmin flowers

Total phenols(µg/g)				
Treatments	**Day 1**	**Day 2**	**Day 3**	**Day 4**
T_1	36.42	43.29	51.02	61.8
T_2	32.20	39.51	46.76	59.21
T_3	24.66	31.22	37.31	53.74
T_4	22.68	27.52	32.21	50.9
S.Em ±	**0.53**	**0.65**	**0.77**	**1.03**
CV	**3.19**	**3.20**	**3.21**	**3.17**
CD (1%)	**2.54**	**3.11**	**3.68**	**4.90**
Factor	**S**	**S**	**S**	**S**

T_1 - Open tray (control), T_2 - Packaging in gunny bag, T_3 - Packaging in polyethylene (PE), T_4 - Pre-treatment with 4 per cent boric acid + packaging in polyethylene (PE)