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CHANGES IN PHENOLIC CONTENT DURING SENESCENCE OF *TITHONIA ROTUNDIFOLIA* BLAKE CUT FLOWER

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ABSTRACT: Complexity of flower bud opening illustrate that various biological mechanisms are involved at different stages. As the flower petals are often the plant organs with the shortest life span, they provide an excellent model system for the study of underlying mechanism and control of senescence that is generally rapid and predictable. During flower senescence, developmental and environmental factors enhance the up-regulation of catabolic processes leading to breakdown and remobilization of cellular components. So during present study changes occur in total phenol content during petal senescence were studied. During present study estimation of total phenol was done from all the stage of *Tithonia rotundifolia* Blake flower petals. Reduction in the total phenol was observed till the pre-senescent stage and at senescent stage the value was found increased but not as much as first stage.
Key words: *Tithonia rotundifolia Blake,* Phenol, Senescence.

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INTRODUCTION

The invigorating beauty of flowers have always fascinated and enthralled people around the globe over the ages. Their beauty lies in their suppleness, their pleasant aroma and their diverse colors. From aesthetic as well as commercial consideration, flowers are important in India. Flower senescence is the extreme phase of developmental processes which leads to the death of flower and includes fading of blossoms, petal wilting, and shedding of flower parts. Petal senescence has been shown to be genetically programmed and involves degradation of proteins, lipids, carbohydrates and nucleic acids [1-9]. Petal senescence has been found to be accompanied by an increase in the activity of catabolic enzymes, ion leakage and nuclear fragmentation. Increased recognition of the importance of phenolic compounds in plant metabolic activities is well known.

The present study focuses on the estimation of phenolic compounds during senescence of petals of *Tithonia rotundifolia* Blake cut flower. Flower of *Tithonia rotundifolia* Blake is well shaped and different organs can be easily separated, these characteristics make a good model system for flower senescence studies.

MATERIALS AND METHODS

In order to study the status of phenols and the changes in it during the senescence period in uncut *Tithonia rotundifolia* Blake flowers, biochemical estimation were done using dry flower petals. The plants grown in the experimental plots of the botanical garden of the department served as the source of the material. It was observed that the uncut flowers of *Tithonia rotundifolia* Blake remained fresh on the plant for 3 days with 4th day as the senescent day at which the petals started abscising. Thus, 4 stages were defined as follows:

Stage 1: Flowers that had just opened (Day 1)
Stage 2: After 24 hours (Day 2)
Stage 3: After 48 hours (Day 3)
Stage 4 (Senescent stage): After 72 hours (Day 4)

In order to carry out the estimation of total phenols from dry material, the petals were collected from the plants according to stages mentioned and were collected and packed separately with proper labels. Then they were placed in oven at 80 ºC for drying for 24 hours till constant dry weight is achieved. 100 mg dry petals were homogenized with 10 ml ethanol and centrifuged for 20 minutes. Supernatant-1 was collected and residue was further centrifuged with 10 ml ethanol. The combined ethanolic extract (supernatant 1+2) was used extracts for estimation of total phenol. Total Phenols content assay [10]: 1 ml of ethanolic extract was taken and 1ml of 20% solution of Na_2CO_3 was added. Thereafter, 0.5 Folin - Ciocalteau reagent were added and the absorbance was measured on a spectrophotometer at a wavelength of 650 nm. The results were expressed as mg phenols per gram dry petals. The experiments was performed with ten replicates per stage.

For statistical analysis, means were based on ten replicates for each stage and the standard error was computed. It was also statistically examined by One-way ANOVA calculated at 0.05% level of significance.

RESULT AND DISCUSSION

Phenols are aromatic benzene ring compounds with one or more hydroxyl groups produced by plants mainly for protection against stress. The functions of phenolic compounds in plant and interactions with biotic and abiotic environments are difficult to overestimate [10]. Phenolics play important roles in flower for pigment biosynthesis. As shown in figure-1 it was found that the amount of total phenols had a decreasing trend till pre senescent stage (stage 3) and at senescent stage (stage 4) the values were found to increase. This reduction is presumably due to possible oxidation of phenolic compounds by the enzymes. Lowered phenol levels result in lowered protection of petal tissue against oxidative stress and hence leads to progressive changes towards abscission [11].

Increase in the level of total phenol in senescent stage suggest that possibly at this stage the accumulation of free radicals and ROS was high with much low POD activity favouring the situation. Similar finding was reported by Vidhya Sankar [12] and Bhattacharjee [10]. During statistical analysis it was found that, the contents of total phenols were significantly different among all the stages of *Tithonia rotundifolia* Blake (Table-1).

Table-1: Showing ANOVA summary for Total Phenol (mg / gm dry petals) in cut flower petals.

Metabolite	Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Squares (MS)	F Ratio	Table Value of F
Total Phenol	Between groups	16.350	3	5.450	50.582	4.07*
	Within groups	0.862	8	0.108		
	Total	17.212	11			

* at 0.05 level of significance

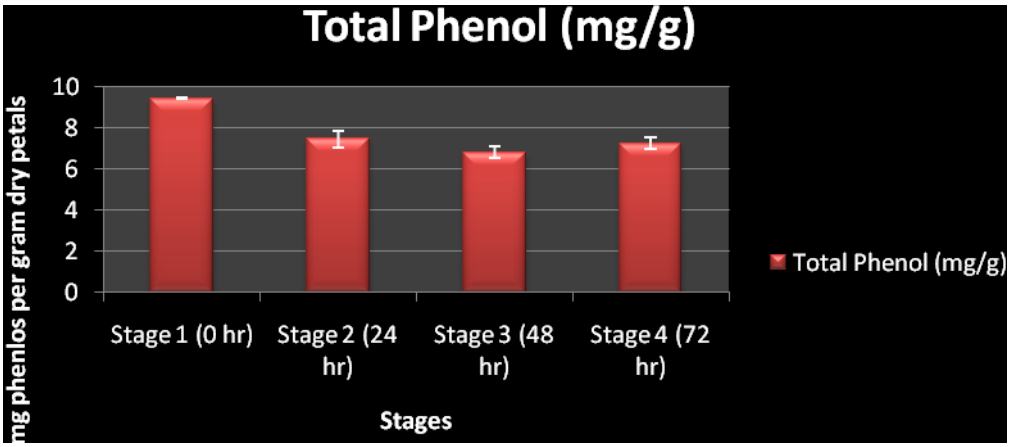

Figure-1: Showing Total phenol content (mg/ gm dry petals) in cut petals of *Tithonia rotundifolia* Blake.

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 [13]. Polyphenols can be oxidised by peroxidase and PPO. The higher value of total phenols during flower opening has been suggested to be due to their antioxidant prosperities and the role scavengers play during senescence [14]. Recently, the increment of antioxidants in broccoli florets has been related to the increment of phenols in the tissues [15]. Desai *et al*., [16] reported that the amount of total phenols had a decreasing trend with the progressing stages of *Tagetes erecta* L.

Paull *et al*., [17] reported an increase in the concentration of tissue phenolics during senescence. As suggested by Schmitzer *et al*., [18] at late senescence stage there will be low phenol content which makes the plant more susceptiable to oxidative stress that leads to accelerated necrosis. Our observation also supports this opinion as it was found that total phenolics content of the *tithonia* cut flowers used in our experiment was gradually reduced till stage 3. The higher value of total phenols during flower harvest has been suggested to be due to their antioxidant proprieties and the role scavengers play during senescence [14]. The total phenols decreased till stage 3. This could possibly because of stress condition caused to the flower as a result of detachment from the mother plant. Total phenols tended to decrease during flower senescence in "Raktagangha" roses 12, 10]. The decrease in the phenol content was detected in miniature rose "KORcrisett" [19].

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