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Research Paper

Petal Senescence in Uncut *Tithonia rotundifolia* Blake: Role of Starch.

Botany

KEYWORDS : *Tithonia rotundifolia* Blake, Starch, Petal senescence

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ABSTRACT

The senescence of flower petals is associated with a series of physiological and biochemical changes. Different flower parts senesce at different rates. Estimation of starch content was studied from first stage to senescent stage of Tithonia rotundifolia Blake flowers in uncut conditions. The amount of starch had a decreasing trend with first stages. After that it shows very less remarkable change till the senescent stage. The products of this starch breakdown could have been used up by the flower petals or might have been transported out of the ray florets.

Introduction:

Flower provides an excellent system for the study of senescence. Flower opening and petal senescence are highly controlled biological events critical in the life cycle of flowering plants. Flower is an actively metabolizing system and carries out all its metabolic activities at the expense of stored food in the form of carbohydrates, proteins, and fats. They are often the plant organs with the shortest life span and as such provide an excellent model system for study of underlying mechanism and control of senescence as it is generally rapid and predictable. Various changes during petal senescence include an increase in hydrolytic enzymes, degradation of macromolecules, increased respiratory activity, and loss of cellular compartmentalization due to leakiness of cell membranes. Senescence of petals is marked by changes in membrane properties especially, membrane phospholipids and hence, membrane permeability, eventually leading to loss of cellular compartmentation and mixing of metabolites thereby, causing death of cells (Halevy and Mayak 1981).

Material and Method:

In order to study the starch status and the changes in it during the senescence period in uncut *Tithonia rotundifolia* Blake flowers, biochemical estimation were done using dry flowers. 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 when the petals started abscising. Thus, four 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 96 hours (Day 4)

Collection and preparation of material for biochemical estimations: In order to carry out the estimation from dry material, the ray florets were collected from the ray florets from every stage (every 24 hours) of flower starting from the day it opened till its senescence. Every day the field was surveyed in the morning and the flowers which had just opened were tagged. These flowers were considered as stage 1 (0 hr.) flowers. Ray florets from some of the stage 1 flowers were collected and packed separately with proper labels. Similarly, ray florets for Stage 2 (24 hrs.), Stage 3 (48 hrs.), stage 4 (96 hrs.) (senescent stage) flowers were also collected. These ray florets were then placed in the oven at 80° C for drying. In order to study the changes in the starch, the biochemical estimation was done from the 100 mg dry material of all stages of *Tithonia rotundifolia* Blake. Starch was estimated by Chinoy's method (Chinoy, 1939), the results of which are expressed as mg starch equivalents per g ray florets.

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:

The starch content was found to be significantly different in all the stages. (Fig- 1). It was also observed that starch content decreased till 2nd stage and slightly increased during 3rd stage. Again it slightly decreased during 4th stage (Fig-1). Koch (1996) reported that sugar accumulation favors expression of enzymes associated with the biosynthesis, utilization, and storage of starch. This justifies the rise in the starch content on the 3rd stage. The decreasing trend in the amounts can be related with the breakdown of starch. The products of this starch breakdown could have been used up by the flower petals or might have been transported out of the ray florets. Halevy and Mayak (1979) stated that petal senescence is accompanied by the consumption of starch as respiratory substrates. A drastic decrease in the starch concentration was observed during the first stage of senescence and a constant but slower decrease in the starch concentration occurred thereafter (Ferreira and Swardt, 1980).

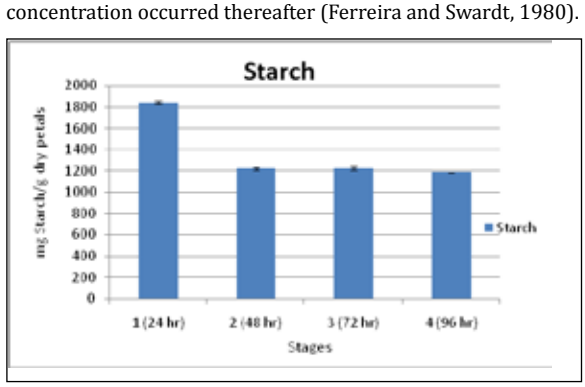

Fig-1: Starch (mg/g dry ray florets) in uncut flower petals of *Tithonia rotundifolia* Blake

Distinct changes take place in carbohydrates during senescence as they are the primary source of energy in the course of respiration of activately metabolizing tissue. Starch is one of the form of carbohydrates which serves as substrate for respiration

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(Coorts, 1973). The content of carbohydrate and dry weight of petals during the final stages of flower development has been reported to be declining by many workers (Coorts 1973, Halevy and Mayak 1979). The decrease in starch content during senescence happens because all starch is converted to sugar in order to serve as substrate for respiration, but after it exhausts, the respiration rate falls and leads to senescence (Buxton and Stoltz, 1977). This has also been reported by Ferreira and Swardt (1980), Ho and Nichols (1977) and at stage 6 (presenescent stage) a steep decrease in the amount was observed. This suggests that with the onset of the senescence, probably the demand of carbohydrates increased very much and to suffice this demand the starch was broken down.

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Table-1(a): ANOVA Summary table for Starch in uncut flower petal.

ANOVA					
Source of Variance	Sum of Squares (SS)	Degree of freedom (DF)	Mean Square (Ms)	F Ratio	Table value of f
Between Groups	4951.450	3	1650.483	3.576	4.07*
Within Groups	3692.640	8	461.580		
Total	8644.090	11			

*** at 0.05 level of significance**

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