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Examination of Flower Bud Initiation and Differentiation in 'Redhaven' Peach by Using Scanning Electron Microscope

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Abstract: Flower initiation and development in 'Redhaven' Peach (*Prunus persica* L.) was examined using scanning electron microscope. The samples were taken every 10 days from 20 June to 10 Oct. and stored in FAA (10% Formalin, 50% Ethanol, 5% Glacial Acetic Acid). On July, 7, 107 days after anthesis (DAA), a doming of the apex signified the initial change from the vegetative to the reproductive stage. After this stage, floral primordia developed in the order of sepal, petal, stamen and carpel. Sepal primordia were evident on 22 Aug. 153 DAA, petal primordia were evident on 31 Aug. 162 DAA. Rings of stamen primordia had formed by 15 Sep. followed by carpel differentiation. These organs of the flower gained their normal forms by the end of September.

Key words: *Prunus persica*, bud differentiation, flower primordia

INTRODUCTION

Flower bud initiation has significant importance in the fruit cultivation due to dependence of fruit formation on flower initiation. Flower bud initiation occurs through a biochemical signal. This biochemical signal makes it possible for the tissue of the floral bud to change it from vegetative to reproductive state in a programmed maner. This biochemical signal occurs as a result of the balance of GA_3, auxin, cytokinins and ethylene like hormones[1].

Flower bud initiation in almond trees is known to occur at the time of stoppage of shoot development after harvest[2], whereas in sour cherry, the apex was scanned 28 days after anthesis[3]. In another study conducted on sweet cherry in Yugoslavia, no direct relationship has been found between flower bud initiation and fruit formation. The flower bud initiation starts at the same time (15th June) in Primavera (early cultivar) and Lambert (late cultivar) inspite of different times of their maturations[4].

In pear and sweet cheery trees, growth retardants like daminozide (SADH) used to inhibit the biosynthesis of GA_3 has been found to encourage the flower bud initiation[5]. GA_3 inhibits flower bud initiation in some prunus varieties[6]. GA_3 application, at the stage of morphological differentiation, in some peach cultivars affects the flower thinning and delay in flowering[7]. Therefore, the presence of floral bud initiation and differentiation in peach tree helps to choose correct time of cultural practices to be performed. The knowledge about the time of different stages of flower bud initiation is important in order to increase the flowering area in the canopy and to get regular yield every year. For example in peach tree, the outer shoots in a canopy are more exposed to sunlight than the inner shoots. The fruits from the outer canopy are of high quality because shoots in that area provide photo assimilates for the development of fruit in high quantities.

This study describes the morphological changes at the apex of axillary buds of peach (Cv. Redhaven) shoots during flower formation as determined by SEM.

MATERIALS AND METHODS

This study was conducted on the peach 'Redhaven' orchard belonging to Ege University, Faculty of Agriculture, Department of Horticulture. Fifteen buds uniform in size and vigor were collected at every 10 days from 5 trees with effect from 20 June to 10 October in 2001. The samples were fixed and stored in a solution of FAA (10% Formalin, 50% Ethanol, 5% Glacial Acetic Acid). Ten buds from each sample were dissected using an Olympus SZ 60 stereomicroscope before processing for Scanning Electron Microscopy (SEM).

Buds were rinsed twice (10 min each) in 50% ethanol (EtOH) to remove the FAA from the plant tissue and were kept in 50% EtOH during disection to prevent desiccation. Later the samples were dehydrated in an EtOH series (50, 70 and 95% for 10 min each), then twice in 100% for

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10 minute each[18]. The samples were dried and stored in a desiccator.

The samples were mounted on stainless–steel stubs with carbon tape before being gold coated with a sputter coater (Polaron SC 502). The samples were examined with a scanning electron microscope (Deol ISM 5200). The photographs of morphological differentiation of the samples examined were taken with the camera attached to SEM.

RESULTS AND DISCUSSION

The use of SEM showed the time frame for initiation of visual changes from a vegetative to a reproductive state in peach buds. Figure 1 illustrates selected stages of development and Table 1 summarizes all observations.

Flattening of the apex marks the change from vegetative to the reproductive phase[2]. This phase had occurred on July 7 (Fig. 1A) 107 DAA. Westwood[1] reported that, this phase is affected by annual environmental conditions especially temperature. In peach tree, this phase has been reported to occur during the month of July. Similar results have been recorded in the present study. The apex continued to grow and took a shape of cylinder on July 27 (Fig. 1B). The sepal primordia changed to pentagonal whorl (Fig. 1C). The rounded apices of the flower primordia gradually became concave[9]. Petal primordia were evident on 31 Aug. Stamen primordia became visible on September 15 and completed its development by forming 1st, 2nd and 3rd line of stamen primordia[8]. At the final stage the carpel developed on 24 Sept. (Fig. 1D).

Table 1: Time taken for flower primordial development stages in 'Redhaven' peach

Sample date	Days after anthesis	Figure	Observation of morphological development
7 July	107	1A	Apical meristem beginning to round
27 July	127	1B	Apex rounded, bracts formed
22 Aug.	153	1C	Sepal primordia developing
15 Sep.	177	1D	Sepal, petals, stamen and carpel differentiating

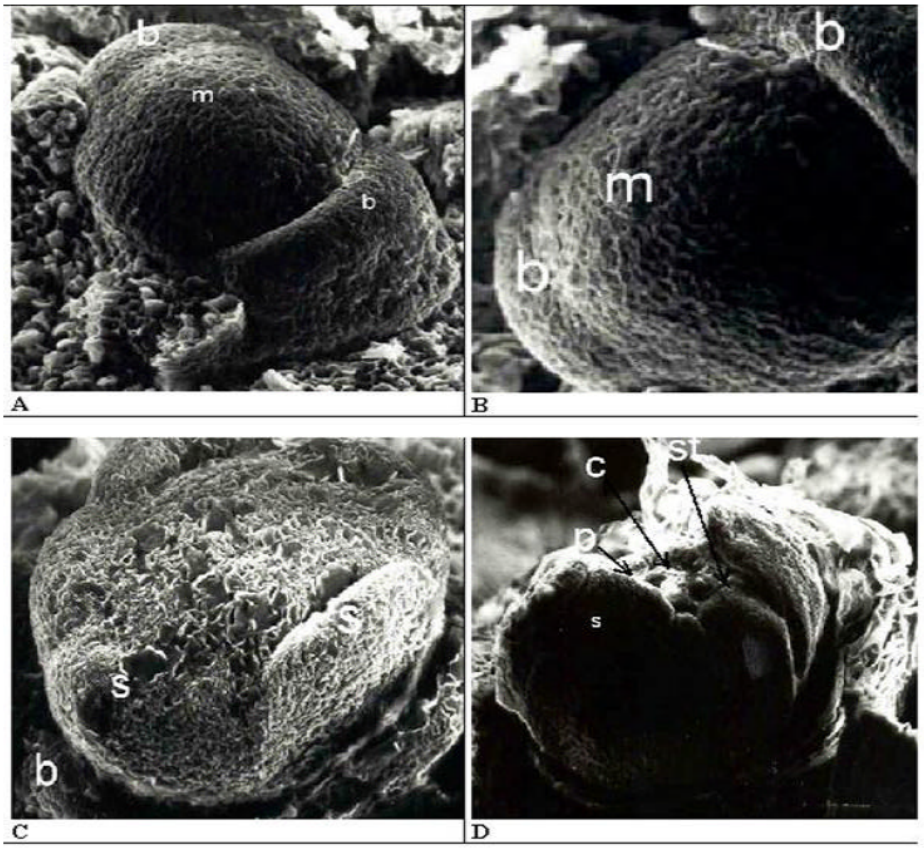

Fig. 1: SEM photographs of Redhaven peach buds showing primordial changes during flower initiation. A: Initial phase of change from vegetative to reproductive stage, showing rounded meristem (m) and 2 bract primordial (b), July 7, X 500. B: Flattened meristem with 2 bract primordial, July 27 X 500. C: Sepal primordial (s) in pentagonal whorl, Aug. 22. X 500. D: All floral organs differentiated, including sepal (s) petal (p) stamens (st) and carpel (c), September 15. X 200

These observations described the morphological changes at the apex of axillary buds of peach shoots during flower formation. The knowledge of these morphological changes will help to chalk out the correct time of application of cultural practices aimed to increase yield.

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