

HISTOLOGICAL STUDIES ON CLUSTER'S ABSCISSION IN *VITIS VINIFERA* L.

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Abstract

The mechanism of inflorescence abscission was investigated by microscopic observations on longitudinal sections of buds during bud-burst. Cuttings of Italia cultivar were used for this study. The results indicated that the abscission of clusters was associated with the formation of the abscission layer. The zone was formed during the stage E of bud-burst according to Baggioini. It was developed in the part of the first branching of the cluster, adjacent to the first bract. It was composed of 5-8 layers of cells. These cells were less rigid and showed poorer cementing properties than those neighbouring cells.

In rare cases, very little number of clusters were transformed into tendrils. They were only those clusters which were born already, having tendrils as the first branch.

INTRODUCTION

In some cultivars of *Vitis vinifera* L. many physiological factors interfere from bud burst to bloom, causing the disappearance of a certain number of clusters. This phenomenon received the name "filage" by the french authors (Branas 1957 and Rives and Havin 1966). Previous investigations (Khalil and Ghobrial, 1991) indicated that the mean percentage of abscission of clusters in some vineyards grown at El-Kanater El-Khairia reached 9.3% in 1987, 8.3% in 1988 for Thompson Seedless grapes and 10.8% in 1987, 6.6% in 1988 for Italia cultivar. Abscission of clusters occurred during the stages F and G according to Baggioini, 1952. Afterwards this process did not take place until flowering.

The effects of some plant growth regulators (GA₃ and Alar 85) on the abscission process of inflorescences in Roumy Ahmar grapes were also studied by Khalil and Eid Abd-El-Fattah (1993) in some vineyards at Menia Governorate. Treatments were done 15 days before bud-burst. The results indicated that GA₃ treatments at 5 microgram / bud and 10 microgram / bud caused high percentage of clusters abscission in both years 1989 and 1990. Moreover the growth of tendrils was promoted by GA₃ treatments which brought about the transformation of the first branch of the cluster into tendril.

The aim of the investigation was to study the mechanism of clusters abscission during bud burst .

MATERIALS AND METHODS

The mechanism of inflorescences abscission was investigated by microscopic observations on sections of buds during the process of bud burst . Cuttings of Italia cultivar were used as plant material for this purpose .

From a productive vineyard planted with Italia cultivar , 400 cuttings were selected for this study . The grapevines were grown at El – Kanater El – Khairia region . They were 20 years old , visibly uniform in vigour . They were head trained , planted 2 meters apart between rows and vines . Each bearing unit contained 5 buds . The cuttings were chosen from the bearing units during winter pruning . They were planted in the nursery in late February 1993 and 1994 . Only the top bud was left above the soil level and was covered with a mound of loose soil. Shallow irrigation was done every two weeks. Soil was kept thoroughly moist until the cuttings rooted . Afterwards irrigation process was regularly applied . When bud burst commenced a group of buds was taken to the laboratory every 7 days for the histological study.

Observations were taken every two days on the remaining cuttings to notice and to report all informations concerning the abscission of inflorescences . Samples of buds during bud – burst were also taken from vines as comparable samples for the histological study .

For this purpose buds were fixed in formalin , acetic acid and alcohol (F. A. A.) , dehydrated , embedded in paraffin and sectioned at 10 μ by standard microtechnique (Johansen 1940) all sections were stained with Heidenhain'Iron Haematoxylen .

RESULTS AND DISCUSSION

Abscission of clusters occurred in all cuttings . The young shoots were dependent on carbohydrate reserves in cuttings and these reserves were soon depleted . Therefore all clusters dropped .

Data in Table 1 showed that the clusters abscission happened in the stages F and G of Baggioolini. Number of clusters abscission in the stage of F was higher than that in the stage G of Baggioolini.

The results showed also that 80% of the clusters abscission happened in the stage F and only 20% of the clusters dropped in the stage G of Baggiolini .

The histological study revealed that the abscission of inflorescences in *Vitis vinifera* L. cultivar Italia was associated with the so called "abscission layer". This zone of cells was formed during the stage E of bud – burst according to Baggiolini 1952 . It was developed in the part of the first branching of the inflorescence , adjacent to the first bract . Inflorescence separation did not occur at their point of attachment to the stem, (Fig. 1).

The abscission layer was composed of 5-8 layers of cells as was shown in Fig. (1 & 2). These cells had less affinity for the haematoxylin dye than the neighbouring cells . Their walls were generally less rigid and showed poorer cementing properties than those of cells proximal or distal the abscission zone .

It seems that chemical changes in cell walls bring about the separation of inflorescence. Two types of dissolution phenomenon are listed :

- 1 – removal of the middle Lamellae.
- 2 – removal of the middle Lamellae and part of the primary wall (Esau 1965).

There was no cell enlargement during the separation process. Furthermore , there was no evidence of cell division . After separation of the cells of the abscission layer the inflorescence remains attached only by the vascular elements .These, soon snap off under the pull of gravity or the pressure of the wind and the inflorescences fall from the plant .

The early development of the abscission layers were shown in Figs. (1) and (2). The separation zone was formed adjacent to the bract . It was noticed in the right periphery (Fig. 1) that the cells showed less affinity to the dye . Cell walls were evidently thin. The separation layer was conspicuous in the middle part at the level of the bract .

An interesting view was observed also in (Fig. 2) Cells collapse happened and the inflorescence was dropping.

Transformation of inflorescences into tendrils:

Tendrils of *Vitis vinifera* L. are morphologically homologous organs to inflorescences (Bugnon 1953) , (Khalil 1961), (Srinivassan and Mullins 1981) and can be regarded as potential reproductive organs.

Branas 1957 , Rives and Hevin 1966 reported that the disappearance of clusters (Filage) could be regarded as regression of inflorescences into tendril . During the performance of these studies , the phenomenon abscission of clusters occurred in a percentage of clusters during the stages F and G of Baggio line. It was found in rare cases that transformation of inflorescences into tendrils could happen.

The longitudinal section in Fig. (3) shows a cluster having a tendril as the first branch . The collapse of cells began from the periphery in the right side reaching the left side above the tendril part . We think that the result would be the abscission of the cluster part leaving the tendril to grow .

This phenomenon was observed also in (Fig. 4) . The abscission of the cluster was happening, leaving the tendril part to grow. The particular cases which were presented suggest an hypothesis. The authors reported that in rare cases a very little number of clusters could be transformed into tendrils . They are those which have already tendrils as the first branch .We have shown before in a previous study (khalil and Ghobrial 1991) that in cultivar Italia 15% circa of the clusters were born cluster tendril , having a tendril as the first branch . Only in these clusters the phenomenon transformation of cluster into tendrial could happen as described before and this process occurs only in early stages of bud burst and exactly in the stage F or G of Baggio lini .

Table 1. Number of cuttings planted in each row, number of clusters developed and the stage of clusters abscission.

Row	Number of cuttings	Number of Clusters developed	Stage of abscission
1	22	12	F.Baggiolini
		1	G.Baggiolini
2	24	8	F.Baggiolini
		5	G.Baggiolini
3	25	13	F.Baggiolini
		3	G.Baggiolini
4	25	9	F.Baggiolini
		4	G.Baggiolini
5	24	8	F.Baggiolini
		7	G.Baggiolini
6	25	9	F.Baggiolini
		3	G.Baggiolini
7	23	13	F.Baggiolini
		1	G.Baggiolini
8	22	9	F.Baggiolini
		2	G.Baggiolini
9	21	11	F.Baggiolini
		1	G.Baggiolini
10	26	10	F.Baggiolini
		3	G.Baggiolini



Fig. 1. photomicrograph of longitudinal section illustrating the early development of the abscission layer . It was formed in the part of the inflorescence adjacent to the bract b. The cells in the middle and in the Periphery had less affinity for the dye. The section was done during the stage E of bud burst according to Baggioini (1952) .

A & B : same section , b : bract abs : abscission layer.



A



B

Fig. 2. An interesting view, cells separation and cells collapse happened , the inflorescence was dropping . Inflorescence separation did not take place at its point of attachment to the stem. It occurred in the part of the cluster adjacent to the bract. b.

A & B same section.

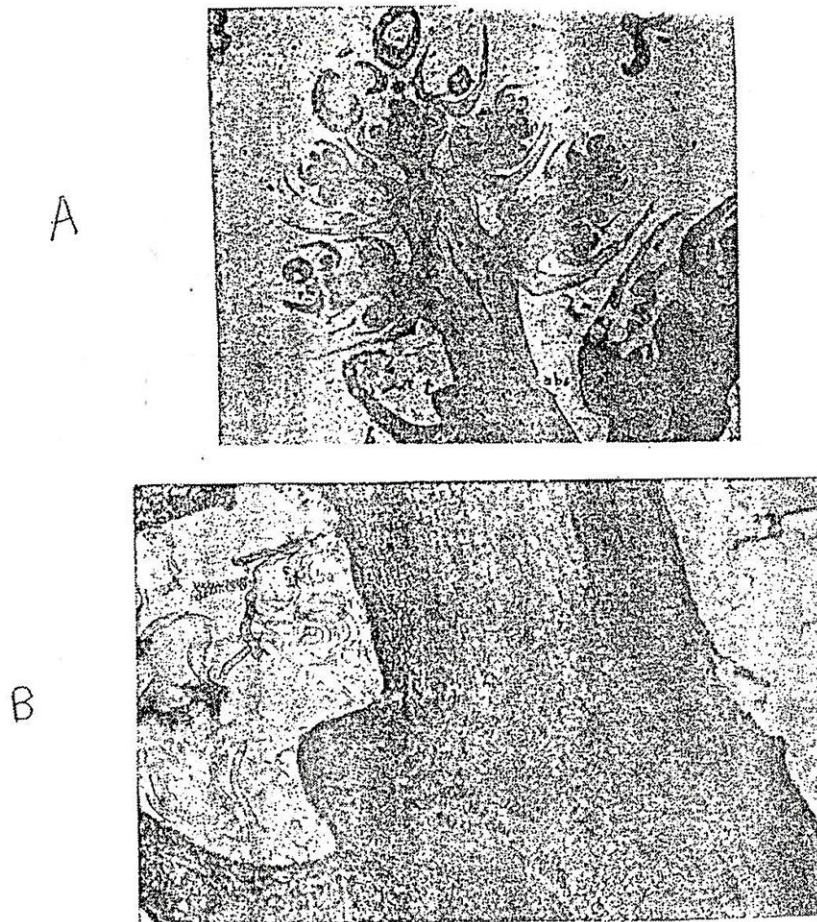


Fig. 3. Photomicrograph of longitudinal section illustrating the inflorescence of Italia cultivar in the stage F of Baggioini. The inflorescence showed signs of abscission. The abscission layer (abs) was clear. Separation and collapse of cells were evident. It was noticed that the inflorescence had a tendril primordium as the first branch. the collapse of cells began from the right side reaching the left side above the tendril. The final results would be the abscission of the cluster leaving the tendril to grow. In this section, replacement of cluster into tendril was taken place.

b = bract, t = tendril primordium



Fig. 4. Shows the photomicrograph of the longitudinal section during the stage F of Baggioini of a cluster of Itala cultivar having a tendril as the first branch. The collapse of cells began from the periphery in the left reaching the right side above the tendril. The result would be the abscission of the cluster part leaving the tendril to grow. The cluster was transforming into tendril.

b = bract t = tendril primordium .

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دراسات تشريحية على تساقط العناقيد فى العنب الأوربي

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الغرض من إجراء هذا البحث هو دراسة تساقط نورات العنب الأوربي تشريحيًا وذلك بفحص قطاعات طوليه لبراعم العنب أثناء تفتحها . وقد استخدمت عقل العنب صنف إيطاليا لهذا الغرض.

وتدل النتائج أن تساقط العناقيد تكون مصحوبة بتكوين منطقة الانفصال فى بادئ الأمر وتتكون هذه المنطقة فى الطور الخامس للتفتح طبقا لباجرلينى . وتنشأ هذه المنطقة عند بداية تفرع العنقود بجوار أول ورقه متحوره وتتكون من 5 - 8 طبقات من الخلايا ذات جدر اقل سمكا من الخلايا المجاورة .

وقد لوحظ انه فى حالات نادرة تتحول بعض العناقيد الى محاليق وقد اتضح أن هذه العناقيد هى التى نشأت أولا ولها فرع محلاقى.