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Embryo Abortion in Some New Seedless Table Grape (*Vitis vinifera* L.) Varieties

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Abstract: Three new hybrids varieties, were obtained by the Viticulture Research Institute in Tekirdağ. Barış (Cardinal X Beauty Seedless), Tekirdağ Çekirdeksizi (Alphonse Lavallée X Sultani Çekirdeksiz-Thompson Seedless) and 2B-56 (Elhamra X Perlette) were used in this research. Ovule and embryo development was studied on the samples which were taken 5, 10, 15, 20 and 25 days after full bloom. It was found that in which development stage embryo was aborted. The embryo development in samples were examined with Paraffin section method. In three seedless varieties, in generally, it was found that the embryo abortion was occurred at the development stage of 5 and 10 days after full bloom. It was concluded that in these seedless varieties, embryo abortion was occurred at the stage of megasporogenesis, because of defective ovary, the embryo couldn't show a complete development and finally it was aborted.

Key words: Seedlessness, stenospermocarpy, ovule and embryo development, megasporogenesis, *Vitis vinifera* L.

INTRODUCTION

Seedless table grape varieties were preferred by grape consumer everywhere in the world. For this reason intensive studies to obtain new seedless varieties, were gone on a lot of countries. Grapes are the world's most widely-grown fruit crop. Breeding of this crop has been mainly based on intra and interspecific hybridization. However, like many other fruit crops, production of novel grapevine varieties by these conventional methods is difficult and time consuming because of the long generation cycle and high levels heterozygosity.

Turkey has a very suitable ecological condition for table, wine and dried grape growing. Every year, 3,650,000 tones fresh grape was produced from the 565,000 ha in Turkey.

Seedlessness in grapes is a result of stenospermocarpy. In these varieties a form of fruit set in grapes where pollination and fertilization occurs and seeds form, but soon embryo abort. Berries, however, continue to mature and usually contain only rudimentary seeds (e.g., in Thompson Seedless). The main reason stenospermocarpic seedlessness was not clearly understood up to now. Definition of stenospermocarpy firstly has been reported by Stout^[1] and his explanation refer to only rudimentary seeds.

Stenospermocarpic seedless berry form has been reported a lot of researchers^[2-13].

In ovary inner and outer integument don't develop and don't contain scleranchymatous tissue in the centre

of these integument that caused degeneration of cells and embryo abortion after fertilization and also micropile generally remain open in these varieties.

MATERIALS AND METHODS

In this research three seedless varieties [Barış (Cardinal X Beauty Seedless), Tekirdağ Çekirdeksizi (Alphonse Lavalée X Sultani Çekirdeksiz), 2B-56 (Elhamra X Perlette)] were used which were obtained from Tekirdağ Viticulture Research Institute by hybridization. Samples were collected at 5, 10, 15, 20 and 25 days after full bloom and placed fixed FAA (Formaldehyde 37-40%+Glacial acetic acid 45%+Ethanol 96%) solution up to dehydration and examined with paraffin section (10 µ slice) method, staining with Hematoxyline and then put into fixed preparative and taken microphotograph's from these to explain embryo abortion phases^[4,5,16-24].

RESULTS AND DISCUSSION

Seven days (Fig. 1a) before full bloom in Barış variety inner integument over the outer integument and micropile stayed open. Fifteen days after full bloom, integuments, endosperm and seed coat became wrinkling and shrinking. Seed coat seen as a rudimentary. 15 days after full bloom embryo completely ceased and berry size increased without seed (Fig. 1b).

In Fig. 2 nucellus tissue became narrow (a: at anthesis), wrinkled and shrinkled (b) and endosperm stay

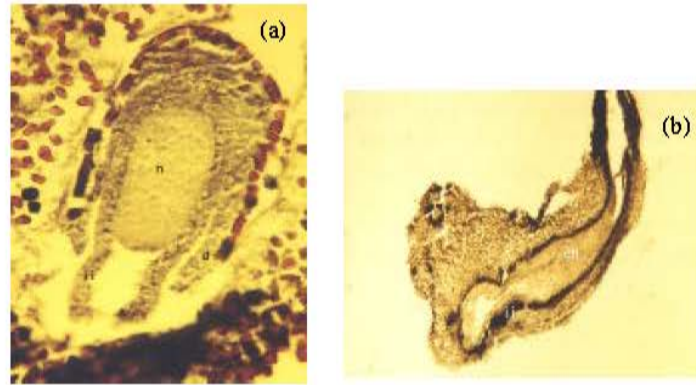


Fig. 1: Longitudinal section of grape ovary 5 days (A) and 15 days (B) after full bloom in seedless Barış grape variety (original)
 a: Length of inner integument over the outer integument and micropile stayed open (x20)
 b: After embryo abortion, Wrinkling and shrinking of endosperm and seed coat rudimentary (x4)
 n= nucellus, di= outer integument, ii= inner integument, en= endosperm

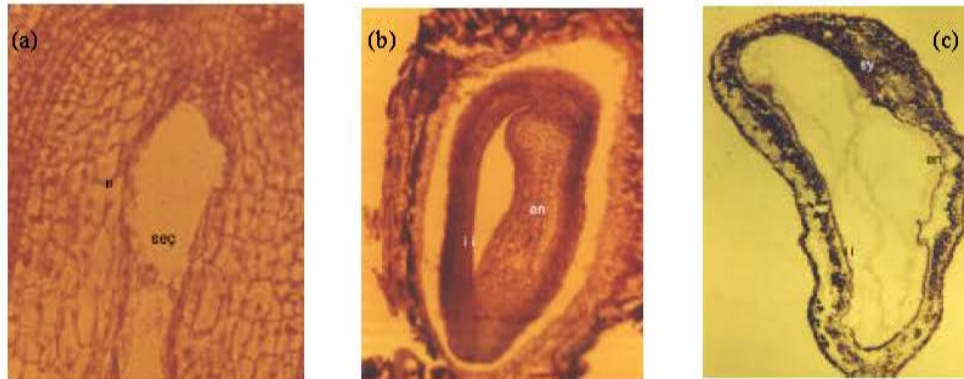


Fig. 2: Longitudinal section of grape ovary, at anthesis (a) (x40), 5 days (b) (x10) and 25 days (c) (x4) after full bloom in seedless Tekirdağ Çekirdeksizi variety (original)
 n = nucellus, seç= secondary endosperm nucleus, en= endosperm tissue, ii= inner integument, sy= chalasal point, (Endosperm and nucellus ceased and embryo aborted)

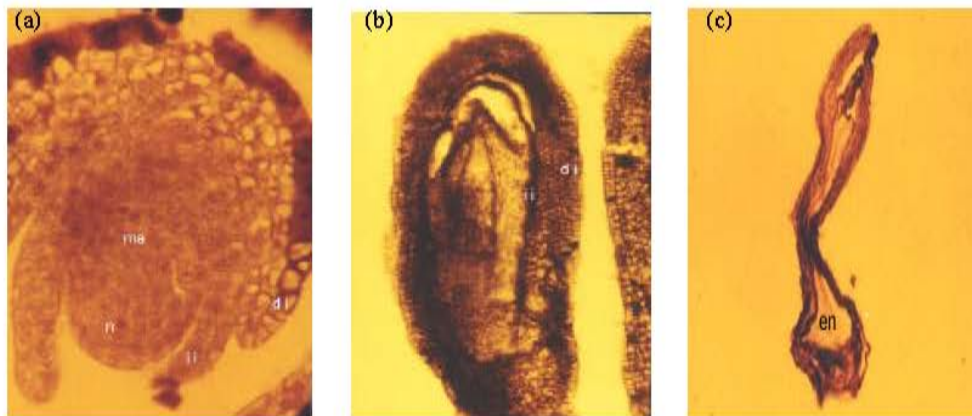


Fig. 3: Longitudinal section of grape ovary, 7 days (a) (x40) before full bloom, 5 days (b) (x10) and 25 days (c) (x4) after full bloom in seedless 2B-56 grape varieties (original)
 ma = megaspore mother cell, n= nucellus, ii= inner integument, di= outer integument, en= endosperm tissue

in stripline, embryo aborted then outer and inner integument united each other with closely pressed together 25 days after full bloom in Tekirdağ Çekirdeksizi (c).

2B-56 grape variety (Fig. 3) length inner integument passed outer integument and also micropile was opened 7 days before full bloom both of two integument. Every periclinal and anticlinal tissue formed in normally (3a). 5 days after full bloom embryo aborted and endosperm became narrowed (3b), wrinkled, shrinkled and seed coat completely stay as a rudimentary (3c).

In three seedless varieties, in generally, it was found that embryo abortion was occurred at the development stage of 5 and 10 days after full bloom. Dokoozlian^[25] said that pollination and fertilization occurred as normal, but the embryo aborts two to four weeks after fertilization. Kanamadi *et al.*^[26] reported that their research on stenospermocarpic grapes, post-pollination at 4-6 days after endosperm and zygote/embryo were degenerated. In this research get similar results, on stenospermocarpic varieties, have been pointed out by other authors^[4-6,9,11,13-15,23].

In ovary inner and outer integument don't develop and don't contain scleranchymatical tissue in the centre of these integument that caused degeneration of cells and embryo abortion after fertilization and also micropile generally remain open in these varieties.

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