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Research Article

**SEED STRUCTURE AND EMBRYO DEVELOPMENT OF SESELI  
RESINOSUM (APIACEAE)****Hanife İRİS \* & Ayşe KAPLAN \*\***

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**ABSTRACT**

*The male and female gametophyte development in Seseli resinosum Freyn et Sint were studied with a-light microscope. In order to study the embryology of Seseli resinosum Freyn & Synth that an endemic plant spreading in Zonguldak-Bartın region development of the seed and embryo have been examined. Embryo development of Seseli resinosum was solanad type. In the sections taken zygote, proembryo, 4-cell embryo, 8-cell embryo, spherical embryo, heart-shaped embryo stages were observed. There are differences in the participation of the integument in the formation of the testa. In Apiaceae, only the epidermis of the outer integument forms the seed coat. Since the fruit type is a schizocarp, the testa and the pericarp are inseparable. Testa was seen as 3 or 6 layers. The layers consist of thin-walled cells. The outermost layer is single row and its thickness is less than the other layers.*

**Keywords:** *Seseli resinosum, Apiaceae, Seed structure, Embryo development*

## 1. INTRODUCTION

The genus *Seseli* L., which belongs to the Apiaceae family, has economic importance. Dried base leaves are used as animal food, and the plant itself is used as an ornamental plant in gardens and parks. *Seseli* chemicals are used in medicine [1-2].

*Seseli resinosum* Freyn et Sint is an endemic species that is widely distributed in the Western Black Sea region of Turkey [3-4]. The environments that harbor the species are quite healthy. However, both the province of Zonguldak, Bartın and tourist destinations with / their sprawling communities represent a danger to which the species is vulnerable (VU) [5].

The author's previous study of the Apiaceae species, including *Aegopodium podagraria* L., *Bupleurum mucronatum* Wight et Arn., *Cuminum cyminum* L., *Coriandrum sativum* L., *Daucus carota* L., *Daucus muricatus* L., *Eryngium yuccifolium* Michx., *Ferula sinkiangensis* KM. Shen, *Foeniculum vulgare* Mill., *Hydrocotyle americana* L., *Osmorhiza longistylis* (Torr.) DC., *Pastica sativa* L., *Pimpinella diversifolia* D.C., *P. Candolleana* Wight et Arn., *P. heyneana* Wall., *P. bracteata* Haines, *P. monoica* Dallz., *Trachyspermum ammi* L. (Sprague), and *Zizia aurea* (L.) W.D.J. Koch., revealed that the embryogeny was Solanad type and that the embryo development was Polygonum type. The embryo sac may be mono-, bi- or tetrasporic, although the first type is predominant [6,7]

Since the fruit type is a schizocarp fruit, pericarp with testa inseparable. Testa was seen as 3 or 6 layers.

Testa consists of the outer / most layer of integument in the Umbelliferae family [8]

The purpose of this work is a detailed investigation of the seed structure and embryo development of *S. resinosum*.

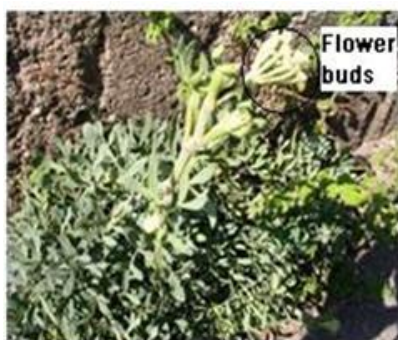
## 2. MATERIALS AND METHODS

In July and August of 2007-2009, 300 flower buds and 100 flowers in bloom were collected from plants that grew in the rocky fields of Bartın-İnküme and Zonguldak (Figure 1). The *Seseli resinosum* flower stems from compound umbels and hermaphrodite. Embryo and seed development in different stages of development were fixed in formaldehyde, acetic acid, ethanol solution (FAA, 5:5:90), stored in 70% ethanol, embedded in paraffin, serially sectioned (7-8 µm thick) with a Thermo-Shandon Finesse 325 rotary microtome and stained with hematoxylin [9-10].

For the development of embryos, longitudinal sections of flower bud samples are preferred [11].

Photomicrographs taken with a Nikon Eclips 200 and a Leica DFC microscope. Photomicrographs of the embryo and seed development.

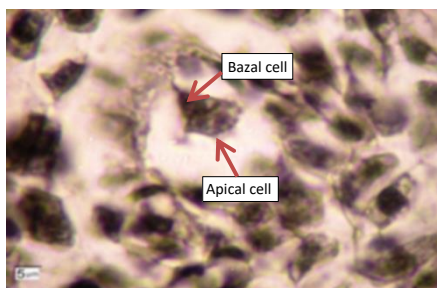
**Figure 1.** Photograph of the upper stem of *Seseli resinosum* showing flower buds.



### 3. RESULTS

#### 3.1. Solanad type embryo development

**Figure 2.** Proembryo, basal and apical cell

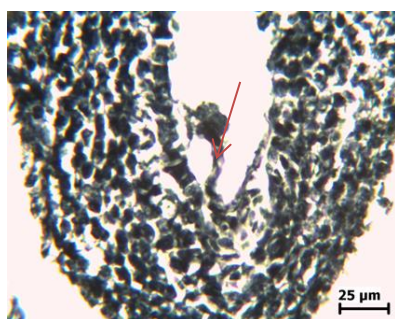


In angiosperms, the zygote is attached to the micropyl end of the embryo sac [12]. Zygote spends a short rest period and it is then divided into a transverse plane to form the basal and apical cell. The basal part and the embryo attach to the sac, and the apical part is located inside the sac (Figure 2).

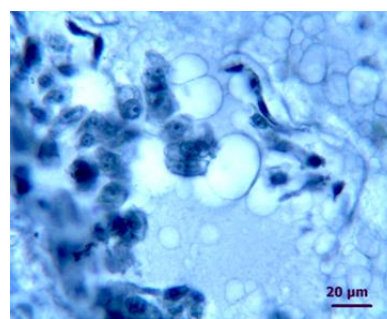
The basal cell forms the suspensor as a result of successive mitotic divisions. The suspensor binds the embryo to the embryo sac and pushes it into the endosperma [12]. In *Seseli resinosum*, single-stranded filament suspensors were distinguished (Figure 3A).

**Figure 3.(A-D).**

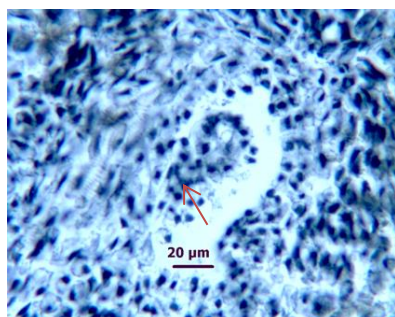
- A. Suspensor, 4-cell proembriyo.
- B. 8-cell proembriyo.
- C. spherical embryo.
- D. Heart shaped embriyo



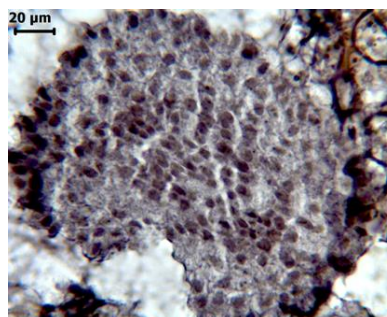
**A**



**B**



**C**



**D**

In most angiosperms, the zygote is transversely divided and an apical cell into the embryo sac and a large basal cell into the micropile. Depending on the transverse and length division of the apical and basal cells, 8-cell proembryo formation is also observed. (Figure 3B).

### 3.2. Structure of testa

The fruit is a schizocarp fruit, the testa and the pericarp are inseparable (Figure 4). The testa is 3-6 layered. The layers consist of thin-walled cells. The outer / most layer is single-row and its thickness is less than the other layers. Testa consists of the outer / most layer of the integument in the Umbelliferae family [8]

**Figure 4.** Testa



## 4. DISCUSSION

Our findings show some similarities between the embryology of the studied Apiaceae species.

Embryo development in *Seseli resinosum* is solanad type.

Zygote proembryo, 4-cell embryo (Figure 3A), 8-cell embryo (Figure 3B), spherical embryo (Figure 3C), heart-shaped embryo stages (Figure 3D) were observed in the sections taken. In *Seseli resinosum*, a single-row filament-like suspensor, which connects the embryo to the embryo sac and has a suitable medium, is distinguished.

There are differences in the participation of the integument in the formation of the testa. In Umbelliferae only the epidermis of the outer integument forms the seed shell [8]. The fruit is a schizocarp fruit, the testa and the pericarp are inseparable.

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