http://fbe.trakya.edu.tr/tujs
Trakya Univ J Sci, 13(2): 77-83, 2011
ISSN 1305–6468
DIC: 314MAET12211111211

Araştırma Makalesi / Research Article

SOME ANTHER STRUCTURES IN *SANGUISORBA MINOR* SCOP. subsp. *MURICATA* (SPACH) BRIQ (ROSACEAE)

Mehmet AYBEKE

Trakya University, Faculty of Science,

Dept. of Biology, Section of Botany, 22030, Edirne, TURKIYE.

e-mail: mehmetaybeke@yahoo.com,

Alınış: 25 Kasım 2010
Kabul Ediliş: 12 Aralık 2011

ABSTRACT

In this study, investigation of some anther structures in *Sanguisorba minor* Scop. subsp. *muricata* (Spach) Briq. was aimed. Anthers were squashed by modified glycerine-gelatine method, and additionally different histochemical stainings also were tested. The result showed that in different parts of anther, such as marginal, connection tissue, starch and protein granules accumulated. Furthermore, during maturation these deposits were detected in pollen grains also. In addition, a very interesting feature, balloon-like structures filled by proteins, were observed in anther cavity. In the light of these findings, theirs importance on pollen development was discussed.

Keywords: Anther, histochemistry, pollen, protein, starch,

SANGUISORBA MINOR'DA (ROSACEAE) BAZI ANTER YAPILARI

ÖZET

Bu çalışmada *Sanguisorba minor* subsp. *muricata*'da bazı anter yapılarının incelenmesi amaçlanmıştır. Bu nedenle anterler, modifiye edilmiş gliserin-jelatin yöntemi ile ezilmiş ve ilave bazı histokimyasal boyama yöntemleri ile de test edilmiştir. Sonuçda anterin kenar, konnektif doku gibi değişik kısımlarında nişasta ve protein granüllerinin biriktiği tespit edilmiştir. Bundan başka ayrıca, olgunlaşma sürecinde bu maddelerin pollen tanelerinde de bulunduğu tespit edilmiştir. İlaveten anter boşluklarında içleri protein granüller ile dolu olan "balon" şeklinde ystlanmıştır. Bu bulgular ışığında, bu yapıların pollen gelişimi açısından önemleri tartışılmıştır.

Anahtar Kelimeler: Anter, histokimya, nişasta, polen, protein

INTRODUCTION

Many morphological and embryological studies have been performed so far, and then the different features of anthers have been revealed (Bhojvani and Soh, 2001; Lersten, 2004). For instance, in family Rosaceae , anthers are monosporangiate, and dinocotyledonous type, as is commonly found in other Angiospermae families (Johri, 1984). Additionally, some cytogenetical faults during pollen development have also been determined (Rivero-Guerro, 2008; Duarte-Silva et al., 2010). And pollen morphology studies were mostly done (Hebda and Chinnappa 1990; Hesse et al., 2009). However, from literature, there is still a significant gap in anther structure or function in some genus, as *Sanguisorba*. Whereas, to more learn about the relationship between anther structures and pollen development, it is necessary to conduct several studies in cytochemical, histochemical, and physiological fields on anthers of different plants, as possible (Ying-Qiang et al., 2004; Lindstrom et al. 1999; Hansson & El-Ghazaly 2000; El-Ghazaly et al., 2001). Therefore, it is likely to bring to light on reproductive success of pollens (El-Ghazaly et al. 2001). Consequently, the aim of this work is to examine anther anatomy and its importance on pollen development in *Sanguisorba minor*.

MATERIAL AND METHODS

Fresh material from Balkan Campus of University of Trakya were used in this study, and deposited EDTU herbarium as EDTU 7644. As for method followed partially by Mascarenhas (1966). Fresh anthers were dissected in mixture of $CaNO_3$ 0,03 % and Boric acid 0,001 % on a glass slide with the aid of dissecting needles. After few minutes, it treated with two drops of Calberla solution, a fuchsine pollen stain(glycerol 16 % vol./vol., ethyl alcohol 33 % vol./ vol., and basic fuchsine 0,02% vol./vol.) and examined under light microscope at 100-200-400 magnifications. For histochemical tests, anther were dissected, as described above, but slides were separately stained with lughole for starch and protein localisation, Sudan III for lipids, Fehling for total carbonhydrates, and Toluidin Blue for phenolic compounds and acidic polyanions, and then mounted with pure glycerin-gelatin mixture (Jensen 1962; Grolig and Wagner 1989). All investigations were done under Prior light microscope and photographs were taken with Olympus BH-2 Photomicroscope.

RESULTS

From all squash preparations, in anthers dense viscous substances were seen (Fig. 1). Furthermore balloon-like and bulging enormous sizes of structures also exist. According to histochemical preparations, dense starch accumulation in anthers wall tissues observed (Fig. 2). In addition, bulging or balloon-like structures with protein granules were found (Fig. 3). Large balloon-like structures were observed with protein granules and filled up entirely anther cavity. This structure firstly covered by a membrane, but afterwards, is without the membrane so that these granules transfer to pollen grains. During squashing preparations, the balloon-like structures burst and ejected protein granules as viscose substance. Furthermore, it is detected that pollen grains have starch granules (Fig. 4).

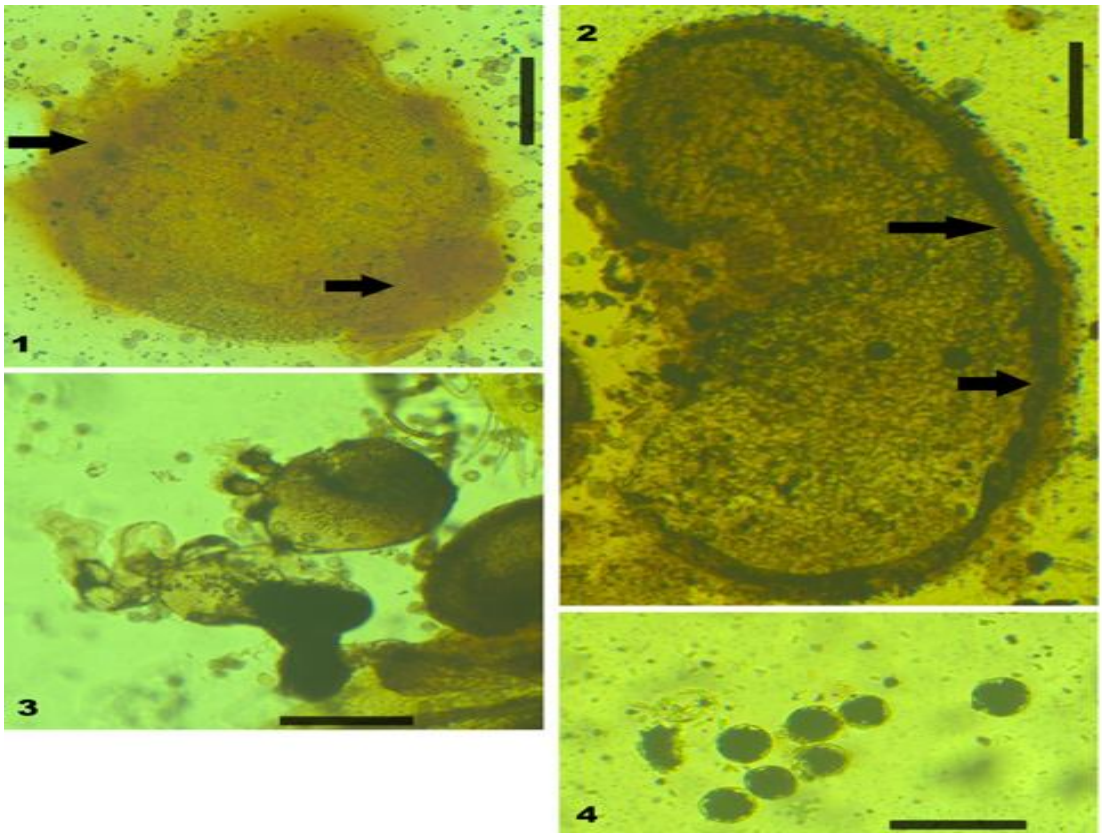

Figure 1: During Anther Squashing Yellowish-Brown Secretion (Arrows),**2.** In Anther Walls Starch Accumulation As A Line (Arrows),**3.** Balloon-Like Structures Within Protein Granules,**4.** Pollens Bearing Starch. Bars: 1,4. 100µ, 2. 10µ, 3. 50µ.

DISCUSSION

This study is especially based on some anther structures and its importance on pollen maturation in *Sanguisorba minor*. From results, in vessel of connection tissue and anther margins, lughole reacted positive with deeply purple-black. Therefore, especially presence of starch granules in connection tissue and anther margins related to vessel tissue, suggested logical that these granules could originate from other organs. As for complex balloon-like structures bearing protein granules, were connected with each other and vessel tissue, thus widened enormously in anther cavity. In author's opinion, starch and protein granules are related with pollen maturation. Because it was determined mature *Sangusiorba* pollens to bear starch grains. Similar results were indicated in a previous report (Tian et all., 1998). Regarding protein granules, they will be possibly used in architectural plan of pollen coat as "pollenkit", the most common viscous fluid material. Our idea was supported by a recent study in which pollenkit was classified in several types depending on its viscosity and heterogeneity, except balloon–like structures (Pacini and Hesse 2005). These are new for both Rosaceae family and *Sangusiorba* genus.

From literatures, only one study has been found on pollen morphology in *Sanguisorba* (Chung et al. 2010) but not anther tissues. However, the functions of anthers in all stage of pollen development were emphasised, and pollen abortion were, therefore, dependent on anther defects (Loukides et al. 1995; Izhar and Frankel, 1971; Sanders et al.1998). Similarly in de Halac and Harte (1995), in their own ultrastructural and histochemical study, proved precisely that the deviation from fertile pollen development was correlated with abnormalities of the tapetum and outer cell layers of anther wall. In author's view, fertilisation success of *Sanguisorba* pollens is also closely related to both tapetum and these balloon-like structures and any defects on the tapetum and/or balloon-like structures caused sterile pollen formation.

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