http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 14 (2): 146-148, 2011
ISSN 1028-8880 / DOI: 10.3923/pjbs.2011.146.148

Some Anther Structures in *Sanguisorba minor* Scop. (Rosaceae)

Mehmet Aybeke
Department of Biology, Faculty of Science, Trakya University, Section of Botany, 22030, Edirne, Turkiye

Abstract: In this study, investigation of some anther structures in *Sanguisorba minor* Scop. subsp. *muricata* was aimed. Therefore, anthers were squashed by modified glycerine-gelatine method and additionally different histochemical stainings also were tested. The result illustrated 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, their importance on pollen development was discussed.

Key words: Anther, histochemistry, pollen, protein, starch

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 of 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 and 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 study is to examine anther anatomy and its importance on pollen development in *Sanguisorba minor*.

MATERIALS AND METHODS

Materials used were freshly collected from Balkan Campus, University of Trakya in 2009-2010. As for method followed partially by Md. Islam and *et al*. (2004) study. Fresh anthers were dissected in mixture of $CaNO_3$ 0.03% and Boric acid 0.001% on which a glass slide with the aid of dissecting needles. After few minutes, two drop of Calberla solution, a fuchsine pollen stain (glycerol 16% v/v., ethyl alcohol 33% v/v. and basic fuchsine 0.02% v/v) and examined microscopically for anther and pollens at 100-200-400 magnifications. For histochemical tests, anther were dissected, as described above, but preparats 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; Jafari and Ghanbarian, 2007). 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. 1a). In addition, bulging or balloon-like structures with protein granules were found (Fig. 1b). Large balloon-like structures were 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 theirs protein granules as viscose substance. Furthermore, it is detected that pollen grains to have starch granules (Fig. 1c).

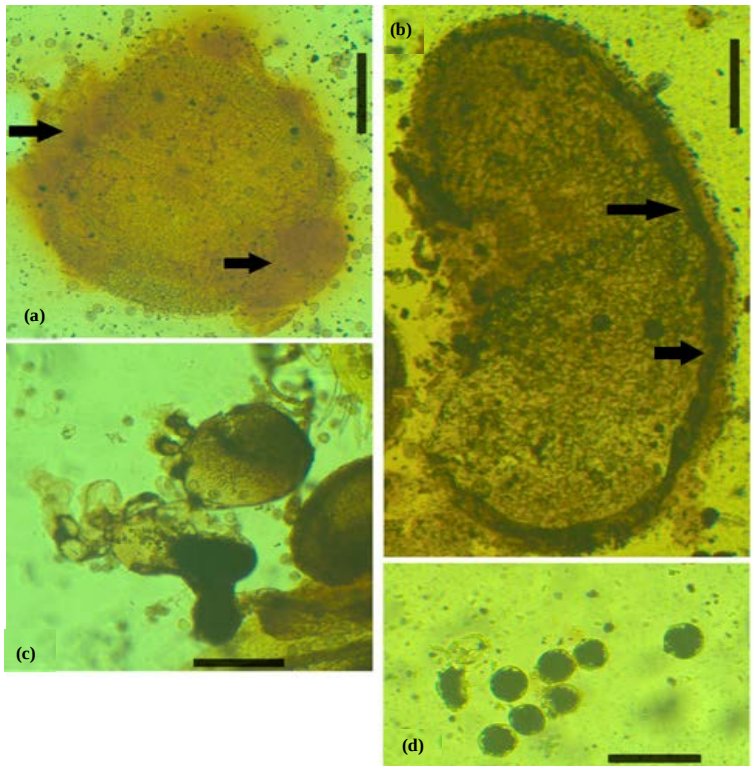

Fig. 1: During anther squashing yellowish-brown secretion (arrows), a. in anther walls starch accumulation as a line (arrows), a. Balloon-like structures within protein granules, c. Pollens bearing starch. Bars: (1,1a). 100 μ, (b). 10 μ, (c). 50 μ

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 authors 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 al*., 1998). Regarding protein granules, they will be possibly used in architectural plan of pollen coat as pollenkit, the most common viscous fluid material (Chehregani *et al*., 2004; Sharma *et al*., 2009). Present 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 some study have been foundon pollen morphology and taxonomy in *Sanguisorba* and/or Rosaceae family (Latif, 2004; Chung *et al*., 2010) but not anther tissues. However, the functions of anther 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, 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 authors 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.

REFERENCES

Bhojvani, S.S. and W.Y. Soh, 2001. Current Trends in the Embryology of Angiosperms. Kluwer Academic Publishers, Dordrecht, Netherlands.

Chehregani, A.H., A. Majde, M. Moin, M. Golami, S.M. Shariatzadeh and F. Mohsenzae, 2004. Effect of air pollution on some cytogenetic characteristics, structure, viability and proteins of *Zinnia elegans* pollen grains. Pak. J. Biol. Sci., 7: 118-122.

Chung, K.S., W.J. Elisens and J.J. Skvarla, 2010. Pollen morphology and its phylogenetic significance in tribe Sanguisorbeae (Rosaceae). Plant Systematics Evolut., 285: 139-148.

De Halac, N.I. and C. Harte, 1995. Genetics and development of morphological and physiological characters of male sterility in *Oenothera*. Protoplasma, 187: 22-30.

Duarte-Silva, E., A.L.L. Vanzela and J.E.A. Mariathe, 2010. Developmental and cytogenetic analyses of pollen sterility in *Valeriana scandens* L. sex. Plant Reprod., 103: 105-113.

El-Ghazaly, G., S. Huysmans and E. Smets, 2001. Structure and Development-Pollen development of *Rondeletia odorata* (Rubiaceae). Am. J. Bot., 88: 14-30.

Hansson, T. and G. El-Ghazaly, 2000. Development and cytochemistry of *Mitriostigma axillare* (Rubiaceae). Grana, 39: 65-89.

Hebda, R.J. and C.C. Chinnappa, 1990. Studies on pollen morphology of Rosaceae in Canada. Rev. Palaeobotany Palynol., 64: 103-108.

Hesse, M., H. Halbritter, R. Zetter, M. Weber, R. Buchner, A. Frosch-Radivo and S. Ulrich, 2008. Pollen Terminology: An Illustrated Handbook. Springer, New York.

Izhar, S. and R. Frankel, 1971. Mechanism of male sterility in Petunia: The relationship between Ph, callose activity in the anthers and the breakdown of the microsporogenesis. Theor. Applied Genet., 41: 104-108.

Jafari, E. and Gh. Gharibarian, 2007. Pollen morphological studies on selected taxa of asteraceae. J. Plant Sci., 2: 195-201.

Jensen, W.A., 1962. Botanical Hystochemistry. W.H. Freeman and Co., San Fransisco, CA. USA.

Johri, B.M., 1984. Embryology of Angiosperms. John Wiley and Sons Inc., USA.

Latif, H.H., 2004. A contribution to the taxonomy of four taxa of sanguisorba (Rosoideae-Rosaceae). Pak. J. Biol. Sci., 7: 1540-1545.

Lersten, N.R., 2004. Flowering Plant Embryology. Blackwell Publishing, Iowa, USA., ISBN-0-8138-2747-7.

Lindstrom, J.T., C. Lei, M.L. Jones and W.R. Woodson, 1999. Developmental physiology, accumulation of 1-aminocyclopropane-1-carboxylic acid (ACC) in *Petunia* pollen is associated with expression of pollen-spesific ACC synthase late in development. J. Am. Soc. Horticultural Sci., 124: 145-151.

Loukides, C.A., A.H. Broadwater and P.A. Bedinger, 1995. 2 new male-sterile mutants of *Zea mays* (Poaceae) with abnormal tapetal cell morphology. Am. J. Bot., 82: 1017-1023.

Md. Islam, M., K.A. Sanjay, G. Purnendu, Md. R. Mizanur and S. Noor-e-Alam, 2004. Effect of plant growth regulators on callus induction and plant regeneration in anther culture of rice. Pak. J. Biol. Sci., 7: 331-334.

Pacini, E.G.G. and M. Hesse, 2005. Pollenkitt-its composition forms and functions. Flora, 200: 399-415.

Rivero-Guerro, A.O., 2008. Cytogenetics, geographical distribution and pollen fertility of diploid and tetraploid cytotypes of *Santolina pectinata* Lag. (Asteraceae: Anthemideae). Bot. J. Linn. Soc., 156: 657-667.

Sanders, P.M.B., Q. Anhtlav, K. Weterings, K.N. McIntire and Y. Hsu *et al*., 1998. Anther developmental defects in Arabidopsis thaliana, male-sterile mutants. Sexual Plant Reprod., 11: 297-322.

Sharma, D., B.K. Dutta and A.B. Singh, 2009. Pollen, fungus and house dust mites survey at the residence of 90 allergic patients in greater silchar area of Assam, India. Res. J. Allergy, 1: 1-11.

Tian, H.Q., A.X. Kuang, M.E. Musgrave and S.D. Russel, 1998. Calcium distribution in fertile and sterile anthers of a photoperiod sensitive genic male-sterile rice. Planta, 204: 183-192.

Ying-Qiang, W., Z. Diang-Xiang and C. Zhong-Yi, 2004. Pollen histochemistry and pollen: Ovule ratios in zingiberaceae. Ann. Bot., 94: 583-591.