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 10 (15): 2603-2605, 2007
ISSN 1028-8880

Comparative Studies of Mucilage Cells in Different Organs in Some Species of *Malva, Althaea* and *Alcea*

M. Pakravan, H. Abedinzadeh and J. Safaeepur
Maneezhe Pakravan, Hajar Abedinzadeh and Jaleh Safaaeepur, Faculty of Sciences,
Alzahra University, P.O. Box 19935-567, Tehran, Iran

Abstract: Distribution of Mucilage Cells (MC) in leaves and petals of two species of *Malva* L. : *Malva neglecta* Wallr and *M. nicaeensis* All, one species of *Altheae* L.: *A. officinalis* L. and one species of *Alcea* L: *A. angulata* (Freyn and Sint.) Freyn and Sint. ex Iljin, have studied. Except of *A. angulata* that mucilage cells observed both in epidermis and mesophyll of leaves, in the others mucilage cells confined to epidermis cells. All of species have mucilage cells in the petals. The area of the mucilaginous elements in the leaves and petals of species determined planimetrically on definite cross-sections was studied as a comparative element to the mucilage content determined by extracting the raw mucilage by Hot Extraction Method (HEM) and then by comparing the dry weight, comparison between species was done. A correlation between the greater area of the mucilaginous elements and the mucilage content measured by methods mentioned was shown, basing on different microscopic examination of cross-sections of the organs fixed and stained with ruthenium red. The results were shown that mucilage content in the leaves of *Malva neglecta* was more than the others and mucilage content in petals of *Malva neglecta* was more than the others.

Key words: *Malva*, *Alcea*, *Althaea*, *Malvaceae*, mucilage, anatomy

INTRODUCTION

The genera of Malvaceae have different amount of mucilage that stored in different type in the tissue (Iljin 1949). In some species mucilage stored in idioblasts and in others stored in the cavities between cells. The numbers and size of mucilage cells are different between species and genera. Bykova and Yakovleva (1991) have studied mucilage cells in the leaves of six species of *Alcea* L. They have measured the area and number of mucilage cells in cross section. They have examined their results by measuring the dry weight of polysaccharides and then they have determined the species with the most mucilage amount in the leaves. These authors also studied the distribution of mucilage cell in stem and root of four species of *Alcea* (Bykova and Yakovleva, 1996). They used the same method (anatomy) for measuring the maximum amount of mucilage in the organs in several season between the species. Turowska *et al.* (1966) have studied the mucilage cells in root of *Althaea rosea* L. The number of mucilage cells on surface of root cross section and total area of mucilage cells are measured and validity of results was tested by measuring the swelling factor and viscosity measurements. Similar researches were done in some species of *Alcea* from Iran (Pakravan and Safaeepur 2005). But the final results of anatomy were tested by indirect method for measuring the mucilage content. In this study, by comparing the absorbed water by leaves, it showed the more mucilage content in the leaves. The aim of our research were to distinguish of mucilage cells in different tissue of the species of *Malva*, *Althaea* and *Alcea* (Malvaceae) and to trace the correlation between different species and also between quantity and size of mucilage-containing elements and mucilage content, which could measured by biochemical methods in the pharmaceutical raw material. Measurements of this kind might afford a basis for a preliminary visual microscopic estimate of particular plants as a source of mucilaginous raw material. In the other words, an attempt was made to find out whether there is any correlation between a larger quantity and area of mucilaginous elements observed microscopically and values obtained for the mucilage content on the basis of biochemical tests and if so, how strong this correlation is. The leaves and flowers were included in the general plant of work, since it is well known that in Malvaceae these parts provide most frequently the mucilaginous raw material (Iljin, 1949). It should be added that such a study closely connected with other studies done on similar problems. For example Turowska *et al.* (1963) worked likewise in tannin idioblastss.

Corresponding Author: M. Pakravan, Maneezhe Pakravan, Hajar Abedinzadeh and Jaleh Safaaeepur, Faculty of Sciences, Alzahra University, P.O. Box 19935-567, Tehran, Iran

MATERIALS AND METHODS

The materials were obtained of plants were collected from different provinces of Iran in flowering season in 2004. For the anatomical studies the leaves and flowers of specimens were preserved in a solution of alcohol and glycerine (1:1). Between 3 and 11 leaves and petals were sectioned from each accession. Hand sections were taken from central portion of leaves and petals. The ruthenium red was used for staining and mucilage cells stained a shining red and observed with an Olympus model BX51 photomicroscope.

For biochemical studies leaves and petals of the same plant specimens pulverized and raw mucilage extracted by Hot Extraction Method (HEM) (Karawya *et al.*, 1980; Brautigam and Franz, 1985). After extracting, the raw mucilage are dried and weighted. This research was done in Plant Physiology Laboratory in Alzahra University since November of 2004 to April of 2005. The voucher specimens are preserved in the herbarium of Alzahra University.

RESULTS AND DISCUSSION

Mucilage cells are often seen in epidermis cells of leaves except in *A. angulata* that found in mesophyll. (Fig. 1). Preliminary observation and calculations of the area of mucilage cells were made on cross-sections of leaves and petals, also in the surface of epidermis cell. Planimetric measurements included the area of all the mucilage cells found in the 1 mm of epidermis and cross-sections of leaves and petals. Maximum area in the leaves observed in *M. neglecta* (Fig. 1A) and minimum area in *A. angulata*. In the petals maximum area observed in *M. neglecta* (Fig. 1B) and minimum in area in *A. officinalis* (Table 1).

Based on biochemical results, maximum mucilage content in leaves, observed in *M. neglecta* and minimum content in *A. angulata* and maximum mucilage content in petal observed in *M. neglecta* and minimum in *A. officinalis*. Table 2 Results of anatomical and biochemical studies are shown that the environment condition could affected the producing of mucilage cells, for example, the plant materials obtained from Darakeh mountain has more mucilage cell in the leaves and flowers, also more mucilage content in these organs than accession that obtained from Karaj city which grow in a wetter soil. Also a correlation between the area of the mucilaginous elements and the estimated mucilage of the raw material measured by the methods mentioned is clearly shown.

The results obtained by both methods are on the whole in agreement.

As a result of investigations carried out on the 16 accession from 4 species, it seems possible to make preliminary guiding visual estimate of the raw material on the basis of a microscopically examination of an organ before proceeding to chemical analysis. This is an exiting result because anatomical studies are very simpler and less inexpensive than chemical analysis. Then for extracting the mucilage we could select the best specimens with the most mucilage content and save time and money by using anatomical study instead of using chemical analysis.

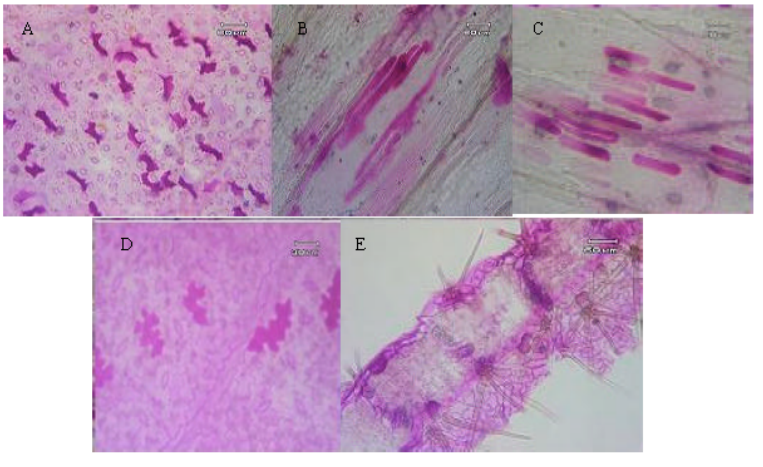

Fig. 1: Observations of adaxial epidermis in superficial view of leaves and petals: A) Leaf, B) Petal in *Malva neglecta*, C) Petal, D) Leaf in *M. nicaeensis* and E) Cross section of leaf in *Althaea officinalis*

Table 1: Results of planimetric measurements in investigated species

Species	Location	Size of mc/leaf µm (mag ×40)	Area of mc in leaf epiderm in 1 mm	No. of mc in leaf in 1 mm	Size of mc/petal µm (mag ×40)	Area of mc in petal epiderm in 1 mm	No. of mc in petal in 1 mm	Herbarium No.
M. neglecta	Ahar	13-25×7-8	9.06	4	12-98×6-12	2.318×10^{-5}	12	1846
M. neglecta	Ahar	9-40×4-20	13.15	10	18-103×5-12	$3.7.29\times10^{-5}$	14	1847
M. neglecta	Karaj	20-39×6-10	26.93	7	14-100×3-11	2.116×10^{-5}	12	1848
M. neglecta	Tehran	4-35×2-19	20.90	23	10-100×5-33	4.024×10^{-5}	23	1849
M. neglecta	Darake	2-53×2-15	21.73	12	15-100×3-14	2.483×10^{-5}	12	1850
M. neglecta	Kashan	10-27×6-13	5.61	9	10-100×2-40	2.429×10^{-5}	26	1851
M. nicaeensis	Khuzestan	8-43×2-13	2.24	18	9-60×1-5	7.74×10^{-6}	10	1852
M. niceensis	Khuzestan	9-40×3-13	2.45	5	8-64×3-6	8.01×10^{-6}	12	1853
M. nicaeensis	Khuzestan	8-42×4-10	2.28	4	12-58×2-4	7.97×10^{-6}	3	1854
A. officinalis	Golestan	19-30×7-10	16.70	10	30-100×4-28	6.01×10^{-6}	2	45631
A. angulata	Firuzkuh	36-39×15-17	2.30	2-4	7-20×5-24	$1.0\ 4\times10^{-5}$	15	26379

Table 2: Percentage of mucilage contents in investigated species

Species	Percentage of mucilage content in leaf	Percentage of mucilage content in petal
M. neglecta	26.14	21.74
M. nicaeensis	23.03	18.47
A. officinalis	17.40	10.60
A. angulata	15.18	18.80

REFERENCES

Brautigam, M. and G. Franz, 1985. Structural features of Plantago lanceolata mucilage. Plant Med., 4: 293-297.

Bykova, O.P. and O.V. Yakovleva, 1991. Mocus cells in leaves of some representative of *Alcea*. Rastitel ' Nye Resursy, 27: 82-90.

Bykova, O.P. and O.V. Yakovleva, 1996. Distribution of mucilage cells in tissues of stem and root of some species of the genus *Alcea*. Rastitel' Nye Resursy, 32: 59-72.

Iljin, M.M., 1949. Malvaceae in Flora URSS. Mosque and Leningrad, 15: 84-127.

Karawya, M.S., G.M. Wassel, H.H. Baghdadi and N.M. Ammar, 1980. Mucilaginous content of certain Egyptian plants. Plant Med., 33: 73-78.

Pakravan, M. and Z. Safaeepur, 2005. Comparative study of mucilage cells in three species of *Alcea* L. in Iran. J. Sci., 18: 16-24.

Turowska, I., S. Kohlmunzer and J. Molik-Wegiel, 1963. Occurrence and determination of tannins, respectively polyphenols, in some representatives of the Labiatae. Acta Biol. Cracov. Ser. Bot., 6: 15-30.

Turowska, I., S. Kohlmunzer and Z. Maga, 1966. Studies on the correlation between the concentrations of the mucilaginous elements and the value of *Althaea rosea* cav. as a mucilaginous raw material. 1-The root. Acta Biol. Cracov. Ser. Bot., 9: 1-11.