

## MORPHOLOGY AND ANATOMY OF SOME WEEDS FROM FLORA OF DISTRICT BANNU, PAKISTAN

Atiq Mehsud<sup>1</sup>, Sultan Mehmood<sup>1</sup>, Asim Muhammad<sup>1</sup>, Rehman Ullah Khan<sup>1\*</sup>, Saad Ullah Khan<sup>1</sup>, Hidayat Ullah Khan<sup>1</sup>, Rafi Wazir<sup>1</sup> and Zahid Hussain<sup>2</sup>

### ABSTRACT

*The study of morphology and anatomy of seven most common weed species infesting agricultural and non-agricultural lands of rain-fed area of Bannu region were investigated during 2012. The study included Datura metel L., Euphorbia hirta L., Fagonia cretica L., Heliotropium europaeum L., Parthenium hysterophorus L., Solanum surattense Burm f. and Withania somnifera (L.) Dunal. It was found that most of the investigated species had well developed vascular bundles both in root and stem systems which clarified their adaptation in the severe rain-fed conditions of Bannu, Khyber Pakhtunkhwa Pakistan. Due to the special morphological and anatomical features, the capacity of rapid absorption of water along with minerals from the soil may be facilitated to compensate the rapid water loss, and thus can also be regarded as common xerophytes. So far as the interaction of these species is concerned within the prevailing environment of Bannu region, their morphological, anatomical and histological characteristics are suitable for their successful growth in rain-fed condition of the region.*

**Keywords:** weeds, morphology, anatomy, Bannu.

**Citation:** Mehsud, A., S. Mehmood, A. Muhammad, R.U. Khan, S.U. Khan, H.U. Khan, R. Wazir and Z. Hussain. 2013. Contribution to morphology and anatomy of some weeds from flora of district Bannu, Pakistan. Pak. J. Weed Sci. Res. 19(4): 437-445.

### INTRODUCTION

Weeds are unwanted plants growing in the domesticated crops and arable lands. Holm *et al.* (1979) estimated that there are about 8000 plant species, which act as weeds, of these only 250 are important for agriculture world. According to Andreson (1996), weeds

---

<sup>1</sup> Department of Botany, University of Science & Technology, Bannu, Pakistan, <sup>2</sup> Department of Weed Science, The University of Agriculture Peshawar, Pakistan.

\*Corresponding author's email: [rehman\\_g4u@yahoo.com](mailto:rehman_g4u@yahoo.com)

compete with the crop mainly for water, light, nutrients and carbon dioxide. The noxious weeds are harmful, adversely affecting crop productivity, causing health hazards in humans and animals and lowering fish production. Weeds are plants whose undesirable qualities outweigh their good points, not internationally sown and growing where it is not wanted. There are approximately 250,000 species of plants worldwide; of those, about 3% or 8000 species behave as weeds. But only about 200 weed species are considered to be problematic (Holm et al., 1977).

Weeds are plants that interfere with the normal growth and development of the crop plants. They are known to limit the production of crops causing serious losses in the output of grains, seeds and fruits etc. (Chaudhri, 1992). Environment plays a dominant role in the distribution of various plants species and it has been observed that plant developed under somewhat similar ecological conditions have similar morphological and anatomical characteristics. Seven weeds species e.g. *Datura metel* L., *Euphorbia hirta* L., *Fagonia cretica* L., *Heliotropium europaeum* L., *Parthenium hysterophorus* L., *Solanum surattense* Burm f. and *Withania somnifera* (L.) Dunal. were collected during 2012.

The district of Bannu is located in the Khyber Pakhtonkhwa Province of Pakistan. It lies at 32.43 - 33.06 North latitude and 70.22 - 70.57 East longitudes. The total area of the district is 1227 sq km. Bannu district is approximately 192 kilometres to the south of Peshawar and lies in a sedimentary basin. It is flanked and guarded on all sides by the hard and dried mountain ranges of Koh-e-Safed and Koh-e-Suleiman. It is a scenic part of the southern region, due to the "Kurrum" river and its tributaries. They have made it a land of meadows, crops and orchards. Every kind of crop and fruit can be grown in it, but the banana, dates, figs and rice are unique in their taste, smell and shape. Geographically, the modern day Bannu is located in the heart of the southern region with its boundaries touching the districts of Karak, Lakki Marwat and the North, South Wazirestan Agencies. The climate of district Bannu is cold in winter and warm in summer. The summer season starts in May and lasts till mid of August. May and June are hot months. In July and August the weather is hot and moist. June is the hottest month with mean minimum and maximum temperature 26°C and 40°C respectively. December, January and February are the winter months. The mean maximum Rainfall occurs in August i.e. 111.36 millimeters. Mean monthly humidity, temperature and rain fall is presented in Table-1.

## MATERIALS AND METHODS

Before starting the research work, general information were collected about the area. Several trips were arranged to different areas of district Bannu during 2012. During the trips, seven plants were collected, dried, preserved and identified with the help of available literature (Ali and Qaiser, 1995-2004; Nasir and Ali, 1971-1995). This study comprised of two parts i.e. morphological and anatomical investigation.

### Stem and Root anatomy

Transverse sections of stem and root were performed for the species given in Table-2. The equipments used were news papers, cutter, tap, pencils and diary. Microscope, Slide, Blades, Beaker, Polythene bags, distal water digital camera with computer and chemical like safranin.

**Table-1.** Meteorological information of Bannu region during 2011-12

MONTHS	HUMIDITY	TEMPERATURE (C°)		RAINFALL (mm)
		MIN	MAX	
January	85.7	4.6	19.8	2.0
February	78.5	6.0	20.7	28.8
March	78.2	11.7	25.5	85.5
April	72.3	15.7	29.0	49.0
May	52.0	22.6	38.0	4.6
June	58.9	24.2	38.8	12.8
July	74.0	27.5	38.1	24.4
August	76.8	27.6	37.6	41.4
September	73.2	24.0	35.9	37.6
October	74.1	15.77	31.7	19.6
November	73.3	8.4	25.3	1.0
December	73.1	4.0	21.0	1.3

**Table-2.** Common weed species from Bannu

Species name	Family name	Local name
<i>Datura metel</i> L.	Solanaceae	Barbaka
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Babersarai
<i>Fagonia cretica</i> L.	Zygophyllaceae	Spelaghzai
<i>Heliotropium europaeum</i> L.	Boraginaceae	Kharporai
<i>Parthenium hysterophorus</i> L.	Asteraceae	Sorai
<i>Solanum surattense</i> Burm.f	Solanaceae	Wara-mra-ghinye
<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Shapyange

## RESULTS and DISCUSSION

### Ecological and morphological remarks

The morphological and anatomical characters of the investigated species were found as matching to the characteristics of xerophytic type and thus these species can be termed as xerophytes. Xerophytes have been under the constant vigilance of ecologists for analyzing their adaptation in order to have comprehensive information on various groups and also anatomical characteristics controlling their range of distribution under the different environmental regime throughout the world. However the essential features regarding the morphological and anatomical characteristics are discussed herewith.

#### ***Datura metel***

It is a small herbaceous herb, 1-1.4 m in height. Branches pubescent when young marked with leaf scars. Leaves alternate unequal at the base, margins wavy. Flower large, white in the leaf axial. Capsule globose and covered with slender spines. Seeds are numerous blackish-brown in color. *Datura metel* is also classified as weed of waste land and distinguished by the presence of dense pubescence on the stem and leaves, 10-toothed corolla and long weak spines on the capsules with peculiar features of xerophyte depicted by the slides of root and stem. The results are matching to Hasanuzzaman et al., 2006.

#### ***Euphorbia hirta***

A prostrate or ascending, erect pubescent, herbaceous annual. Stem is herbaceous and forks at the base. Leaves are opposite, and acute at both ends. The flower-heads, which are cymose, minute, numerous, and crowded, are borne on a stalk which proceeds from only one leaf-axil. The involucre are minute and arranged in dense, short-stalked clusters, which are terminal. The gland-appendages are narrow or obtuse. The fruit is an acute-angled, hairy pod, inclosing the reddish 4-angled, transversely rugulose seeds. *Euphorbia hirta* L. is herbaceous xerophyte. The special histological features reflect that the maximum area of the root is covered by vascular bundles. Large pith

is present in the centre. Wood vessels are seen as radiating from the centre. The central area is without pith. Certainly the features are enough for the xerophytic adaptation in the peculiar environment. Similar results were earlier reported by Myers *et al.* (1964).

#### ***Fagonia cretica***

It is a semi-shrub having hard, rough, glabrous and spiny stems. Leaves are opposite, compound, trifoliolate, smooth, spinescence stipules. Flower Pink, solitary, 5 free, mucronate sepals; 5 free, clawed imbricate, petals; 10 free stamens, inserted on a disc, filaments filiform, without appendages, 5-celled sessile ovary; 2 ovules at the base of each cell; 5-angled style persistent, simple stigma; septicial capsule fruit, pentagonous, deeply 5-lobed, splitting along the axis into 5 carpals; carpals 1-seeded. *Fagonia cretica* L. is another interesting medicinal xerophyte having seeds which are ovate or ovate-oblong, compressed and with mucilaginous coat which protect the seeds from desiccation and helps its survival in severe climate. The vascular bundles are radially arranged in circles. More than half of the stem is covered by vascular bundles. A vast number of glands are also seen in the slide within the thick cortex. Surely all these characteristics are enough to withstand in critical environment.

#### ***Heliotropium europaeum***

It is an annual herb 45 cm tall; stem woody at the base; leaves petiolate, petiole upto 4 cm long; lamina elliptic-ovate, slightly attenuate towards the base, apex obtuse to roundish, rarely acute, 1-6 cm long, 1.0-3.5 cm broad; inflorescence usually terminal, some times axillary; calyx persistent, divided to the base, lobes lanceolate, covered with white spreading trichomes; corolla 3.0-3.5 mm long; fruit globose, lobed, 1.5-2.2 mm; nutlets 4, free, dorsally convex, ovate. *Heliotropium* is equipped with epidermal hairs which protect the plant from rapid transpiration and evaporation. The vascular bundles are in abundance and covered the central region.

#### ***Parthenium hysterophorus* L.**

This is an annual herbaceous member of the Asteraceae, with a deep tap root and an erect stem that gradually changes into semi-woody with age. It branches itself out usually up to about 1-2 meter. It has bi-pinnatifid and pale green leaves covered with soft fine hairs. Vascular bundles are arranged along the endodermis and are connected through primary meristematic tissue. The pith is composed of collenchymatous polygonal cells and is very large. Through its peculiar characteristics it may complete its life history within summer and become dormant in winter.

***Solanum surattense* Burm.F.**

A perennial herb resembling the common watermelon from family Solanaceae, is a prostrate herb, 19-14cm long, stellate hair are present. The stems are herbaceous and with rough hairs woody at the base, covered over with strong, broad, sharp, compressed, straight, yellowish white prickles; the leaves stand alternately on long petioles. Flowers are born in clusters. Fruit Berries, globose, green turning golden yellow. Well developed vascular bundles are found in radial pattern in the ground tissues. All the characteristics are depicting its xerophytic expression within the prevailing environment.

***Withania somnifera* (L.) Dunal.**

It grows as a stout shrub that reaches a height of 170 cm (5.6 ft). Like the tomato which belongs to the same family, it bears yellow flowers and red fruit, though its fruit is berry-like in size and shape. *Withania somnifera* (L.) Dunal with leaves having the special glands can also be classified both as weed and xerophyte and its histological view depicts a complete ring of small vascular bundles arranged in a circle differentiated as protoxylem and metaxylem which is enough to adopt in any situation of climate and thus it can also be included as xerophytes.

**Anatomical Remarks****Trichomes**

Trichomes were present in many species with varied proportions. Hairs were common in *Datura metel* L., *Fagonia cretica* L., *Heliotropium europaeum* L., *Parthenium hysterophorus* L., *Solanum surattense* Burm f. and *Withania somnifera* (L.) Dunal.

**Epidermis**

All examined species have thick epidermis consists of compact cells surrounding the cortex.

**Endodermis**

Endodermis is present in all species but clearly seen in species e.g. *Datura metel* L., *Fagonia cretica* L., *Heliotropium europaeum* L., *Parthenium hysterophorus* L. and *Solanum surattense* Burm F.

**Pith**

Most species have large pith which supports the stem. In *Euphorbia hirta* L. *Parthenium hysterophorus* L. the translocation of stem and root respectively shows absence of pith.

**Cortex**

Cortex was present in all examined species with varied proportions. The cortex consist of both collenchymatous and paranchymtous cells.

**Vascular Bundle**

The vascular bundles are arranged in different manner. Vascular bundles are radially arrange in circle in *Fagonia cretica* L.

covering most of the area of stem. In *Parthenium hysterophorus* L. the vessels of protoxylem are lying towards the centre while the vessels of metaxylem are arranged towards the periphery of cortex. In *Solanum surattense* Burm.f. the vascular bundles are arranged in radial pattern in the ground tissues. Ring of vascular bundles arrange in circle are present in *Withania somnifera* (L.) Dunal. Selected weeds (Table-1), revealed the following anatomical features (Fig. 1-7).

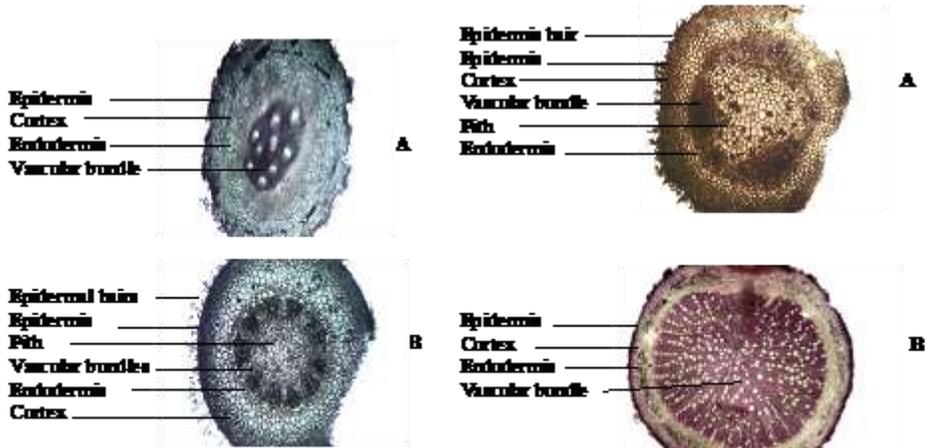


Figure 1. Transverse section of root (A) and stem(B) of *Datura alba* L.

Figure 2. Transverse section of root (A) and stem(B) of *Euphorbia hirta* L.

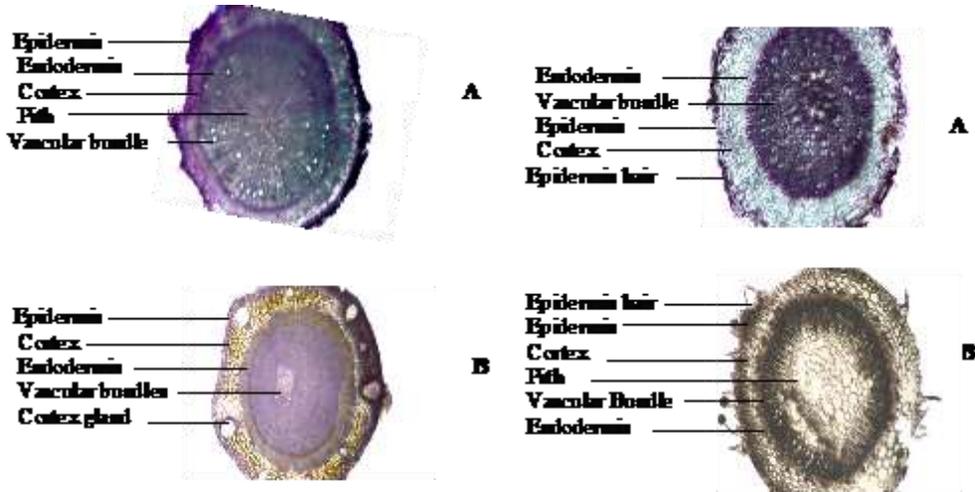


Figure 3. Transverse section of root (A) and stem(B) of *Ficus cretica* L.

Figure 4. Transverse section of root (A) and stem(B) of *Helictropis europaeum* L.

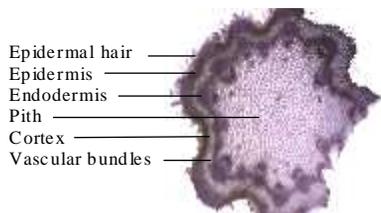
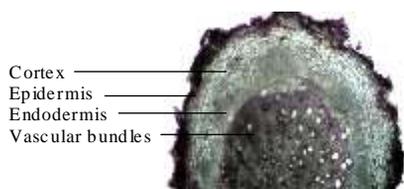


Figure 5. Transverse section of root (A) and stem(B) of *Parthenium hysterophorus* L.

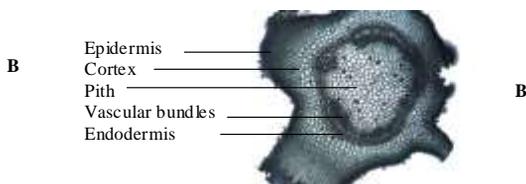
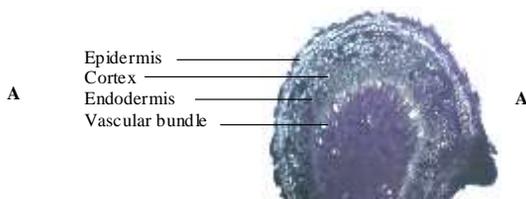


Figure 6. Transverse section of root (A) and stem (B) of *Solanum surattense* Burm f.

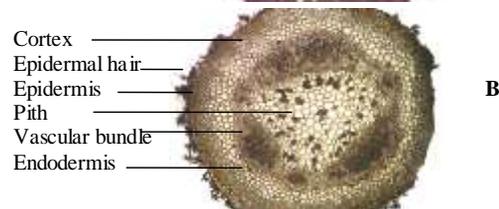
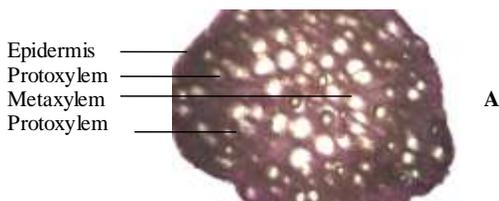


Figure 7 Transverse section of root (A) and stem (B) of *Withania somnifera* (L.) Dunal

## CONCLUSION

The habitats of Bannu Township, Tazeri, Umarzai, Bezan Khail and Said Khail were studied regarding the morphological, anatomical and histological features of *Datura metel* L., *Euphorbia hirta* L., *Fagonia cretica* L., *Heliotropium europaeum* L., *Parthenium hysterophorus* L., *Solanum surattense* Burm f. and *Withania somnifera* (L.) Dunal for adaptation within their habitats. Under this study, these collected flora are classified as common weeds having xerophytic characteristics. All these xerophytes have a well developed and deep rooted system with advanced histological area of vascular bundles depicting rapid absorption of water along with minerals from the soil to compensate the rapid loss of water.

**ACKNOWLEDGEMENT**

The authors are thankful to the Vice chancellor Prof. Dr. Abdur Rahim Marwat for providing necessary facilities and encouragement throughout the course of the experiment.

**REFERENCES CITED**

- Andreson, C., H. Stryhn and J.C. Streibig. 1996. Decline of the flora in Danish arable fields. *J. Appl. Ecol.* 33 (3):619-626.
- Javaid, A. and T. Anjum. 2005. *Parthenium hysterophorus* L.: A noxious alien weed. *Pak. J. Weed Sci. Res.* 11(3-4): 81- 87.
- Chaudhri, M.N. 1992. Weeds and their identification. *In: Identification and control of weeds manual*. National training course. Pak. Agric. Res. Council, Islamabad. P. 14.
- Hasanuzzuman, S.M, Tshitila, S. Maiti, B.R. Kaini, Z. Ahmad, D.S.A. Wijesundara. 2006. Guide on medicinal and aromatic plant of SAARC Country. SAARC Agricultural Information Center. Pp. 430-557.
- Holm, L., J.V. Pancho, J.P. Herberger and D.L. Pluckenett. 1979. A geographical atlas of world weeds. John Wiley, 391 p.
- Holm, I.G., P. I. Okycjbett, J. N. Pancho and J.P Gerverger. 1977. The world worst weed distribution Biology. The University Press of Hawaii, Honolulu. Jafri SMH (1966). The flora of Karachi. The book corporation, karachi. P. 9.
- Subhan, M., M. Qasim, M.A.I. Ayub. 1983. "Ecological study of xerophytes of Bannu and its outskirts". The Gomal University journal of research vol.2 no 2 pp. 1.14.
- Pandey, B.P. 2004. A Text Book of Botany Angiosperms (taxonomy, anatomy, embryology including tissue culture and economic botany) 15<sup>th</sup> edition published by S. Chand & Company Ltd. Pp. 212-214, 115-117, 190-191.
- Pandey, B.P. 2007. Plant Anatomy (including embryology and morphogenesis of angiosperms) 18<sup>th</sup> edition published by S. Chand & Company Ltd. Pp. 212-224.
- Qurashi, M.A. and S.A. Khan. 1972. Flora of Peshawar district and Khyber Agency. Vol. 2 part (a). *Pak. J. For. Pakistan Forest Institute (PFI), Peshawar.* 22(2): 153-220.
- Stewart, R.R. 1972. An Annotated Catalogue of the vascular plants of West Pakistan and Kashmir". *In: Flora of West Pakistan, Karachi.* Pp. 383-425.