



RESEARCH PAPER

OPEN ACCESS

Distribution of shrub plant species in Cholistan Desert of Pakistan through quadrat method

Muhammad Zeeshan Talib^{*1}, Nargis Naz², Syeda Sadaf Zehra², Kiran Majeed³, Naveed Aslam¹, Abdul Rehman¹, Muhammad Imran¹, Shakar Hussain¹, Muhammad Nadeem Akram¹, Muddassir Abbas¹, Aftab Aslam¹, Muhammad Farooq Haider⁴

¹Department of Botany, University of Agriculture, Faisalabad, Punjab, Pakistan

²Department of Botany, The Islamia University of Bahawalpur, Punjab, Pakistan

³Department of Forestry, The Islamia University of Bahawalpur, Punjab, Pakistan

⁴Department of Plant Pathology, University of Agriculture, Faisalabad, Punjab, Pakistan

Key words: Cholistan desert, Vegetation, Quadrat method, abiotic factors.

<http://dx.doi.org/10.12692/ijb/16.4.428-432>

Article published on April 30, 2020

Abstract

Plant communities are constantly declined due to various biotic and abiotic factors such as drought, high salinity, temperature, over grazing and urbanization. The Cholistan desert has a very limited and subnormal vegetation cover. The present study was conducted to determine the phyto-sociological status of various locations of Cholistan desert, Punjab, Pakistan. Overall 12 species of plants were reported in Cholistan desert. Generally *Lasiurus scindicus* showed very high relative density, frequency, relative cover and importance value index. *Crotalaria burhia* and *Aerva persica* have moderate while *Calotropis procera*, *Capparis decidua* and *Leptadenia pyrotechnica* have very low relative values of phyto-sociological parameters.

* **Corresponding Author:** Muhammad Zeeshan Talib ✉ zeeshan.talib12@gmail.com

Introduction

The Cholistan desert is ranked at 7th position among all desert across world and expanded along the south border of Punjab, Pakistan (Rao *et al.*, 1989). It spread on an area of about 26,000km² (Arshad *et al.*, 2007) at 112m altitude at sea level (Ali *et al.*, 2009).

On the basis of vegetation and soil type, it divided into two regions: Lesser cholistan desert located at northern region cover an area of about 7,770km² while Greater cholistan desert which is located at southern region cover an area of about 18,130 (Akhter & Arshad, 2006).

Cholistan desert has very poor soil because of its poor organic matters. Lesser cholistan has large saline areas with interdunal dahars (Arshad *et al.*, 2007). Interdunal dahars soil varies insalinity level, sodicity and soil structure with pH range from 8-9.6 (Arshad *et al.*, 2008). The Greater Cholistan comprise of large dunes and ridges but interdunal plains greatly reduced (Arshad *et al.*, 2003). Its climate is hot, arid and harsh, and prejudiced by monsoon seasons.

Its temperature varies on daily basis. Mean temperature varies from 35-50°C during summer while winter temperature from 15-20°C (Arshad *et al.*, 2007). Due to very high temperature, annual rainfall is very low ranges from 100 to 250 mm but very high during July and September (Arshad *et al.*, 2006).

Due to environmental stresses particularly low nutrients in soil, high salinity level and even high temperature, its vegetation comprised of xeromorphic character species (Naz *et al.*, 2010). *Boerhavia procumbent*, *Mollugo cerviana* and *Ziziphus mauritiana* are blood purifier (Padmavathy and Anbarashan, 2011), while *C. cretica*, *C. procera* and *A. nilotica* are used as tonics (Jabeen *et al.*, 2009). Many herbs *Crotalaria burhia*, *Euphorbia prostrate*, *Capparis deciduas* and *Cleome scaposata* are used to cure wounds and relief pain (Kataria *et al.*, 2010). While some used to cure chronic diseases: *Haloxylon salicornicum* as hepatoprotective *Trianthema triquetra* used against hepatotoxic, while *Cleome scaposata* cure cancer (Ahmad & Eram, 2011).

Cyperus conglomeratus, *Withania somnifera*, *Zaleya pentandra*, and *Leptadenia pyrotechnica* are used to cure many digestive tract problems like gastrointestinal discomforts stomach upset and constipation. *P. cineraria*, *M. cerviana*, and *B. procumbens* are used for circulatory system problems like cardiac troubles and anaemia and also used to cure heart problems and as blood purifier (Goyal and Sharma, 2009). *C. cretica*, *S. imbricata* and *G. pharnacioides* are useful for leprosy and hypertension diseases (Nandagopalan *et al.*, 2011). *Aerva javanica*, *Haloxylon stocksii* and *Citrullus colocynthis* are useful against urinary system problems, especially for bladder stones and kidney (Sharif *et al.*, 2011).

Vegetation at cholistan desert constantly decline due to various biotic and abiotic factors but the present study was conducted to determine current status of vegetation and phyto-diversity at various locations of cholistan desert. It will help in locating the plant species through quadrat method this paper aims to show the parameters like relative density, relative frequency and covering area of plants present at cholistan desert.

Material and methods

Study Sites

The present study was conducted at district Bahawalnagar in Cholistan desert of 5 different sites to determine the shrub plant species. The name of places were Fort Moj Garh (Latitude: 29°0'48.2" (29.0134°) North Longitude: 72°8'28.2" (72.1412°) East), Fort Marot (Latitude: 29°10'39" North Longitude: 72°26'7" East), Fort Jam Garh (29°10'04.1" North and Longitudes 72°32'53.2" East), Fort Meer Garh (Latitude: 29°10'34.5" North Longitude: 72°37'26.4" East), Fort Abbas (Latitude: 29°11'33.00" North Longitude: 72°51'13.00" East).

Procedure

Quadrat method was used to record shrub plant species (Chul and Moody, 1983). 3 quadrats of about 1x1m² were randomly taken from each site of cholistan desert to measure shrub plant species. The recorded plant species were identified with field guide (Rao *et al.*, 1989).

Parameters

Frequency, cover, density and IVI were recorded whereas relative frequency, relative cover and relative density for each of the plant species were computed by method described by Hussain (1989). Importance value index (IVI) was calculated by the summation of relative frequency, relative density and relative cover of each plant species (Chul and Moody, 1983).

Relative Frequency (RF), relative density (RD) and relative cover (RC) were measured by formula described by Hussain, 1989.

$$\text{Relative frequency} = \frac{\text{Number of quadrats in which species occurred}}{\text{Total number of quadrats occupied by all species}} \times 100$$

$$\text{Relative Density} = \frac{\text{Density of a Species}}{\text{Total density of all species}} \times 100$$

$$\text{Relative cover (RC)} = \frac{\text{Total plant cover}}{\text{Cover of species}}$$

Importance value index (IVI) was calculated by formula given by Chul and Moody, 1983.

$$\text{IVI} = \frac{\text{R. density} + \text{R. frequency} + \text{R. cover}}{3}$$

The species at cholistan desert having the highest phyto-sociological parameters values were considered as the most dominant species.

Result and discussion

The results showed that *Aerva persica* exhibited high relative density, relative frequency, relative cover and also IVI but *Calligonum polygonoide* showed very low values at sit Fort Moj Garh (Fig. 1). While at Fort Marot *Crotalaria burhia* showed high relative density and relative frequency but at the same time *A. persica*, *H. salicornicum* and *L. scindicus* also showed high relative frequency, *H. salicornicum* showed high relative cover and IVI. *Leptadenia pyrotechnica* exhibited very low values (Fig. 2). At site Fort Jam Garh, *L. scindicus* dominated followed by *A. persica*, *C. burhia*, *C. polygonoide*, *H. salicornicum*, *C. dactylon*, *C. procera* and *S. baryosma* while *Calotropis procera* showed very low relative density, relative frequency, relative cover and IVI (Fig. 3).

While at Fort Meer Garh, *L. scindicus* showed high relative density, relative frequency, relative cover and IVI but *C. procera* showed very Low values (Fig. 4). While *L. scindicus* exhibited high relative density, relative frequency, relative cover and IVI but

Leptadenia pyrotechnica showed very low relative density, relative frequency, relative cover and IVI at Fort Abbas (Fig. 5).

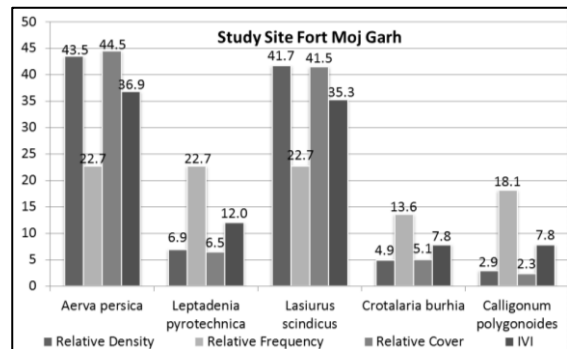


Fig. 1. Distribution of Shrub Plant Species in Fort Moj Garh.

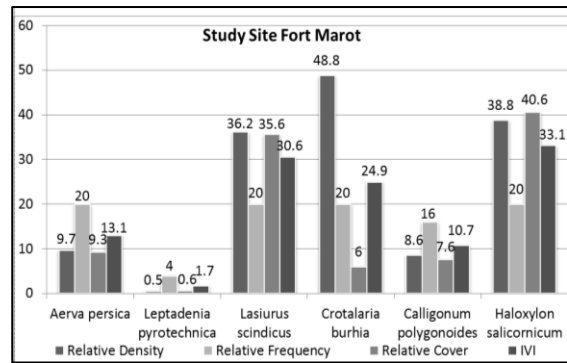


Fig. 2. Distribution of Shrub Plant Species in Fort Marot.

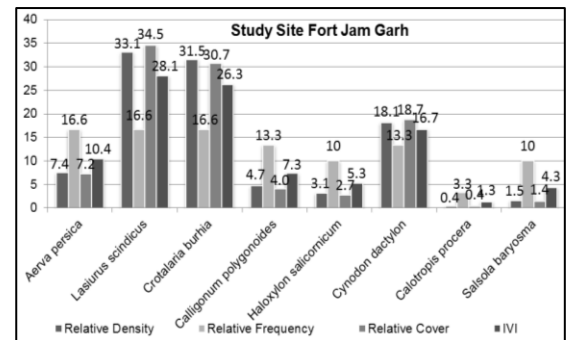


Fig. 3. Distribution of Shrub Plant Species in Fort Jam Garh.

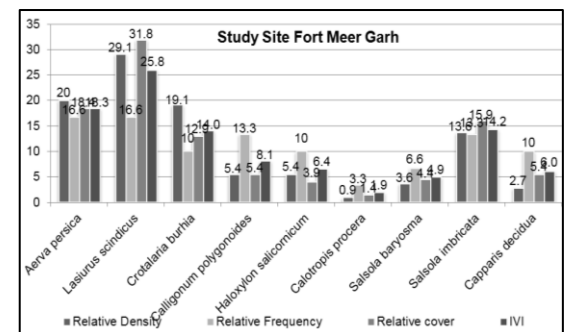


Fig. 4. Distribution of Shrub Plant Species in Fort Meer Garh.

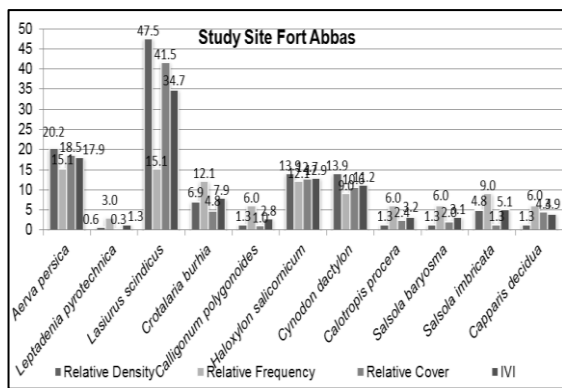


Fig. 5. Distribution of Shrub Plant Species in Fort Abbas.

The present study showed that *Lasiurus scindicus* showed very high RD, RF, relative RC and IVI at all study sites that was confirmed by Rao *et al.*, (1989) results investigated that compact saline soil dominated by *Haloxylon salicornicum*, *Suaeda*

fruticosa and *H. recurvum* whereas *Crotalaria burhia* and *Aerva persica* showed moderate while *C. procera*, *C. decidua* and *L. pyrotechnica* showed very low relative values at different study sites which was investigated and confirmed by Arshad *et al.*, (1994) results which showed *Sporobolus ioclados*, *Prosopis cineraria*, *C. juarancusa*, *O. compressa*, *S. baryosma*, *A. lagopoides* and *C. decidua* are dominant to the dahars which cover sandy soil.

Similarly, all plant species show great variation in vegetation at different study sites which depending upon their relative adaptation to the their soil conditions and these results was also confirmed by Arshad & Akbar, (2002) stated that the sand dunes exhibited *L. scindicus*, *A. javanica*, *C. polygonoides* and *P. turgidum*.

Table 1. Plant Species Recorded in Cholistan Desert of Pakistan.

SN	Scientific name	Family	Common name	Sites
1	<i>Aerva persica</i>	Amaranthaceae	Desert Cotton	Fort Moj Garh ; Fort Marot ; Fort Abbas; Fort Jam Garh ; Fort Meer Garh ;
2	<i>Leptadenia pyrotechnica</i>	Asclepiadaceae	Khip	Fort Moj Garh ; Fort Marot ; Fort Abbas ;
3	<i>Lasiurus scindicus</i>	Poaceae	Sewan grass	Fort Moj Garh ; Fort Marot ; Fort Abbas; Fort Jam Garh ; Fort Meer Garh ;
4	<i>Crotalaria burhia</i>	Papilionaceae	Chag	Fort Moj Garh ; Fort Jam Garh; Fort Abbas; Fort Meer Garh; Fort Marot ;
5	<i>Calligonum polygonoides</i>	Polygonaceae	Phog	Fort Moj Garh ; Fort Marot ; Fort Abbas; Fort Jam Garh ; Fort Meer Garh ;
6	<i>Haloxylon salicornicum</i>	Chenopodiaceae	Lana	Fort Marot ; Fort Jam Garh ; Fort Abbas; Fort Meer Garh ;
7	<i>Cynodon dactylon</i>	Poaceae	Bermuda grass	Fort Jam Garh ;Fort Abbas
8	<i>Calotropis procera</i>	Asclepiadaceae	Ak	Fort Jam Garh ; Fort Meer Garh ; Fort Abbas ;
9	<i>Salsola baryosma</i>	Chenopodiaceae	Mauritania	Fort Meer Garh
10	<i>Salsola imbricata</i>	Chenopodiaceae	Lani	Fort Jam Garh ; Fort Meer Garh ;
11	<i>Capparis decidua</i>	Capparidaceae	Karir	: Fort Meer Garh ; Fort Abbas ;

Conclusion

At present research work *Lasiurus scindicus* showed very high relative density, frequency, relative cover and importance value index while *Crotalaria burhia* and *Aerva persica* showed moderate while *Calotropis procera*, *Capparis decidua* and *Leptadenia pyrotechnica* showed very low relative values at different study sites of bahawalnagar of cholistan desert of Pakistan.

Acknowledgement

This research was supported by my teacher Dr. Nargis Naz. We thanks our colleagues who provided greatly assisted the research in the field.

References

- Ahmad M, Eram S.** 2011. Hepatoprotective studies on *Haloxylon salicornicum*, A plant from Cholistan desert. Pakistan Journal of Pharmaceutical Sciences **24**, 377-382.
- Akhter R, Arshad M.** 2006. Arid rangelands in the Cholistan Desert (Pakistan). Sécheresse **17**, 210-217.
- Ali I, Chaudhry MS, Farooq U.** 2009. Camel rearing in Cholistan Desert of Pakistan. Pakistan Veterinary Journal **29**, 85-92.
- Arshad M, Akbar G, Rashid S.** 2003. Wealth of medicinal plants of Cholistan desert, Pakistan, Conservational strategies. Hamdarad Medicus **105**, 25-34.

- Arshad M, Akbar G.** 2002. Benchmark of plant communities of Cholistan desert. *Pakistan Journal of Biological Sciences* **5**, 1110-1113.
- Arshad M, Anwar-ul-Hussan MY, Ashraf S, Noureen, Moazzam M.** 2008. Edaphic factors and distribution of vegetation in the Cholistan desert, Pakistan. *Pakistan Journal of Botany* **40**, 1923-1931.
- Arshad M, Ashraf M, Arif N.** 2006. Morphological variability of *Prosopis cineraria* (L.) Druce from the Cholistan desert, Pakistan. *Genetic Resources and Crop Evolution* **53**, 1589-1596.
- Arshad M, Ashraf MY, Ahamad M, Zaman F.** 2007. Morpho-genetic variability potential of *Cenchrusciliaris* L., from Cholistan desert, Pakistan. *Pakistan Journal of Botany* **39**, 1481-1488.
- Arshad M, Rao AR.** 1994. Flora of Cholistan desert (Systematic list of trees, shrubs and herbs). *Journal of Economic and Taxonomic Botany* **18(3)**, 615-625.
- Chul KS, Moody K.** 1983. Comparison of some methodologies for vegetation analysis in transplanted rice. *The Korean Journal of Crop Science* **28**, 310-318.
- Goyal M, Sharma SK.** 2009. Additional wisdom and value addition prospects of arid foods of desert region of North West India. *Indian Journal of Traditional Knowledge* **8**, 581-585.
- Hussain F.** 1989. *Field and Laboratory Manual of Plant Ecology*. National Academy of Higher Education, University Grants Commission, Islamabad, Pakistan.
- Jabeen A, Khan MA, Ahmad M, Zafar M, Ahmad F.** 2009. Indigenous uses of economically important flora of Margallah Hills National Park, Islamabad, Pakistan. *African Journal of Biotechnology* **8**, 763-784.
- Kataria S, Shrivastava B, Khajuria RK, Suri KA, Sharma P.** 2010. Antimicrobial activity of *Crotalaria burhia* Buch.-Ham roots. *Indian Journal of Natural Products and Resources* **1**, 481-484.
- Nandagopalan V, Anand SP, Selvakumar U, Doss A.** 2011. An ethnobotanical study in the Pudukkottai District, South India. *Asian Journal of Experimental Biological Sciences* **2**, 412-421.
- Naz N, Hameed M, Ahmad MSA, Ashraf M, Arshad M.** 2010. Is soil salinity one of the major determinants of community structure under arid environments. *Community Ecology* **11**, 84-90.
- Padmavathy A, Anbarashan M.** 2011. Phytomedicinal study of coastal sand dune floras in Puducherry. *Journal of Medicinal Plants Research* **5**, 2566-2571.
- Rao AR, Arshad M, Shafiq M.** 1989. Perennial Grass Germplasm of Cholistan Desert and its Phytosociology. Cholistan Institute of Desert Studies, Islamia University, Bahawalpur, Pakistan p. 160.
- Rao AR, Arshad M, Shafiq M.** 1989. Perennial grass germplasm of Cholistan desert and their phytosociology. Cholistan Institute of Desert Studies, Islamia University of Bahawalpur pp. 84.
- Sharif A, Ahmed E, Malik A, Mukhtar-ul-Hassan, Munawar MA, Farrukh A, Nagra SA, Anwar J, Ashraf M, Mahmood Z.** 2011. Antimicrobial constituents from *Aerva javanica*. *Journal of The Chemical Society of Pakistan* **33**, 439-443.