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EXPLORING THE ETHNOBOTANY OF *Haloxylon recurvum* (KHAR) AND *Haloxylon salicornicum* (LANA) IN CHOLISTAN DESERT, PAKISTAN

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Human beings are dependent on plants to fulfill various life accessories. Plants and various fungi are also a significant part of healthcare. Traditional system of medicine based on plants and herbs is gaining grounds today. Cholistan desert is enriched with various plant species of medicinal value. The objective of the study was to enlist the traditional use and folklores of two Haloxylon species by the local dwellers of Cholistan desert rangeland. Detailed questionnaires were used to interview the local inhabitants from 16 villages and medicinal plant experts/ herbal medicinal practitioners of the area. Both plant species were also chemically analyzed for various nutritive and secondary metabolite attributes. It was found that local people used these plants for treating various human and livestock diseases (total 20) in different traditional recipes. During this study, the use of *Haloxylon salicornicum* (Moq.) Bunge is first time recorded in treating eye infections (fresh juice of green leaves), diarrhea, skin diseases and piles. Similarly, *Haloxylon recurvum* (Moq.) Bunge ex Boiss use in wounds (burned plant is externally applied), ear infections and in sciatica pain is not reported yet in other parts of the world. Both species were found rich in Nitrogen, Protein, Total Ash, Crude Fibre, Ether Extractable Fat other salts like Potassium, Phosphates and Secondary metabolite components.
Keywords: Ethnobotany, traditional use, nutritive analysis, desert flora, rangeland.

INTRODUCTION

Plants are the major shareholder of the earth life and provide various services to other life forms including man by so many ways. Plants are also being used in healthcare from ancient times as remedy for different ailments (Newton *et al*., 2000). In recent times, dependency on plants as medicine is increased manifold due to ease in access, nature of action, minimum side effects and other various reasons. Natural products of plant origin have provided an alternative source for the development of new drugs (Koehn *et al*., 2005; Newman *et al*., 2007)**.** Dependency on plants (as medicine, fuel and fodder) is more in developing countries like Pakistan where the maximum population depends on agriculture as major livelihood source.

Cholistan is a desert rangeland in Pakistan with great botanic diversity. It also hosts two members of Chenopodiaceae family i.e. *Haloxylon salicornicum* (Moq.) Bunge and *Haloxylon recurvum* **(**Moq.) Bunge ex Boiss. *H. salicornicum* is a diffuse shrub with pale multi branches having yellowish green scale like leaves. It is locally called as Lani, Lana in Urdu and Rimth in Arabic language (Zaman, 1997). It may attain a height of 5-60 cm. Terminal and lateral spikes bear flowers. Fruiting perianth have 5 membranous wings of 5-8mm diameter and pink yellow in colour (Kostecki, 1999).

H. salicornicum is reported by many scientists to be used by various ways in different countries like fuel, fodder, food and medicines (Bhandari, 1995; Arshad *et al*., 2002; Dogla and Shekhawat, 2006). Different minerals and chemical components from the stem and leaf of this plant are used in making of animal feed (Ashraf *et al*., 2012). In Oman, its stem is used for dyeing of wool in traditional weaving (Ghazanfar, 1994). *H. recurvum* is also a densely branched pale diffuse shrub. Locally it is called as Khar or Sajji.Its stem is almost leafless and glabrous which secretes thick fluid on cut. Inflorescence is pale greenish like a small cup with scattered spikes. Wings like fruits are brownish in colour (Ahmad *et al*., 2004). Khan and Qaiser (2006) mentioned this shrub as an important fodder species. Other reported uses in various countries are, burned plant use in washing of cloths, in glass, soap industry, dye of cloth and medicines (Bhandari, 1990; Singh *et al*., 2005; Qasim *et al*., 2010; Iqbal *et al*., 2011).

The local inhabitants of the Cholistan used various local plants for treating various human diseases and of their livestock as well in different traditional recipes. The main objectives of the study were to explore and document the uses of these shrubs by local dwellers of Cholistan desert, to consult the medicinal plant experts for their opinion and to find out the chemical composition of above cited shrubs.

MATERIALS AND METHODS

***Study site*:** The permanent and semi-permanent settlements of Cholistan desert rangeland near tehsil Yazman of district Bahawalpur, Pakistan were selected for conducting study during 2010-2012. The Sixteen targeted villages of the said tehsil are located between latitudes 27°42′ and 29°45′ North and longitudes 69°52′ and 75°24′ East on geographical map (Anonymous, 2009).

***Ethnic community*:** Local inhabitants of the Cholistan are called "Rohelas" meaning nomadic graziers in local dialect. They are Muslim by religion but a small fraction of Hindus and Christians is also present. Saraiki is widely spoken language in the area but Punjabi is also used for communication in permanent settlements. Livestock rearing is the major profession but agriculture is also practiced along livestock in canal irrigated areas.

***Collection of ethnobotanical information*:** Ethnobotanical information of the shrubs is collected by adopting the procedures of Cunningham (2001). The research was conducted in different phases. Firstly, household surveys (320 households) were conducted in 16 selected villages of the area. Only male head (because it was not possible to include females on traditional and religious grounds) of the family was interviewed. The respondents included village farmers, old inhabitants, graziers and peasants. The ages of the respondents were in between 40 to 75 years. In second step, 14 local medicinal plant experts were interviewed. Most of these experts were qualified from "Tibbi colleges" (Govt. College for herbal and eastern medicine) and selected by adopting snowball method. A well prepared questionnaire was used to collect information on major ethnobotanical uses. Finally, whole plants of both species were sampled from the study area and identified by consulting available standard literature (Shafi *et al.*, 2001). The sampled plants were shade dried, grinded and stored in plastic bags for laboratory analysis.

***Chemical analysis*:** The dried and grinded material of both plant species was analyzed by using standard techniques and repeated thrice in different laboratories of University of Agriculture, Faisalabad. Proximate analyses were carried out by following the procedures of AOAC (1995). The PO_4^{3-} (soluble phosphates) and K^+ (potassium) were determined by using the methods described by Yoshida *et al*. (1976). The procedural method of Julkunen-Titto (1986) was followed in determining total phenolics. Harborne (1976) and the colorimetric assay method (Zhishen *et al*., 1999) was used to measure the alkaloids and total flavonoids contents in dried plant samples with minor modifications.

***Statistical analysis*:** MS Excel spread sheets were prepared from the collected data and analyzed into descriptive statistics by using the SPSS (Nie *et al*., 1975). The nutritive and medicinal parameters were statistically presented by using Tukey's test in complete randomized design.

RESULTS AND DISCUSSION

The diseases cured by both plant species are presented separately according to the respondents (local dwellers and medicinal plant experts) in Figure 2 and Table 1 and 2. The doses of the listed diseases are not mentioned here, therefore the readers are advised to verify before following them. Figure 1 graphically represents the common uses of both plant species in the area as mentioned by the local dwellers. These shrubs were mostly used as fodder, firewood and as medicine. These shrubs were also used for washing cloth and in making dyes which are grouped in miscellaneous. Besides the number of diseases cured, nutritive value and secondary metabolites are listed in Table 3. Frequently used parts of both plants to treat diseases are shown in Figure 3, and Table 1 and 2 along with diseases name (medicinal plant experts' responses). The medicinal plant experts' response on the local use of these shrubs is also elaborated in Figure 4. Present study revealed that a total of 20 different diseases are treated by both species. Both species have medicinal properties to cure veterinary ailments, intestinal pain/ulcer, insect bite, skin problems and also used as diuretic. Leaves were most commonly used plant parts for the treatment of

Table 1. *Haloxylon recurvum* uses in different diseases (experts response).

Diseases	Responses Percentage	Plant part used (%)				
		Flower	Leaves	Stem	Roots	Others*
Wounds	14.3	7.1	14.3	0.0	0	**7.1**
Insect bite	14.3	14.3	14.3	14.3	0	0.0
Intestinal ulcer	50.0	42.9	35.7	14.3	0	0.0
Veterinary medicine	71.0	0.0	7.1	0.0	0	0.0
Skin diseases	21.4	21.4	21.4	21.4	0	0.0
Stomach pain	28.6	21.4	7.1	7.1	0	0.0
Diuretic	21.4	0.0	21.4	14.3	0	0.0
Kidney disease	35.7	28.6	14.3	7.1	0	7.1
Ear infections	35.7	14.3	14.3	14.3	0	0.0
Sciatica pain	14.3	14.3	7.1	14.3	0	0.0
Viral diseases	14.3	0.0	14.3	0.0	0	0.0

*Whole plant (burned)

Table 2. *Haloxylon salincornicum* uses in different diseases (experts response).

Diseases	Responses Percentage	Plant part used (%)				
		Flower	Leaves	Stem	Roots	Others*
Veterinary medicine	35.7	14.3	21.4	35.7	0.0	0.0
Diabetes	21.4	7.1	7.1	21.4	0.0	0.0
Insect bite	21.4	21.4	21.4	21.4	0.0.	0.0
Skin diseases	21.4	0.0	21.4	7.1	0.0	0.0
Diuretic	28.6	21.4	21.4	21.4	0.0	0.0
Ulcer	21.4	7.1	21.4	28.6	0.0	0.0
Piles	21.4	7.1	7.1	21.4	7.1	0.0
Diarrhea	14.3	0.0	14.3	21.4	0.0	0.0
Women diseases	14.3	7.1	7.1	0.0	0.0	7.1
Wounds	21.4	0.0	7.1	14.3	0.0	0.0
Eye infection	21.4	21.4	21.4	21.4	0.0	0.0
Inflammation	50.0	0.0	0.0	0.0	0.0	50.0

*Whole plant

Table 3. Nutritive value and secondary metabolite compound analysis of both shrubs

Shrubs	Nutritive value (%)							
	Nitrogen	CF	Protein	Ash	EETF	Phosphate	Potassium	NFE
H. recurvum	2.43b	23.5a	15.00b	18.81b	4.81a	0.04a	4.51a	52.43a
H. salicornicum	4.87a	19.9b	30.31a	24.31a	5.21a	0.03a	0.79b	49.39b
	Secondary metabolite compounds							
	Phenolic (mg/.o1g)		Flavonoids (mg/.o1g)			Alkaloids (mg/.o1g)		
H. recurvum	0.6a		0.06a			0.04a		
H. salicornicum	0.8a		0.04b			0.04a		

CF = Crude fibre, EETF = Ether extractable fat, NFE = Nitrogen free extract

such diseases. Sometimes whole plant was used after burning in form of coal which was further processed for extracting different salts to use in different combination for making herbal medicines. According to the local dwellers (n=320), the intestinal pains/ulcer (16.3%), veterinary medicine (3.4%) and diarrhea in cattle (2.5%) are cured by *H. recurvum* while intestinal pains/ulcer (16.6%), diarrhea in cattle (2.8%), toothache (2.2%), bleeding gums (0.9%) and sunstroke (0.3%) are being treated by *H. salicornicum* .

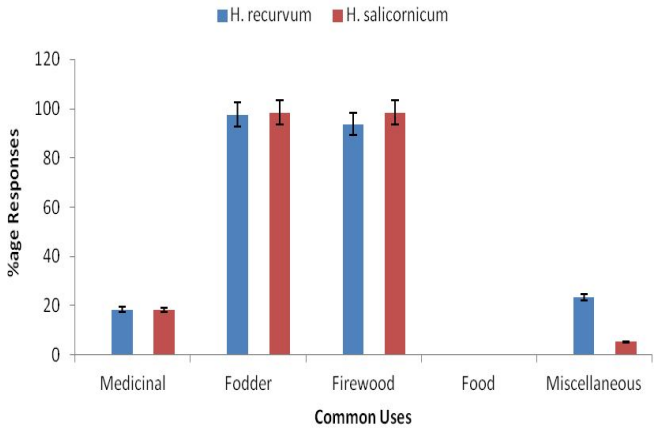


Figure 1. Common uses of the shrubs in the area (local dweller's response).

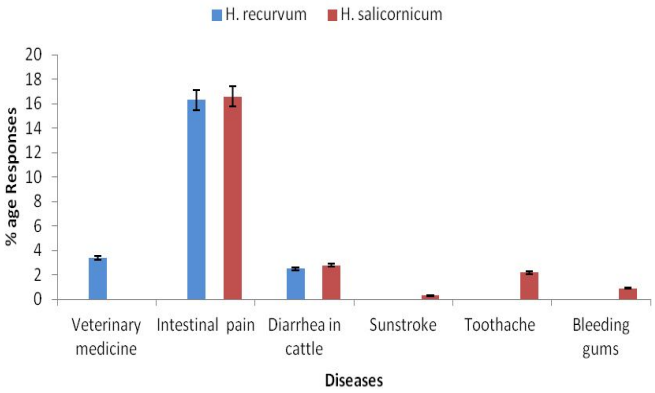
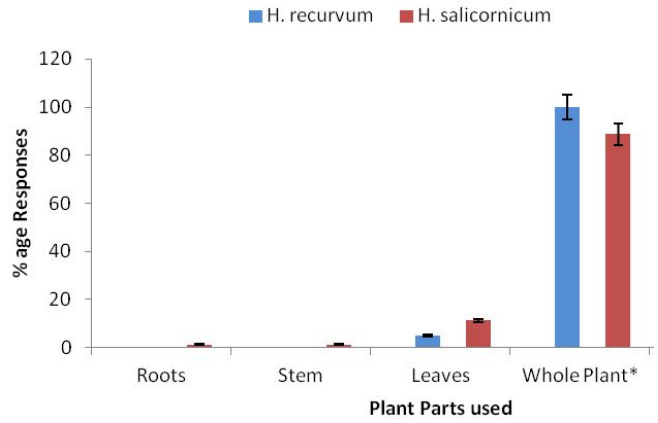


Figure 2. Medicinal uses of the shrubs in the area (local dweller's response).

According to the local medicinal plant experts, *H. recurvum* is used in treating 11 diseases. Major diseases cured were intestinal ulcer (50.0%), kidney pain (35.7%) and ear infections (35.7%). Mostly flowers, leaves and stem bark were used but sometimes whole plant burned and used for making various herbal medicines for treating diseases. "Khar" (Sodium bicarbonate) is also extracted from the coal of this plant. Similar to our findings Iqbal *et al*. (2011) reported its medicinal properties as diuretic and many others mentioned its use in various diseases in other parts of the

world (Bandari, 1990; Hussain *et al*., 2006; Qasim *et al*. 2010). Use in wounds (burned plant is externally applied), ear infections and in sciatica pain was first time reported.



*Usually whole plant is used as firewood

Figure 3. Plant parts used in different ailments (local dweller's response).

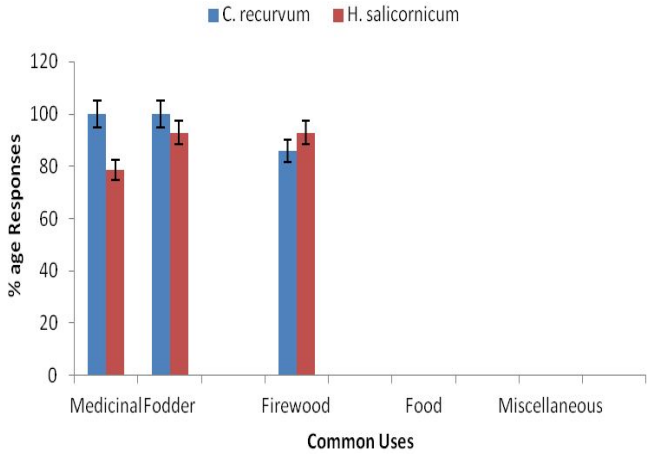


Figure 4. Common uses of the shrubs in the area (experts response).

H. salicornicum plant was responded to be used in 12 diseases like inflammation (50.0%), in veterinary medicines (35.7%), as Diuretic (28.6%), in diabetes (21.4%), insect bite (21.4%), in skin diseases (21.4%), ulcer (21.4%), piles (21.4%), wounds (21.4%) and eye infections (21.4%) by the local medicinal plant experts. Flowers and leaves were the most commonly used plant parts but roots and sometimes whole plant (crushed) is used in some diseases (table 2). Only a few past studies reported to its use as medicinal plant. Arshad *et al*. (2002) and Bhandari (1995) reported its use in veterinary medicine and for insect bite. Its decoction as herbal medicines is use as antiseptic, anti-inflammatory (Al-Shanawani, 1996), diuretic (Twaij *et al*., 1985) and antiulcer (Shafi *et al*., 2001). Its use in diabetes is reported in literature (Ajabnoor *et al*., 1984). Its use in curing women diseases (excessive bleeding and leucorrhoea) is also reported by Wariss *et al*. (2014) from Cholistan desert. Its use in treating eye infections (fresh juice of green leaves), diarrhea, skin diseases, and piles was first time recorded.

Both shrubs species were also analyzed for various nutritive attributes and secondary metabolite components. The assessment of their nutritional significance might be helpful in understanding the worth of these shrubs. The quantities of N (4.87%), P (30.3%), total ash (24.31%) and EEF (5.21%) were found maximum in *H. salicornicum* while the CF (23.5%), K (4.51%) and NFE (52.43%) were more in *H. recurvum*. Secondary metabolite components (flavonoids, phenolics and alkaloids) were almost in same concentrations in both species (Table 3). Flavonoids and phenolics are the most significant bioactive chemical compounds produced by plants. These compounds play a part in plant growth, reproduction and various other primary processes. These are also natural antioxidant substances which are capable of cleaning free superoxide radicals, minimizing cancer risks and anti-aging. Most medicines are based on secondary metabolites from plants and used to enhance human immunity (Atoui *et al*., 2005). Flavonoids are capable for inhibiting aldose reductase enzyme (responsible for converting sugars to sugar alcohols). It is also concerned with diabetic complications (Thomas-Barberan and Espin, 2001). Phenolic compounds are also used in numerous pharmacological activities. Various studies reported the antidiabetic activity of flavonoids and phenolic acids (Luo *et al*., 2009). Phenolic components and flavonoids perform diverse biological functions like antiulcer, anti-inflammatory, antioxidant, antispasmodic and anti depressant activities (Ammon and Wahl, 1991; Araujo and Leon, 2001; Yu *et al*., 2002; Ghasemzadeh *et al*., 2011).

Local people of an area are much associated with the surrounding vegetation for different life accessories. Both species have great medicinal and nutritional importance (Table 3) for the human and livestock. *H. recurvum* is available during summer and highly browsed by goats and camels. Camels are supposed to like more salt rich fodder than other livestock. Therefore, both species particularly *H. recurvum* might be the best halophytic fodder in Cholistan desert for camels which will be available all the year.

***Conclusions*:** Present study generated important information about the locally found Haloxylon species that might be helpful for initiating different socio-economic and health-care programs in the area. These species can be used as soil binder for conserving sandy soil and a source of poverty alleviation as well for the local communities. Local people are also much familiar with their medicinal uses. Their traditional knowledge about plants as medicine and cultural affiliation with local flora is to be conserved by documentation and should be facilitated with proper policy framework. Well motivated awareness campaigns for local

people should be conducted on proper use and conservation of local medicinal plants. A mutual exchangeable knowledge based social service network among different medicinal plant users like medicinal plant experts, local old people (with medicinal plant use knowledge) and botanist should be developed to protect the traditional use knowledge of local plants. It will also be helpful for the conservation of medicinally and economically important plant species.

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REFERENCES

Ahmad, H., G.R. Bhatti and A. Latif. 2004. Medicinal flora of the Thar Desert: an overview of problems and their feasible solutions. Zonas Áridas 8: 1-11.

Ajabnoor, M.A., M.A. Al-Yahya, M. Tariq and A.A. Jayyab. 1984. Antidiabetic activity of *Hammada salicornicum*. Fitoterapia Vol.: 107-109.

Al-Shanawani, M.A.A. 1996. Plant used in Saudi folk medicine. King Abdul-Aziz city for Science and Technology (KACST), Riyadh, Saudi Arabia; p.162.

Ammon, H.T.P. and M.A. Wahl. 1991. Pharmacology of *Curcuma longa*. Planta Med. 57: 1-7.

Anonymous. 2009. Profile of district Bahawalpur- with focus on livelihood related issues. South Asia Partnership-Pakistan, Haseeb Memorial Trust Building, Nasirabad, 2 km Raiwind Road, P.O. Thokar Niaz Beg, Lahore-53700, Pakistan; pp.7-9.

AOAC. 1995. Official methods of analysis of the association of official analytical chemists, Washington D.C., USA.

Arshad, M. and G. Akbar. 2002. Benchmark of plant communities of Cholistan desert. Pak. J. Bio. Sci. 5: 1110-1113.

Araujo, C.A.C. and L.L. Leon. 2001. Biological activities of *Curcuma longa*. Mem. Inst. Oswaldo Cruz. 96:723-728.

Ashraf, M.A., M. Karamat, K. Shahnaz, A. Wajid and I. Yusoff. 2012. Study of chemical and mineral constituents of *Haloxylon salicornicum* collected from Cholistan Desert, Bahawalpur, Pakistan. Wulfenia J. 19:306-327.

Atoui, A.K., A. Mansouri, G. Boskou and P. Kefalas. 2005. Tea and herbalinfusions: their antioxidant activity and phenolic profile. Food Chem. 89: 27-36.

Bhandari, M.M. 1990. Flora of the Indian Desert. MPS Repros, Jodhpur, India.

Bhandari, M.M. 1995. Biodiversity of Indian desert: Taxonomy and Biodiversity. CBS Publishers, Dehli, India; pp.29-43.

Cunningham, A.B. 2001. Applied Ethnobotany: People, wild plant use and conservation. Earthscan, London.

Dogla, H.R. and N.S. Shekhawat. 2006. Little known use of *Haloxylon* species in traditional food. Natural Product Radiance 5:131-132.

Ghazanfar, S.A. 1994 . Handbook of Arabia Medicinal Plant. Boca Raton, Ann. Arbor. (CRC), London; pp.83-86.

Ghasemzadeh, A. and H.Z.E. Jaafar. 2011. Anticancer and antioxidantactivities of Malaysian young ginger (*Zingiber officinale* Roscoe) varieties grown under different CO_2 concentration. J. Med. Plant Res. 5: 3247-3255.

Harborne, J.B. 1976. Phytochemical methods, London. Chapman and Hall, Ltd; pp.49-188.

Hussain, S., E. Ahmed, A. Malik, A. Jabbar, M. Ashraf, M.A. Lodhi and M.I. Choudhary. 2006. Halosterols A and B, chymotrypsin inhibitory sterols from *Haloxylon recurvum*. Chem. Pharm. Bull (Tokyo) 54:623–628.

Iqbal, H., Z. Sher and Z.U. Khan. 2011. Medicinal plants from salt range Pind Dadan Khan, district Jhelum, Punjab, Pakistan. J. Med. Plant Res. 5:2157-2168.

Julkunen-Tiitto, R. 1986. A chemotaxonomic survey of phenolics in leaves of northern *Salicaceae* species. Phytochemistry 25:663–667.

Khan, M.A. and M. Qaiser. 2006. Halophytes of Pakistan: Characteristics, distribution and potential economic usages. In: M.A. Khan, G.S. Kust, H.J. Barth and B. Boer (eds.), Sabkha ecosystems, Vol. II. Springer, Netherland; pp.129-153.

Koehn, F.E. and G.T. Carter. 2005. The evolving role of natural products in drug discovery. Nat. Rev. Drug Disc. 4:206-20.

Kostecki, P. 1999. Assessments and remediation of oil contaminated soils. Taylor & Francis Pub., pp.145-150.

Luo, H., G.O. Rankin, L. Liu, M.K. Daddysman, B.H. Jiang and Y.C. Chen. 2009. Kaempferol inhibits angiogenesis and VEGF expression through both HIF dependent and independent pathways in human ovarian cancercells. Nutr. Cancer 61:554-563.

Newton, S.M., C. Lau and C.W. Wright. 2000. A review of antimycobacterial natural products. Phytother. Res. 14:303-22.

Newman, D.J. and G.M. Cragg. 2007. Natural products as sources of new drugs over the last 25 years. J. Nat. Prod. 70:461-77.

Nie, N.H., C.H. Hull, J.G. Jenkins, K. Steinbrenner and D.H. Bent. 1975. Statistical Package for the Social Sciences, 2nd Ed. McGraw-Hill, New York.

Qasim, M., S. Gulzar, Z.K. Shinwari, I. Aziz and M.A. Khan. 2010. Traditional ethanobotanical uses of halophytes from Hub, Balochistan. Pak. J. Bot. 42:1543-1551.

Shafi, M.S., M.Y. Ashraf and G. Sarwar. 2001. Wild medicinal plants of Cholistan area of Pakistan. Pak. J. Biol. Sci. 4: 112-116.

Singh, J.P., M.L. Soni and V.S. Rathore. 2005. Halophytic chenopod shrubs of arid zone. In: P. Narain, M. Singh,

M.S. Khan and S. Kumar (eds.), Shrubs of Indian Arid Zone. Central Arid Zone Research Institute, Jodhpur, India; pp.27-32.

Tomas-Barberan, F. and J.C. Espin. 2001. Phenolic compounds and related enzymes as determinants of quality of fruits and vegetables. J. Sci. Food Agric. 81: 853-876.

Twaij, H.A.A., E.E. Elisha and A.A. Al-Jeboory. 1985. Screening of Iraqi medicine plants for diuretic activity. Indian J. Pharmacol. 73:73-76.

Wariss, H.M., S. Ahmad, S. Anjum and K. Alam. 2014. Ethnobotanical studies of dicotyledonous plants of Lal Suhanra National Park, Bahawalpur, Pakistan. I. J. Sci. and Res. 3:2452-2460.

Yoshida, S., D.A. Forno, J.H. Cock and K.A. Gomez. 1976. Laboratory manual for physiological studies of rice. Philippines: IRRI; p.83.

Yu, L., S. Haley, J. Perret and M. Harris. 2002. Antioxidant properties of hard winter wheat extracts. Food Chem. 78:457–461

Zaman, S. 1997. Effects of rainfall and grazing on vegetation yield and cover of two arid rangelands in Kuwait. Foundation for Environmental Conservation 24:344-350.

Zhishen, J., T. Mengcheng and W. Jianming. 1999. Research on antioxidant activity of flavonoids from natural materials. Food Chem. 64:555-559.