International Journal of Farm Sciences **12(3):** 31-34, 2022; **doi: 10.5958/2250-0499.2022.00069.6**

Review

Uses and phytochemical analysis of *Haloxylon stocksii*- a review

ROHIT CHANDI

Division of Seed Science and Technology, Indian Agricultural Research Institute Pusa 110012 New Delhi, India

Email for correspondence: chandirohit93@gmail.com

 Received: 05.01.2022/Accepted: 22.05.2022

ABSTRACT

Saline area of semi-arid and arid regions is very harsh for growth of normal mesophytes due to high temperature, low moisture and high content of salt in soil. *Haloxylon stocksii* is a halotypic shrub which can tolerate high stress for salt and temperature hence suitable to grow in such abiotic stress conditions. It is native to northwest Rajasthan and some parts of Pakistan. It is although a wild plant yet it has appreciable uses such as medicinal, animal pasture etc. Moreover taste of Bikaneri papad is not complete without the use of *H stocksii*. The inadequate and improper knowledge of this shrub makes it futile. Therefore for proper utilization of barren and waste land of northwest India and increasing farmers' economy, study of this shrub becomes very important. The article gives information on importance of *H stocksii* wrt all aspects such as medicinal, papad making and improving the land. The article focuses on uses of *H stocksii* and commercialization and globalization of various products obtained from this particular shrub. Various biochemical and photochemistry aspects are also summarized in the article.

Keywords: *Haloxylon stocksii*; uses; phytochemical constituents

INTRODUCTION

In nature there are various underutilized species which are actually important to human in securing food and fulfill energy requirement of rural population. Ignored and deserted plant species frequently play an important role in providing livestock fodder, food, generation of income and energy needs of Arcadian population. In spite of their great potential, these plant species are being ignored (Ahmed et al 2004). *Haloxylon stocksii* (Boiss) (Fig 1) is one of such types of halophyte shrubs which are naturally growing in saline, arid and semi-arid areas. It is used for making Sajji and plant ash is used as washing agent. *H stocksii* is having more than 100 genera and 1,200 species in the world (Qasim et al 2014). In Punjabi it is called as Kharilana, Khiri-Lani and in Hindi it is known as Khar, Sajji Lana, Kangan Sajji, Sibi Khar and Khara Lana.

Botany and ecological distribution

H stocksii (syn *H recurvum*) is perennial, dwarf, glabrous, having succulent leaf, found in the saline parts of western Rajasthan. It has ability to store high amounts of salts (sodium chloride) in ionic form (Rathore et al 2012). It is a shrub that is having height up to 90 cm or sometimes more. The plant is spreading, recurved, paniculated branched, hairless, powdery, brown dark having strict spikes of 5-15 cm long at the end. Sajji Lana has glabrous stem and leaves are ellipsoid, trigonous, obtuse or acute at the tip and sometime blunt or pointed. Its flowering time is from October to December.

Haloxylon is distributed in southwest and central Asia, China (Sinkiang and Kansu) and Egypt to Mongolia where it grows as wild plant in sandy terrace (Hedge 1997). It is widely distributed in Syria, Turkey, Iran, Iraq, Afghanistan, India, central Asia and Pakistan (Hussain et al 2006). Tolerance to abiotic stresses such as drought and high temperature makes this plant suitable for cultivation in marginal lands of arid regions (Rathore et al 2012). In India, it is widely scattered in saline habitats of northwestern Rajasthan. In Rajasthan major cultivation areas of *H stocksii* include Anupgarh and Suratgarh Tehsils of

a

b

c

Fig 1. *Haloxylon stocksii*, a) Shrub, b) Seeds, c) Sajji obtained from the plant

district Sri Ganganagar. The farmers mainly cultivate it for production of Sajji. *H stocksii* plants are burnt in a furnace to obtain Choa and Sajji. Sajji is black coloured solid material obtained after burning plant and the whitish material collected is called Choa (Rathore et al 2012). Bikaneri papads are prepared by using Sajji because it gives good taste and crispiness to papads.

Halophytes have higher osmotic potential and high proline content. Similarly *H stocksii* has also more negative osmotic potential. Higher glycinebetaine acts as good osmo-protectant of protein to avoid oxidative stress (Khan et al 2000). The inability of *H stocksii* to excrete salt from tissue leads to accumulation of ions in stem of the plant (Aziz et al 2011). Zehra and Saeed (2015) studied the effect of different salts (NaCl, Na_2SO_4, $MgCl_2$, $CaCl_2$ and KCl) on the seed germination of *H stocksii*. During checking germination ability at different salinity levels (0, 100, 200, 300, 400 and 500 mM) at day-night temperature 30-20°C in a 12 h light/dark photoperiod, highest seed germination was observed in distilled water (control). Increase in salt concentration decreased the seed germination in all salt treatments. It was also found that KCl was most toxic among all the treatments.

Uses

Sajji is main product of *H stocksii* obtained by air-dried burning of plant. Preparation of Bikaneri papad is not possible without Sajji. Best Sajji is said to be Lota Sajji found in Montogomery district of Pakistan (Babar et al 2018). Farmers of villages of Tehsil Anupharh sell it for making Bikaner papad and production of soap and glass. Impure sodium carbonate obtained from Barilla (*Salsola soda*) is used for preparation of soaps (Hammer et al 1990).

H stocksii is famous for its toxicity and also acts as good insecticide (Ali and Qaiser 2001). Ash of *H stocksii* is used for curing internal ulcers (Rathore et al 2012). *H stocksii* decoction is very effective against arthritis (Ahmed et al 2004). It is also effective for healing the cutting wounds in various body parts (Babar et al 2018).

Studies of Gilani and Shaheen (1994) suggested that it is effective vasoconstrictor and also has cardiac stimulatory effects. It stimulates α-adrenergic receptors in the blood vessels and cardiac β-receptors. The plant is very effective diuretic, abortifacient and emmenagogue. Local people use burn of the plant for obtaining soda ash which is used for cloth washing (Iqbal et al 2011). Decoction of *H stocksii* is used by local physicians for treating various viral diseases (Babar et al 2018). The leaves, stem, fruits and seeds are used to cure 23 ailments (Qasim et al 2014). Ash powder of burnt plant is used in dyspepsia, flatulence, hemorrhoids and constipation (Wariss et al 2014).

The Sajji-Khar is added as an ingredient for unique taste of papad (Ahmed et al 2004). Its bushes are used for fire. Seed of *H stocksii* contains 22 to 25 per cent oil and about 20 per cent of ash. Its seed oil has 12 unsaturated fatty acids and four saturated fatty acids (Weber et al 2007). Its whole plant is used for making ash and ash mixed with sugar is used to cure renal stones (Qasim et al 2014).

Anupgarh, Vijaynagar, Raisinghnagar and Surathgarh Tehsils of Sri Ganganagar have saline soils in various patches which makes the growth of mesophytic palnts difficult in these conditions. Due to halophytic nature of *H stocksii*, it is grown for Sajji, making washing soda and for fodder purposes. The fodder can be used for goats and camels. For camel the plant is regularly used fodder because of high concentration of salts in stem of the plant that makes camel healthy in arid conditions. During the summer months when no pasture is available, its fodder can be used as alternative (Babar et al 2018).

Rise in electrical conductivity and pH of soil makes it ineffective for cultivation. In canal irrigated area of Indra Gandhi main canal, due to large seepage losses land becomes unfertile and unfit for cultivation due to rise in salt concentration. Moreover in some parts of Rajasthan soil is saline naturally. To overcome these problems, various chemical, mechanical and biological methods are adopted. So farmers of these areas adopted *H stocksii* which is very effective candidate in low moisture and high temperature circumstances for phytoremediation of saline soils. Rathore et al (2012) investigated soil samples from area of northwestern Rajasthan and concluded that *H stocksii* increases organic carbon in soil and also reduces electrical conductivity and pH of soil.

Various synthetic chemicals are used in textile and leather industries to remove dyes. These synthetic dyes are very harmful to the environment because of their non-biodegradable nature. Experiments conducted by Hassan et al (2017) concluded that stems of Sajji

Khara could be employed as a low cost and eco-friendly biosorbent. Sajji Khara can be used as alternative for non-biodegradable methylene blue dye. Hence in India Sajji Khara is used as soap and dye removal especially in rural areas of Rajasthan.

Phytochemical constituents

Phytochemical studies of *H stocksii* on chloroform soluble fraction leads to isolation of seven main compounds. These compounds are 1-triacontanol, β-sitosterol, triacontanoic acid, ursolic acid, β-sitosterol 3-O-β-D-glucopyranosid, octacosonic and octadecanoic acid. These chemicals were tested for phytotoxicity but none of them were found phytototoxic (Ahmed et al 2004). Studies of Ahmed et al (2006) on sterols of Sajji Khar showed that haloxysterols A-D (1-4), new C-24 alkylated sterols, have been isolated from the chloroform soluble fraction of this plant which were found non-competitive inhibitors of both the enzymes acetylcholinesterase and butyrylcholinesterase.

CONCLUSION

H stocksii is an excellent candidate for saline, arid and semi-arid conditions. It has multiple uses like as a medicinal plant, as washing powder, Sajji making and remedial plant for correction of salt-affected soils. It has ability to tolerate extreme climatic conditions and can be grown on marginal lands without any irrigation facilities. Moreover it acts as a good graze for camels and goats. Keeping in view all its wonderful features, there is need for further research and domestication and commercialization of this species.

REFRENCES

Ahmed E, Malik A, Riaz N and Sharif A 2004. Phytochemical studies of *Haloxylon recurvum*. Journal of the Chemical Society of Pakistan **26(4):** 389-391.

Ahmed E, Nawaz SA, Malik A and Choudhary MI 2006. Isolation and cholinesterase-inhibition studies of sterols from *Haloxylon recurvum*. Bioorganic and Medicinal Chemistry Letters **16:** 573-580.

Ali SI and Qaiser M 2001. Flora of Pakistan. Department of Botany, University of Karachi, Pakistan, 1995-2008, 189p.

Aziz I, Gul B, Gulzar S and Khan MA 2011. Seasonal variations in plant water status of four desert halophytes from semi-arid region of Karachi. Pakistan Journal of Botany **43(1):** 587-594.

Babar A, Ahmad A, Rehman T, ul Sabah N and Arshad MA 2018. A review on photochemical analysis and enthnobotanical uses of *Haloxylon stocksii.* RADS Journal of Pharmacy and Pharmaceutical Sciences **6(2):** 162-167.

Gilani AH and Shaheen F 1994. Vasoconstrictor and cardiotonic actions of *Haloxylon recurvum* extract. Journal of Phytotheraphy Research **8(2):** 115-117.

Hammer K, Pignone D, Cifarelli S and Perrino P 1990. Barilla (*Salsola soda*, Chenopodiaceae). Economic Botany **44(4):** 410-412.

Hassan W, Farooq U, Ahmad M, Athar M and Khan MA 2017. Potential biosorbent, *Haloxylon recurvum* plant stems for the removal of methylene blue dye. Arabian Journal of Chemistry **10(2):** S1512-S1522.

Hedge IC 1997. *Haloxylon*. In: Flora Iranica, Vol 172: Chenopodiaceae (KH Rechinger, IC Hedge, H Akhani, H Freitag, G Kothe-Heinrich, D Podlech, S Rilke and P Uotila, eds), Flora Iranica Project, pp 315-326.

Hussain S, Ahmed E, Malik A, Jabbar A, Ashraf M, Lodhi MA and Choudhary MI 2006. Halosterols A and B, chymotrypsin inhibitory sterols from *Haloxylon recurvum.* Chemical and Pharmaceutical Bulletin **54(5):** 623-625.

Iqbal H, Sher Z and Khan ZU 2011. Medicinal plants from salt range Pind Dadan Khan, district Jhelum, Punjab, Pakistan. Journal of Medicinal Plants Research **5:** 2157-2168.

Khan MA, Ungar IA and Showalter AM 2000. Effects of sodium chloride treatments on growth and ion accumulation of the halophyte *Haloxylon recurvum*. Communications in Soil Science and Plant Analysis **31(17-18):** 2763-2774.

Qasim M, Abideen Z, Adnan MY, Ansari R, Gul B and Khan MA 2014. Traditional ethnobotanical uses of medicinal plants from coastal areas of Pakistan. Journal of Coast Life Medicine **2(1):** 22-30.

Rathore VS, Singh JP and Roy MM 2012. *Haloxylon stocksii* (Boiss) Benth et Hook f, a promising halophyte: distribution, cultivation and utilization. Genetic Resources and Crop Evolution **59(6):** 1213-1221.

Wariss HM, Ahmad S, Anjum S and Alam K 2014. Ethnobotanical studies of dicotyledonous plants of Lal Suhanra National Park, Bahawalpur, Pakistan. International Journal of Science and Research **3:** 2452-2460.

Weber DJ, Ansari R, Gul B and Khan MA 2007. Potential of halophytes as source of edible oil. Journal of Arid Environments **68:** 315-321.

Zehra A and Saeed R 2015. Germination response of potential halophyte *Haloxylon stocksii* in different salts and photoperiods. FUUAST Journal of Biology **5(1):** 99-105.