



Ethno-botany and Ethno-Pharmacology of Seabuckthorn (*H.rhamnoides*) in Kargil district of Ladakh UT (Trans – Himalaya)

Mehmood*, E-mail: MKWaxeri@gmail.com*

Department of Botany , Rabindranath Tagore university (U-0656) Bhopal-Chiklod Road, Pin 462045 District: Raisen, (M.P.) India.

Abstract

An extensive survey was conducted by me , to know the ethnobotanical and ethnopharmacological study of seabuckthorn (SBT) in Kargil district of Ladakh trans-Himalaya. For this we used the questionnaire's and interview method from experienced persons in several locations of kargil district from Drass to Parkachik, the total village visited for this survey is 26 villages, during the survey we noticed that different use of this medicinal plant was going from the past to now. The local people of this region still depend on traditional systems of medicine for different purpose like most of the boto tribe particularly Amchis use Amchi system which is based on Tibet system of Medicine. Seabuckthorn are multipurpose plant the different use of seabuckthorn are for fuel, fencing, fodder, protect from soil erosion, food, flavouring, cosmetics, beverage, land reclamation etc. One new thing noticed in SBT is they are chilling resistant plant. There is an tremendous scope for pharmaceutical companies, cosmetic companies, beverage companies etc, to fulfil the need of people whose demands are increasing every day.

Keywords: Seabuckthorn (SBT) ; Ethno-botany; Pharmaceutical companies ; Land reclamation; Amchi ; Aba; N₂ Fixation

INTRODUCTION

Ladakh is northern most part of India ,it falls in the trans Himalayan region and covers more than 70,000 sq km which lie between 31°44'57"-32°59'57"N Latitude and 76°46'29" - 78°41'34"E Longitudinally. The climate is characterized by extreme heat and cold couples with excessive dryness, temperature shows great fluctuations during different month of the year ,in winter temperature falls as -59°C (lowest recorded from

Drass) -26°C (at Kargil) and -30°C at Leh and summer temperature reach up to 37°C. Annual precipitation is very little (less than 100mm in a year), their topography is rugged with rocky terrains.

Seabuckthorn are perennial deciduous shrubs grow up to 18 feet ,their flowering and fruiting time is august- October ,plant are bushy, herbaceous shrubs having extensive rooting and strong stem, the silvery green leaves are linear or

lanceolate shape and a very sharp thorn appear from the brunches, flower are small greenish yellow and pollinated by wind (Anemophilous) it carry globular and ellipsoid shaped fruit, the colour of berry are greenish it is not mature after fully ripened its colour changes to either Red, Orange or Yellow according to their genetic diversity,(Singh⁶, *et al.*, 2006). Seabuckthorn are found at an altitude of 2000-17000 ft above msl. It can with stand extreme temperature from 40°C to - 40°C.

Distribution of Seabuckthorn: The distribution of seabuckthorn is mostly found at the northern temperate regions like many European countries, Russia, Central Asian countries, Turkey, China, India, Pakistan, Bhutan, Nepal, Tibet etc²¹. It was known that seabuckthorn (*H.rhamnoides*) was native to Eurasia and is the hotspot for their availability but also indigenous to China, the paleo botanic studies found fossil pollen trace in the sediments or deep soil, this indicate the origin , era and their distribution of the plant²².

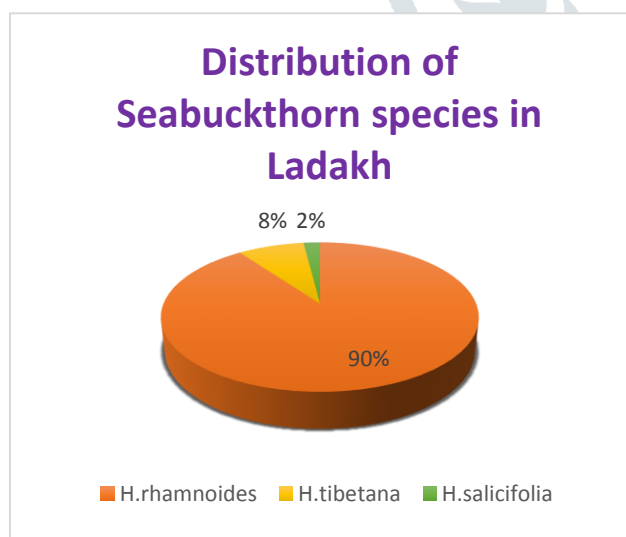


Fig.1 Showing percentage wise distribution of seabuckthorn in UT Ladakh.(Trans-Himalaya)

History of Seabuckthorn (*Hippophae spp.L*) Was very ancient their ethnobotanical and

ethnopharmacological uses was documented in ancient greek texts by Theophrastus and Dioscoridis their medicinal importance was recorded in classic Tibetan medicinal literature involving RGYud Bz (four book of pharmacopeia) dated to the time (Tang Dynasty 618-907 AD). It includes the utilization pattern of seabuckthorn (Chinese pharmacopoeia commission; 2005)

TAXONOMY

The taxonomic classification of *Hippophae rhamnoides* given by Khan et al., 2010.

Kingdom	Plantae
Division	Spermatophyte
Clade	Fabidae
Subclass	Rosidae
Order	Rhamnales
Family	Elaeagnaceae
Genus	<i>Hippophae</i>
Species	<i>rhamnoides</i>

The species in the genus “*Hippophae*” are known as seabuckthorn, which belong to the family Elaeagnaceae, and is the major group in this Flowering plant (Angiosperm). It includes four genera in this family.

- 1.Elaeagnus
- 2.Hippophae
- 3.Shepherdia
- 4.Lepargyrea

the number of species under Hippophae is yet uncertain, originally it consist of only one species

now three sub species are included, i.e. *ramnoides*, *tibetana* and *salicifolia*.

From the latest systematic classification of the genus *Hippophae* L, it consists of seven species and the species *H.ramnoides* circumscribe eight sub species namely, *sinensis* Rousi, *caucasia* Rousi, *carpatica* Rousi, *yunnanensis* Rousi, *turkestanica* Rousi, *mongolica* Rousi, *fluvialis* van Soest and *ramnoides* Rousi. The classification of the genus is still ambiguous for their precision /accuracy, due to variation found in Himalayan region, European regions and central Asian species.

The species *H.ramnoides* L distribution occur widely but sporadically in Asia and Europe, seabuckthorn are exported from Russia to Canada and to modern research station now successfully cultivated, the seven recognized species of *Hippophae* are

- i. *H.ramnoides* Linn
- ii. *H.salicifolia* D.Don
- iii. *H.tibetana* Schltdl
- iv. *H.goniocarpa* Y.S.Lian, et al.
- v. *H.neurocarpa* S.W.Liu & T.N.He
- vi. *H.Gysntsensis* (Rousi) Y.S.Lian
- vii. *H.litangensis* Y.S.Lian & X.L.Chen ex Swenson & Bartish

Nutritional and Medicinal Value

Many scientist and researcher confirmed that SBT have immense number of nutritional and medicinal value, Killio *et al.*, 2002; Yang and Killio., 2002; Liskinen *et al.*, 2010; Korekar²⁶ *et al.*, 2011; Ranjith *et al.*, 2006. Found SBT have wide variety of secondary metabolites like flavonoids and

phenolics - Quercetin, isorhamnetin, kaempferol, myricetin;

tannins- hippophae cerebroside, dolichoic acid, oleanolic acid, carotenoids – carotene, lutein, zeaxanthin, tocopherol, lycopene; 5 hydroxymethyl-2-furancarboxaldehyde, palmitic acid, 1-o-hexadecanolenin, octacosanoic acid, 19-alpha- hydroxyursolic acid; Fatty acids – palmileic acid, oleic acid (omega-9), linoleic (omega-6), and linolenic acids (omega-3), etc. have been isolated from the plant. Due to presence of particular fatty acid like γ -linolenic acid palmitoleic acid in the oil, which is believable for skin regeneration and repair properties (Marsinach and Cuenca, 2019). Moreover, it protects from infection, staves off the ageing process and eradicates inflammations along with enhancement of blood circulation, removal of toxin from the body and fast permeation through the epidermis, which facilitates oxygenation of the skin cells.



Fig.2 *H.ramnoides* in autumn season at 4°C, Kargil (Ladakh)

RESEARCH METHODOLOGY:

An ethnobotanical survey was conducted by me and my colleagues to collect, identify, and examine the medicinally important plants and their traditional uses in different village of kargil district of UT Ladakh, we have survey around 26 village from Drass (second coldest area of the world after Siberia where freezing temperature falls up to -60°C) to parkachik village (where snowfall is around 5 ft. in planes and >5 in mountains during the winter season).

We have used various questionnaire's method and interview method to know the ethnobotanical information or traditional uses of various selected plant, for this we consulted experienced aged person, village heads, old women's and Amchis and some literature of Tibetan and Buddhist scholars. Amchis are experienced person in botoo community who treat people traditionally by medicinal herbs they follows Tibetan system of Medicine [Amchis are also named as "Aba" in some village of sankoo block and suru block. The plant species are identified by using various Monograms and herbaria such as Forest Research Institute, Dehradun, Botanical survey of India, Dehradun and Herbaria of Jammu and Kashmir.

Area of study

My area of study was fall in the trans-Himalayan region where the topography is challenging, with big mountains, steep-sided jagged peaks, slopes,

valley alpine glaciers along with gorges where different river flow.

An extensive survey was conducted from time to time to get accurate result of the ethnobotanical survey, the area of survey is from drass to parkachik the distance between them are 142 km, the red dots on the Map (fig. 3) represent the surveyed areas, during the survey lot of new things we have experienced due to extremely harsh environment, topography and fluctuating weather, proper equipment and energy stuff should be carried along, for this kind of survey, as we move towards elevation the vegetation, plant size, temperature, O_2 concentration will decrease as we have experienced.

Our survey begin from Tehsil Drass, and its adjoining villages, then move to (Drass Bhimbat - Drass Tungus - Thasgam - Kaksar - Kharbu, Chanigound), Hardas, Khrool, Shilikche, Kargil And Its Adjoining Areas (Baroo, Poen, Goma Kargil Etc) Tituchumic - Menji - Chutuk - TSG Block - Khumbohang - Kachan/Farona - Lankarchey - Sankoo (Stakpa/Umba) - Barsoo - Sanghra - Damsna - Tai Surur - Panikhar - Khawus - Num Suru - Tangol and finally Parkachik where we conclude our survey.

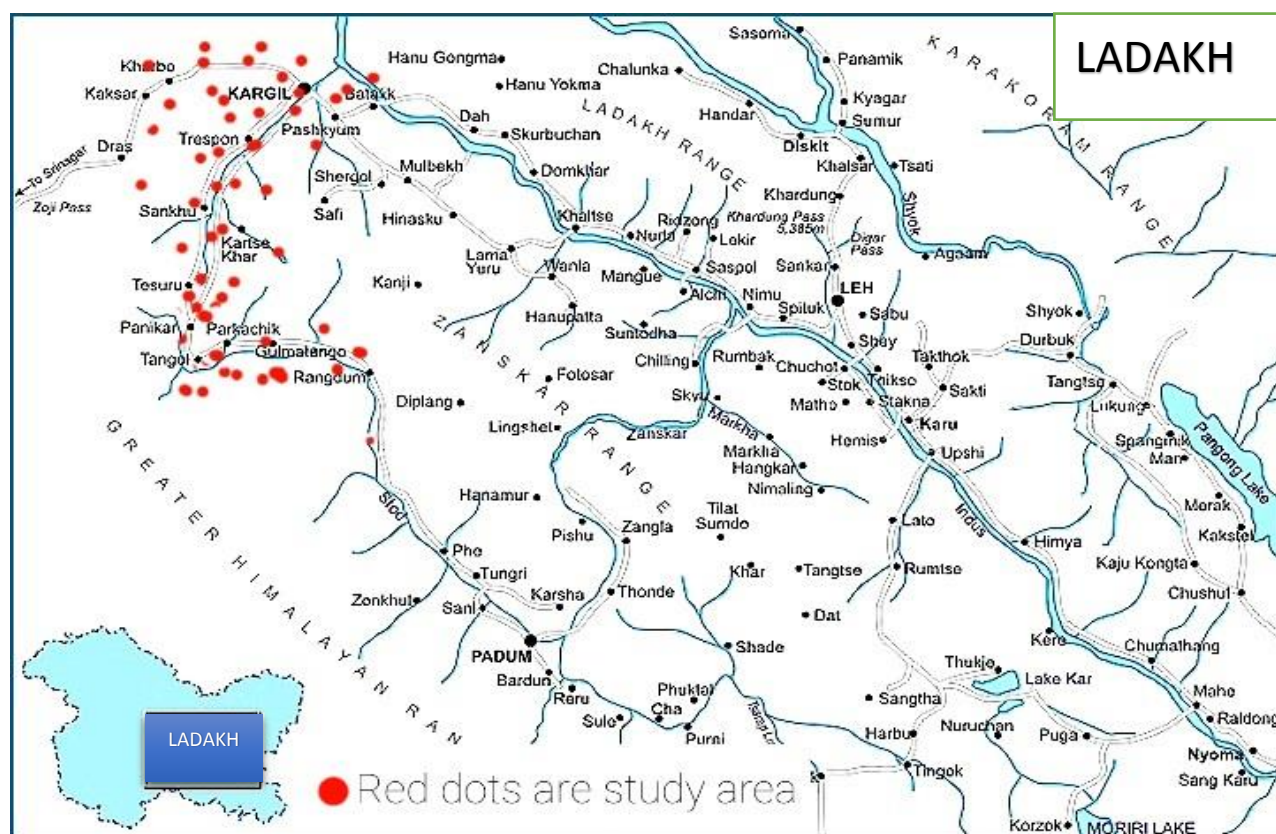


Fig .3 Physical Map of Ladakh (India)

RESULT:

Traditional uses of Seabuckthorn :

1. Medicine: Both leaves and berry are used as medicine for improve blood circulation ,cough ,digestive problem, treatment of sputum, skin related problem .Leaves are also use to make herbal tea.
2. Whole shoot part are used in house roof as a shuttering material mixed with clay to stable the roof for long time(traditionally from past times) .
3. Beverage: SBT Berry are rich in Anti oxidant, vitamins C, E, K, B-complex, minerals, secondary metabolites and many bioactive compounds (Leskinen et al., 2010; Yang and Kallio, 2002; Kallio et al., 2002; Zheng et al., 2009)
4. Flavouring : Seabuckthorn berry is used as Flavouring agent because of their good fragrance and beautiful colour this give the food more attractive and delicious. Most of the people use these berries as food source in the form of delicious chutney (local jelly), pickle, squash etc.
5. Fencing: Aerial part of the seabuckthorn are used for making local fencing to safeguard the crop and plants from animals and also to make open animal shelters (for domestic animal) to be kept in a particular place.
6. Soil erosion and Water conservation: due to their strong rooting system this plant is very important and magic plant for soil erosion along with their drought resistant quality. It is easy to grow in barren area where water

scarcity is their, the rate of vegetative propagation is very fast as compared to other plants.

7. Improve Soil fertility : Seabuckthorn have root nodule where symbiotic association with Frankia is happen that fixes atmospheric nitrogen therefore N_2 deficiency are fulfilled by symbiotic bacteria.
8. SBT is a good plant for afforestation, because of their N_2 fixing capability and drought resistant quality, which grow better as compared to other plant species.
9. There is enough quantity of vitamin C in SBT berries to meet the dietary demand of human population.

10. Seed dispersal and germination is very fast due to this they are successfully propagated in that environment, vegetative propagation in SBT is through shoot cutting and stem layering.

11. There is no much caring needed to grow it as compared to other plant.

12. SBT are habitat for many birds and wild life animals.

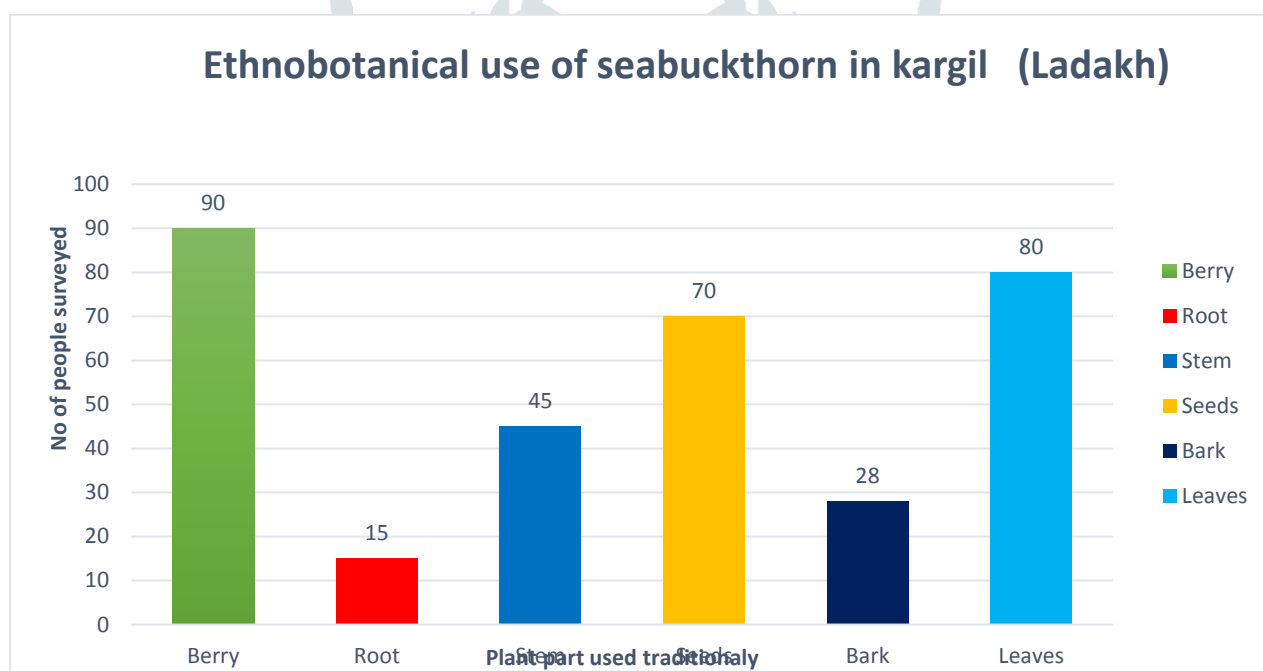


Fig.4 Traditional use of plant part in Kargil.

CONCLUSION:

Ethno botanically seabuckthorn are very important plant, economically as well as medicinally their different uses make this plant more interesting, several products are developed and commercialised from this plant parts .Traditionally seabuckthorn

have many uses like for curing digestive problem, cough, improve blood circulation ,energy drink, fencing, flavouring, improves soil fertility, soil and water conservation etc. Currently research on seabuckthorn is increasing rapidly because of their presence of very important bioactive compounds, in India many research institutes working on SBT. There is tremendous scope for researchers, scientist, farmer, public and pharma companies to

get benefit from this, SBT is also economically very important plant and a best source for Income generation along with these there should be need of modern equipment's to harvest and preserve them. SBT is a best plant to achieve Carbon Neutral environment that is the goal our current government, SBT have capability to grow quickly and make the soil more fertile, it has been seen that wherever SBT are rich in area that area promote the growth of other plants like populous spp, shrubs and grasses i.e Rich in biodiversity (Lei *et al.* 1983; Shi *et al.* 1987). One new thing notice in SBT is that they are chilling resistant plant (at freezing temperature, no effect are seen in fruit and leaves without, wilting and drying, plant are perfectly working which was not noticed by other researcher.

ACKNOWLEDGMENT

Author are very thankful to my colleagues who helped in this survey and also very thankful to Amchis, Local peoples, My Mom, Dad, Brothers and sister, My supervisor and old experienced men and women of kargil district who cooperate me to complete this research survey smoothly and successfully.

REFERENCE

1. Saxena, S., Bhardwaj, A. K., Kumar, V., Patel, M. K., Kumar, R., & Chaurasia, O. P. (2018). Sustainable Utilisation of Medicinal Plants of Ladakh and Lahaul-Spiti of trans-Himalaya. *Defence Life Science Journal*, 3, 120-5.
2. Pundir, S., Garg, P., Dwivedi, A., Ali, A., Kapoor, V., Kapoor, D., Kulshrestha, S., Lal, U.R., Negi, P., Ethnomedicinal uses, phytochemistry and dermatological effects of *Hippophae rhamnoides* L.: A review, *Journal of Ethnopharmacology*, <https://doi.org/10.1016/j.jep.2020.113434>.
3. Stobdan T., Angchuk D., Singh S.B. (2008). Seabuckthorn: An emerging storehouse for researchers in India. *Current Science*, 94(10):1236-1237.
4. Basistha B.C. (2009). Seabuckthorn in Sikkim Himalayas. In: *Seabuckthorn (Hippophae spp.): The Golden Bush*. Edited by SK Dwivedi, T Parimelazhagan, SB Singh, Z Ahmed, SSPH, Delhi, India, pp 99-104.
5. Cheng-Jiang Ruan, Kimmo Rumpunen & Hilde Nybom (2013) Advances in improvement of quality and resistance in a multipurpose crop: sea buckthorn, *Critical Reviews in Biotechnology*, 33:2, 126-144, DOI: [10.3109/07388551.2012.676024](https://doi.org/10.3109/07388551.2012.676024)
6. Singh R., Mishra S.N., Dwivedi S.K., Ahmed Z. (2006). Genetic variation in seabuckthorn (*Hippophae rhamnoides* L.) population of cold arid Ladakh (India) using RAPD markers. *Current Science*, 91:1321-1322.
7. Zeb A., Malook I. (2009). Biochemical characterization of seabuckthorn (*Hippophae rhamnoides* L. ssp. *turkestanica*) seed. *African Journal of Biotechnology*, 8:1625-1629.
8. Stobdan, T.; Targais, K.; Lamo, D. & Srivastava, R.B. Judicious use of natural resources: a case study of traditional uses of Seabuckthorn (*Hippophae rhamnoides* L.) in trans-Himalayan Ladakh, India. *Nat.Acad.Sci.Lett.*, 2013, **36**, 609-13. doi:10.1007/s40009-013-0177-4
9. Dolkar, P.; Dolkar, D.; Angmo, S.; Srivastava, R.B. & Stobdan, T. An improved method for propagation of Seabuckthorn (*Hippophae rhamnoides*, L.) by cuttings. *Natl. Acad. Sci.*

- Lett.,2016,**39**,323-6.
doi: 10.1007/s40009-016-0489-2
10. Bhoyar, M. S., Mishra, G. P., Singh, R., & Singh, S. B. (2011). Ethno-botany of Traditional Wild Edible Plants from Cold Arid Desert of Ladakh-a Potential Source of Winter Vegetables. *Indian Forester*, 137(8), 1029-1033.
 11. Shabir, M., Tiwari, J. K., & Agnihotri, P. Bio-Cultural Diversity of Kargil District (J&K), with Special References to Ethno-Botany.
 12. Bashir, A., Singh, C., Chauhan, N., Rani, A., & Singh, C. (2018). A review: Ethnobotanical study on medicinal plants of Kargil district, Ladakh, India. *J. Emerg. Technol. Innov. Res*, 5, 181-196.
 13. Ballabh, B., Chaurasia, O.P., Ahmad, Z. and Singh, S.B.,(2008). Traditional medicinal plants of Cold desert Ladakh-Used against Kidney and Urinary disorders. *Journal of Ethnopharmacology* 118: 331-339
 14. Geetha, S., Sai Ram, S., Singh, V., Ilavazhagan, G., Sawheny, R.C.,(2002). Anti-oxidant and immunomodulatory properties of seabuckthorn (*Hippophae rhamnoides*)- An invitro study. *Journal of Ethnopharmacology*; 79: 373-378
 15. Geetha, S. & Gupta, A. Medicinal and therapeutic potential of Sea buckthorn (*Hippophae rhamnoides*,L.).*J. Ethnopharmacol.*, 2011,**138**,26878.doi:10.1016/j.jep.2011.09.04
 16. Dwivedi, S.k.; Paljor, E.; Attrey, D.P. & Singh,B. Propagation of common seabuckthorn (*Hippophae rhamnoides*) through hard wood cutting in Ladakh. *Indian J. Agric. Sci.*, 2002, **72**, 228-9
 17. Dwivedi S.K., Stobdan T., Singh S.B. (2009). Seabuckthorn in Ladakh. *In: Seabuckthorn (Hippophae spp.): The Golden Bush*. Edited by S.K. Dwivedi, T. Parimelazhagan, S.B. Singh, Z. Ahmed. SSPH, Delhi, India, pp 35-51.
 18. Stobdan T., Chaurasia O.P., Korekar G., Mundra S., Ali Z., Yadav A., Singh S.B. (2010). Attributes of seabuckthorn (*Hippophae rhamnoides* L.) to meet nutritional requirements in high altitude. *Defence Science Journal*, 60(2):226-230.
 19. Stobdan T., Chaurasia O.P., Korekar G., Mundra S., Ali Z., Yadav A., Singh S.B. (2010). Attributes of seabuckthorn (*Hippophae rhamnoides* L.) to meet nutritional requirements in high altitude. *Defence Science Journal*, 60(2):226-230.
 20. Dwivedi S.K., Singh R., Ahmed Z. (2006). *The Seabuckthorn*. Field Research Laboratory (DRDO), Leh-Ladakh, India.
 21. Reznicek, V. and Plsek, J., 2008. Sea buckthorn (*Hippophae rhamnoides* L.)-the effective source of vitamin C. Conference proceeding, Medicinal and Aromatic Plants of Southeast European Countries, (5th CMAPSEEC), Brno, Czech Republic, 2-5 September, 2008. Mendel University of Agriculture and Forestry in Brno. <https://www.cabdirect.org/cabdirect/abstract/20083299123>
 22. Tang L.Y., Shen C.M. (1996). Cenozoic vegetation history and climatic characteristics of Qinghai-Xizang Plateau, *Acta Micropalaeont Sin*, 13:321-337
 23. Korekar, G.; Dolkar, P.; Singh, H.; Srivastava, R.B & Stobdan, T. Variability and the genotypic effect on antioxidant activity, total phenolics, carotenoids and ascorbic content in seventeen natural population of seabuckthorn (*Hippophae rhamnoides* L.) from trans-Himalaya. *LWT-Food Sci. Technol.*, 2014,55,157-62. Doi: 10.1016/j.lwt.2013.09.006

24. Brij Lal, Ahuja, P.S., Gupta, A.K., 2001. Application of Seabuckthorn in Amchi system of medicine. In: Singh, V., Khosala, P.K. (Eds.), Seabuckthorn—A Resource for Health and Environment in Twenty First Century. CSK Himachal Pradesh Agriculture University, Palampur and Indian Society of Tree Scientists, Solan, pp. 239– 242
25. Ruan CJ, Rumpunen K, Nybom H (2013). "Advances in improvement of quality and resistance of a multipurpose crop: sea buckthorn". Critical Reviews in Biotechnology. **33**(2): 126–144. [doi:10.3109/07388551.2012.676024](https://doi.org/10.3109/07388551.2012.676024)
26. Korekar, G.; Stobdan, T.; Chaurasia, O.P. & Singh, S.B. Phenolic content and antioxidant capacity of various solvent extracts from seabuckthorn (*Hippophae rhamnoides* L.) fruit pulp, seed, leaves and stem bark. *Acta Aliment.*, 2011,**40**(4), 449-58. doi: 10.1556/AAlim.40.2011.4.4

