

Introduction

Seabuckthorn, found in the icy heights of the Himalaya, is a deciduous, thorny willow-like plant species native to Europe and Asia. It has been distributed in over 40 countries of the world. It is a pioneer species and prefers to grow in low humid, alluvial gravel, wet landslips and riverside with brown rusty-scaly shoots. It is a multipurpose fast growing species which is serving as a measure of biodiversity conservation, soil conservation, medicines, food, fodder and fuel wood. It has an extraordinary capacity to grow and survive under adverse conditions (-40 to 40° C) and has extensive subterranean rooting system with strong soil binding ability useful for soil stabilization, riverbank control and water retention. Out of the seven species and eleven subspecies found in the world, two species (*Hippophae Salicifolia* and *H. tibetana*) have been thriving at high altitude areas of Nepal Himalayas. In Nepal, *H. salicifolia* has been distributed from 2000 – 3600 m from msl whereas *H. tibetana* has been distributed from 3300 – 4500 m.



Lu, 1992

Hippophae salicifolia, Mustang District

Hippophae salicifolia

H. salicifolia is a dioecious tree species generally with 6 – 10 m in height. It is known as Tijicyun in Manang, Chichi in Thakali language in Mustang, Dalechuk in Dolpa, Tarachuk in Mugu, Jumla and Humla. The berry is round (slightly oval) with a single ovate-oblong seed. The leaves are alternate, linear, lanceolate and covered with silvery stellate scales on the backside.

Berry: 5.5-7 mm diameter

Seed: 4-7 mm long, 2.5-3.5 mm wide and 1.6-2.2 mm thick

Leaves: 3-8 cm long and 0.4-1 cm wide

Comparison of the Vitamin Contents of Seabuckthorn and Others (mg/100g)

Species	Vit A	Vit B ₁	Vit B ₂	Vit C	Vit E
Seabuckthorn	11.00	0.04	0.56	300-1600	203
<i>Cilicrossa roxburghii</i>	4.83	0.05	0.03	1000-3000	-
Hawthorn	0.82	0.02	0.05	100-150	-
Orange	0.55	0.08	0.03	50.0	-
Tomato	0.31	0.03	0.02	11.8	-
Carrot	4.00	0.02	0.05	8.0	-
Oil of Maize	-	-	-	-	34
Soybean	-	-	-	-	7.5

Usefulness

Due to its immense use, it has aptly been called wonderful plant, magic plant, super food, functional food and bank of vitamins. Seabuckthorn berry is very rich source of vitamins and is called treasure of bio-activity substance because of its over 190 bio-activity substances possessing unique medicinal properties. Its leaves are also the important source of nutrients. China alone develops over 200 types of industrial products from the seabuckthorn.

Other Important Features of Seabuckthorn

- Regarding root systems and the ability to propagating itself, a 5-year old plant has a taproot of 3 m and horizontal roots of 6 – 10 m. A three-year old plant can produce 10 – 20 new generation plants by root turions.
- An 8 to 10-year old seabuckthorn forest can fix 180 kg of nitrogen/ha/year.
- A 6-year old seabuckthorn plantation can produce 18 tons of fuel wood. The heat value of seabuckthorn wood is 4785.5 cal/kg. One ton of seabuckthorn wood is equal to 0.68 ton of standard coal.
- Compared to wasteland, 7-year old seabuckthorn forest can reduce 99% of runoff and 96% of soil loss.
- If the seabuckthorn forest is managed properly, 750 to 1500 kg of fruits can be produced per hectare.



Sub-terrain Rooting System of Seabuckthorn

Squash

The squash can be formulated with 25 % crude juice, 40 – 45 % sugar and 30 – 35 % water. Sugar mixed with water is boiled and then juice is mixed. It is again boiled for a moment and squash is prepared. About 0.5 gm of potassium meta-bisulphide can be used for one litre of squash if it has to be stored for several months. It needs dilution with three parts of water before serving. The squash does not need any extra artificial flavors and colours as the juice contain its natural yellow and orange red colour and orange flavors.

Quick Reference for Squash: Seabuckthorn Raw Juice: 1 kg (1 liter), Clean Water: 1.4 kg (1.4 liter), Sugar: 1.6 kg and Potassium Meta-Bisulphide: 2.4 gm (if necessary)

Jam

Best quality jam can be prepared out of the fruit extract. The jam is prepared with 0.75 % pectin, 10 % juice, 70 % sugar, 1.14 % acid and remaining water. These are boiled till paste is prepared and then cooled.

Tea from Seabuckthorn Leaves

The tender leaves of seabuckthorn are used for making tea. The processing procedure is as follows:

- Collect the green leaves preferably from male tree and wash with water
- Quick fry the leaves to remove moisture and twist them
- Stir-frying the leaves, twist them and moisten them with some water spray
- Continue stir-frying and fluttering them for a few minutes until it forms small tea leaves
- Remove the larger sized particles
- Tea is ready. You can package it and store

Wine

The juice contained less amount of sugar and excessive amount of acid to make the wine. So, addition of water and sugar is essential.

- Mix 10 kg sugar, 2 gm ammonium sulphate, 1.35 kg fruit juice with 38 litre of water
- Heat the mixture to 60° C for about five minutes and then cool it.
- Add 10 % of activated wine yeast and allow it to ferment for 3 – 4 weeks (within this period, the fermented mesh produces a fine taste and wine flavor)
- For maturation, allow it to ferment for 6 – 8 months (this enhances fine aroma and clarity in the wine).

Juice Powder

- Mix 100 gm of juice in a kilogram of sugar and 36 gm of acid
- Dry the mixture preferably in electric oven at about 40 – 50° C and ground to powder. This powder easily mixes with water and gives a taste of seabuckthorn squash.

Harvesting Techniques

The harvesting technique of the local people is the major concern in the sustainable management of seabuckthorn forest. The harvesting of ripe fruits of seabuckthorn is the most difficult and time consuming operation because it is highly thorny and fruit being soft, small, delicate and highly perishable and attached strongly to the plant poses difficulty in the operation. Hand picking, though easier, is very time consuming. Cutting of the branches, though convenient, is not a legal and sustainable. In some countries, use of mechanical shaker has been used. But it does not seem to be practical in Nepal due to steep slope and costlier. Using mineral water for harvesting fruits seems better for the conservation of the resource. The bottom part of mineral water bottle is cut in such a way that it looks like U-shaped fan. With the help of a rope and a long stick, the berries can be collected without damaging the plants. It takes quite longer time.

It has been observed that harvesting of ripe fruits is comparatively easier and effective in early morning hours before sunrise when the air temperature is almost 0° C, since subsequently fruits develop turgidity. Harvesting of fruits is easy and quick at this time just by beating the fruiting branches with a stick and one does not have to suffer from the thorns. After sunrise it becomes difficult. Use of ladder has also been practiced to reach the height of the tree. Forks, used in kitchen can also be better in the sense that one can use such equipments for easiness, collecting berries without any loss of juice and for hygienic. Use of fork is a bit more time consuming in comparison to some of the other options.

Seabuckthorn Forest Management

Being a pioneer and the light demanding species, the seabuckthorn forest should be managed in proper way for its germination and higher yield of the fruits.

For regeneration, the land should be cleared and the older, dried and dying branches should be pruned. During thinning, consideration should be made in such a way that male:female ratio becomes 1:6. Weed control, mulching, pest management and thinning operations are continuously necessary in the nursery, plantation sites and forest.



Group Discussion for Management

Local Biomass Table of Seabuckthorn (*H. salicifolia*)

Diameter at 30 cm in cm	Oven Dry Weight of Wood in kg	Fresh Weight of Fruits in kg	Oven Dry Weight of Leaves in kg
1	0.04	0.00	0.02
2	0.22	0.00	0.05
3	0.60	0.00	0.08
4	1.23	0.21	0.12
5	2.13	0.29	0.16
6	3.36	0.37	0.21
7	4.93	0.46	0.26
8	6.87	0.56	0.31
9	9.20	0.66	0.37
10	11.96	0.76	0.43
11	15.15	0.87	0.49
12	18.81	0.99	0.55
13	22.95	1.11	0.61
14	27.60	1.23	0.68
15	32.76	1.35	0.75
16	38.46	1.48	0.82
17	44.72	1.61	0.89
18	51.55	1.75	0.96
19	58.96	1.88	1.04
20	66.98	2.03	1.11
21	75.62	2.17	1.19
22	84.89	2.32	1.27
23	94.81	2.47	1.35
24	105.39	2.62	1.43
25	116.64	2.77	1.51
26	128.59	2.93	1.60
27	141.24	3.09	1.68
28	154.60	3.25	1.77
29	168.70	3.42	1.86
30	183.53	3.58	1.95
31	199.12	3.75	2.04
32	215.47	3.92	2.13
33	232.60	4.10	2.22
34	250.52	4.27	2.32
35	269.24	4.45	2.41
36	288.77	4.63	2.51
37	309.12	4.81	2.61
38	330.31	5.00	2.70
39	352.35	5.18	2.80
40	375.24	5.37	2.90
41	398.99	5.56	3.00
42	423.62	5.75	3.10
43	449.14	5.95	3.21
44	475.56	6.14	3.31
45	502.89	6.34	3.42

Propagation

Land should be prepared at least for a year before planting. Soil composition in the polypot and plain bed should be prepared by mixing sand, humic soil and soil from seabuckthorn forest in the ratio 5:3:1. The propagation of seabuckthorn is possible through seed, root sucker and branch cutting. Propagation through root sucker and branch cutting is more productive as one can choose male or female plant to produce but quite difficult.

Seed Treatment and Sowing

Soak the seed in clean water for three days or 48 hours at hot water of 70° C with stirring intermittently until the temperature drops to 10 – 15° C prior to the sowing in the polyplot or bed. Seeds will start germinating within 1 – 3 weeks based on the condition of the seeds and the species of seabuckthorn and will be ready to plant for the next year.



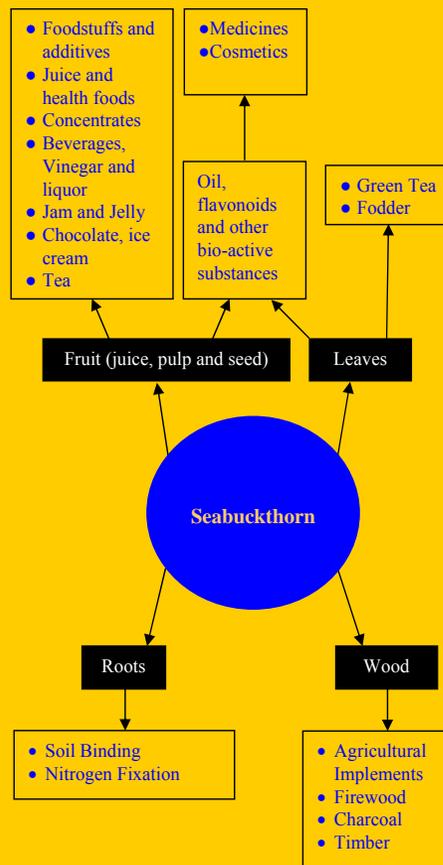
H. salicifolia Nursery, Lete, Mustang

Propagation by Cuttings

Cuttings of 15 – 20 cm long seabuckthorn plant should be prepared from 3 – 5 year old one week before planting. Root cuttings are planted in pots in a greenhouse for 6 – 8 weeks before transplanting to the field in spring.

Conclusion

Interest in and desire for community-based seabuckthorn management is one of the most important prerequisites for the success. The community of Mustang has ample resource, interest and good coordination. This project has built capacity of the local people for the income generation from seabuckthorn and established the community based management in Mustang district. Thus, the organized project supported from Rufford Maurice Laing Foundation, UK and Community Based Natural Forest and Tree Management in the Himalaya, Pokhara has hopefully added a cornerstone for building seabuckthorn industry in Nepal.



Uses of Seabuckthorn

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Seabuckthorn (*Hippophae salicifolia*) Management

An Introduction



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