

Performance evaluation of Russian seabuckthorn varieties in high altitude cold desert of Himachal Himalayas, India

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Study area

The geography of study area

University research Station (2750 m asl) is located in Lahaul region, a part of district Lahaul-Spiti, a cold desert mountainous region located in the Trans-Himalayan Mountains in Himachal Pradesh state, 2000-3500 m asl (25% of state) in north India.

- Rainfall 300-500 mm/yr
- Snowfall 91-4 m/yr
- Off season vegetables, cabbage, peas, potatoes main crops
- Apple grows in 2 valleys out of 5 valleys
- Natural forests: Pines, Betula, Juniperous spp.
- Plantations of willow dying due to climate change (Pest attack)



Comparison of local and Russian seabuckthorn

Sr.No.	Parameters	Local will seabuckthorn (spp. turkestanica)	Russian seabuckthorn (spp. mongolica)
1	Thorns/10 cm of 2 yr old branch	2-8	1-3
2	Fruit yield (Kg/plant)	3-6	6-16
3	Fruit harvesting (Kg/day/person)	10-20	100-150
4	Fruit weight (g/100)	11-32	35-110
5	Vitamin C (mg/100g)	250-930	40-120
6	Oil	1.5-4.5	4-6

Objectives

- 1. To study the performance of 11 Russian seabuckthorn varieties during before fruiting stage.
- 2. To study the performance of 2 Russian seabuckthorn varieties during the fruiting stage.

Characteristics of Russian seabuckthorn high yielding varieties in the country of origin

№	Code No.	Fruit yield, kg/plant	Mass of 100 fruits, g	Oil content, %	Vitamin "C", mg/100g	Caroten oids, mg/%	Plant height, (m)	Time of repining	Producti vity, t/ha
1	NX-1	10-11	64	5.0	110	9.9	2.5	25-30.08	11.4
2	NX-2	10-11	65	4.1	86	27.0	2.5-2.7	10-15.08	11.0
3	NX-3	7-8	75	4.5	95	28.8	2.5-2.8	01-05.09	9.0
4	NX-4	10-12	80	2.5	97	9.8	2.5	25-30.08	12.0
5	NX-5	10-12	70	5.7	162	24.0	2.5	10-15.09	12.0
6	NX-6	-	60-110	4,7	81	10,7	3-4	15.08 15.09	-
7	NX-7	-	60	4,9	74,5	8,7	3	-	-
8	NX-8	10	55-60	-	-	-		-	-
9	NX-9	-	-	6.2	134	13.7		-	18.0
10	NX-10	5.3	-	1,5-3,0	37,5-103,		3.1	-	-
11	NX-11	6.3	-	-	-	-	3.2	-	-

Growth of exotics under nursery at University Research Station, Kukumseri during 2014 & 2015

Nursery were raised for 11 Russian and 1 local selection "Drilbu" (H. salicifolia) during 2014-16

They were transplanted under field conditions for study in August 2016.



Comparison between 1st year and 2^{end} year of growth in plant height of Russian seabuckthorn



Field evaluation Plan

The trial plan on evaluation for long term evaluation and selection and cultivation

Code of SBT variety	NX-1	NX-2	NX-3	NX-4	NX-5	NX-6	NX-7	NX-8	NX-10	NX-11	Drilbu cultivar
Replicates	R1, R2	R1, R2,	R1, R2								
	, R3	R3	, R3	, R3	, R3	, R3	, R3	, R3	, R3	, R3	, R3

Evaluation of 10 most Russian seabuckthorn varieties (2021-23) and selection of 2-3 most suitable forms with economic characteristics:

- 1. No thorn /mild thorny (0-2 thorns/10 cm),
- 2. Large fruits (40-110 g/100),
- 3. High fruit yield (6-15 kg/plant),
- 4. High oil content (4-6.2%)
- 5. High vitamin C
- 6. Larger horizontal spread of canopy
- 7. No diseases and pests occurrence
- 8. Wide adaptation.

A. 4 years old Russian Varieties during early stage of growth were evaluated for performance during 2014-2020:

Growth: Height, girth of main stem, crown spread (East & South), leaf length and width, incidence of diseases and pests, occurrence of thorns in Russian seabuckthorn (*H. rhamnoides* spp. *mongolica*) in Lahaul,
No of seabuckthorn varieties=11
(11 Russian and 1 local *Drilbu*)

Plot size:120 m2 No. of plants/plot : 15, replicates=3, Spacing: 3.5 m x 1.5 m

Site: 2750 m asl (Kukumseri) No of treatments: 12 Statistical analysis: Data were analyzed using analysis of variance.

11 Russian varieties under testing at Seabuckthorn Research Farm of University at Kukumseri



Training & Plantation in farmers' fields in August 2016 in Lahaul











Comparison of growth under nursery & Field Conditions



Comparison of height (cm) of different Exotics (NX 1-14) in 2020



Comparison of diameter (cm) of different Exotics (NX 1-14)



Comparison of spread (cm)-east direction & South directions





Comparison of leaf length & Width (cm)





Germplasm bank, Kukumseri



Fruiting under germplam Bank of seabuckthorn genotypes

- 4 local genotypes of seabuckthorn (*H.* salcifolia and ssp. turkestanica)
- 2 exotic genotypes of seabuckthorn (ssp. mongolica)- NX-2,
- NX-12







Local cultivar "Drilbu" of H. salicifolia

- Nearly thornless
- High yielding (5.5 kg fruits/plant) selection (large fruit: 32g/100, rich in vitamin C>930 mg/100g)
- Suitable for community land



10 years old Russian varieties under fruiting stage in germplasm bank at Kukumseri for performance for 2018-20:

Growth: Height, girth of main stem, crown spread (East & South), leaf length and width, incidence of diseases and pests, occurrence of thorns in Russian seabuckthorn (*H. rhamnoides* spp. *mongolica*) in Lahaul,

No of seabuckthorn varieties=6

(2 Russian and 4 local selections at 80 cm 20 cm spacing)

Plot size: 40 m2 No. of plants/plot : 20, replicates=3, Spacing: 80 cm x 20 cm

Site 2750 m asl (Kukumseri)

No of treatments: 6

Statistical analysis: Data were analyzed using analysis of variance.

Comparison of height (cm) and diameter (cm) of 10 year old 2 exotics and 4 local selections



Comparison of Canopy spread (cm) in East & South directions





Comparison of leaf length & width (cm)





Comparison of fruit yield (kgs/tree)



Conclusions

- 1. 11 Russian seabuckthorn varieties showed no occurrence of thorns during 4 years of growth. No attack of fruit fly was found.
- 2. There is significant (P<0.05) variations in the morphological features of Russian seabuckthorn varieties during early stage of growth. Will reach to any conclusion after studies on fruiting is complete.
- 3. Among the 10 years old, 2 Russian seabuckthorn selections, "NX-12 and "HI-2" having vigorous growth, mild thorny and higher fruit yields have high potential for cultivation under alley cropping systems of cold deserts of Lahaul, Himachal Pradesh.
- 4. The "Drilbu" a local selection of *H. salicifolia*, having vigorous growth, mild thorny and high fruit yields is suitable for cultivation on the community land.
- 5. The local selections of *H. rhamnoides* spp. *turkestanica*, low yielding, are suitable only for afforestation on marginal lands for the environmental conservation.
- 6. The results of the study were affected by untimely heavy snowfall during September 2018 (effect of climate change).