

Autecology of *Capparis spinosa* Linn. in Cold Desert of Spiti Valley in Himachal Pradesh.

R P Singh, Nav Bahar and Prakash Chand
Conifers Research Centre, Shimla- 171 001 India

Abstract *Capparis spinosa* Linn. is a dominant trailing shrub of cold desert of Spiti Valley in Himachal Pradesh. Its seed has hard seed coat dormancy which can be overcome by concentrated sulphuric acid (H_2SO_4) treatment and mechanical scarification. Root system contributes maximum (65.33%) to the total biomass followed by aboveground biomass (34.66%). It covers $4.24 m^2$ areas of soil by aerial portion. Root of single plant can bind soil upto $3.43 m^2$ with the strong lateral roots. The taper rate varies from 0.42 to 1.04 which itself is an indication of strong root system.

Key words Spiti Valley, Cold desert, Root characters, Biomass, Soil and moisture conservation, Seed germination

Spiti Valley has very little vegetation on steep hill slopes and more on comparatively flat areas which have better moisture conditions or are irrigated (Singh *et al.* 1991). *Capparis spinosa*, a trailing shrub show its presence with long green branches and thick woody roots even on very hot dry rocks and steep hill slopes (Brandis 1874). In view of its use as feed, fodder and in soil and water conservation (Singh & Gupta 1990a), attempts have been made to determine its autecology and the same is presented in this communication.

Materials and Methods

The seeds of *C. spinosa* collected from Tabo, Poh and Lurry areas of Spiti Valley in the month of October 1989, stored in glass bottles at room temperature for a period of one year, were used in the present study. The seeds of this species has hard coat and no germination was recorded. Therefore, the seed treatments (Table 1) were tried.

Besides different treatments (Table 1), seeds were scarified with sand and glass pieces (2 to 6 mm size) for 30, 60, 90, 120 and 150 min in rotatory shaker at the shaking speed fixed at approximately 250 oscillation per min to break the seed coat dormancy. Mechanical scarification was also done with the help of forcep and precautions were taken to remove the seed coat without damaging the embryo. The pretreated seeds were sown in petri-

dishes containing sterilized cotton and Whatman filter paper moistened with distilled water. Three replicates of 50 seeds of each treatments were maintained separately. Seeds trial were conducted in BOD incubator at $32 \pm 2^{\circ}C$.

One hundred plants were studied for different morphological characters (Table 2) and fifty plants were dug out for recording aboveground and underground biomass. Six plants of different spread/size were dug out carefully for measuring different root parameters (Table 2). The spread of lateral roots was observed by measuring the distance between two outermost lateral roots i.e. North-South and East-West (Singh *et al.* 1990 b).

Results and Discussion

Seed germination : The results (Table 1) show that all the treatments were found to enhance germination of *C. spinosa* over control. Among different treatments, maximum % germination was obtained in T₁₇ (mechanical scarification) followed by T₁₂, T₁₁, T₁₀, T₉ and T₈ in descending order. No germination was recorded in T₁₈ treatment. The study indicates that seed of *C. spinosa* remains viable for over one year. In erratic climate of cold desert areas, the survival of any plants species depends upon the longevity of viability because of adverse atmospheric . The hot water treatment has significant effect on seed germination (T₁₃, T₁₄, T₁₅)

Table 1 Effect of different treatments on seed germination of *C. spinosa*.

Treatments	Germination(%)
Dip in conc. H ₂ SO ₄ for	
1 min. (T ₁)	2.00±0.00
2 min. (T ₂)	2.66±1.154
5 min. (T ₃)	3.33±1.154
10 min (T ₄)	5.33±1.154
20 min. (T ₅)	7.33±3.055
30 min. (T ₆)	14.00±2.00
45 min. (T ₇)	16.00±2.00
60 min. (T ₈)	29.33±3.055
90 min. (T ₉)	42.66±5.033
Soaking in H ₂ O ₂ (30%) for 60 min. of acid dipped seeds for	
60 min. (T ₁₀)	44.66±5.033
90 min. (T ₁₁)	56.00±5.291
120 min. (T ₁₂)	74.66±3.055
Dip in hot 80 ⁰ C) water for	
30 min. (T ₁₃)	6.66±1.154
60 min. (T ₁₄)	7.33±3.055
90 min. (T ₁₅)	8.66±1.154
Scarification	
Sand (T ₁₆)	Nil
Mechanical (T ₁₇)	100.00±0.00
Control (T ₁₈)	Nil

± is the standard deviation of mean.

over control (T₁₈) and can be compared with concentrated sulphuric acid (H₂SO₄) treatments for 10 and 20 (T₄ and T₅) respectively.

In cold desert ecosystem, the seeds have to pass through an adverse environment before germination and hard seed coat dormancy is the inhibiting factor for germination. Although, mechanical scarification (T₁₇) gives the maximum germination (100%) but on large scale it is not possible, therefore, concentrated sulphuric acid treatments, out of which T₁₂ is most effective, and recommended for the purpose of hastening germination.

Morphological characters and biomass : The morphological characters, which vary widely are presented in table 2. On an average each plant has 26 branches with an average length of 94.9 cm and

covers an area of 4.24 m². Each prostrate branch has 269.8 of leaves and on an average 6.3 cm² leaf area. A plant of *C spinosa* adds about 211 g annum⁻¹ of organic matter to the soil.

The average number of fruits per plant were 35.0. The contribution of underground biomass was recorded maximum (65.33%) to the total biomass followed by aboveground biomass (34.66%). It is clear from the data that root development is more than aboveground plant parts and thus an ideal species for checking soil erosion.

Root characteristics : Root data (Table 2) reveals that *C. spinosa* has a strong with little tapering tap root which penetrates deep in the soil (80 cm) and

Table 2 Morphological characters, biomass and root dimensions (range and mean) of *C. spinosa*.

Character	
Morphological	
No. of branches (Plant ⁻¹)	7.0—47.0 (26.20±14.0)
Speread of prostrate aerial portion (m ²)	0.66—7.86 (4.24±2.52)
Length of prostrate branch (cm)	62.1—111.7 (94.95±19.15)
No. of leaves branch ⁻¹	100.0—532.0 (269.83±116.52)
No. of fruit plant ⁻¹	8.0—80.0 (35.0±16.71)
Leaf area (cm ²)	0.4—16.6 (6.28±4.89)
Biomass (g plant ⁻¹)	
Aboveground	135.0—285.0 (211.0±54.21)
Underground	177.0—598.0 (398.0±107.5)
Root dimension	
Length of tap root (cm)	43.0—80.0 (62.0)
Number of lateral roots plant ⁻¹	4—8 (6.5)
Length of lateral root plant ⁻¹ (cm)	17.0—230.5 (116.0)
Spread of lateral roots (m ²)	0.72—5.3 (3.4)
Taper rate 10.0 cm ⁻¹	0.42—1.09 (0.64)

have 17-230 cm long lateral roots (4-8 plant⁻¹). The average taper rate of lateral roots varied between 0.42 to 1.04. Spread of lateral roots in the soil varied from 0.72 to 5.33 m² which is about 10.5% less of the aerial prostrate portion spread. On an average the roots of individual *C. spinosa* plant binds soil over an area of 3.43 m².

Thus, for hastening germination of *C. spinosa* seeds may be treated prior to sowing with concentrated H₂SO₄ for 120 min and soaking in H₂O₂ (30%) for 60 min. Seeds of this species can be stored in glass bottles at room temperature for over a period of one year.

References

- Brandis D 1874 *The Forest Flora of North-West and Central India*.
- Singh R P & Gupta M K 1990a Soil and vegetation study of Lahaul & Spiti cold desert of Western Himalayas. *Indian Forester* **116** 785-790
- Singh RP, Gupta MK & Singh Virendra 1990b Studies on root behaviour, biomass and morphological characters of *Indigofera gerardiana* Wall in Western Himalayas. *Indian Forester* **116** 584-588
- Singh RP, Bahar N, Prasad B & Gupta MK 1991 Ecological studies on *Hippophae rhamnoides* Linn. in Spiti Valley of Himachal Pradesh. *Annals of Arid Zone* **30** (2) 119-122

(Received March 1992 Accepted September 1992)