IMPROVING GERMINATION IN *CEDRUS DEODARA* THROUGH PRE-SOWING SEED TREATMENT

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Abstract

Seeds obtained from eleven families of *Cedrus deodara*, pretreated with gibberallic acid, hydrogen peroxide and control were tested for germination in the laboratory. Highly significant differences were observed among the families, treatments and their interactions. The results suggest that in hormonal control of dormancy, gibbere Uric acid plays a primary role in regulation of germination.

Keywords: *Cedrus deodara*, germination, gibberellic acid.

Introduction

Deodar (*Cedrus deodara*) is typically gregarious and commonly occurs as pure crop though the species also occurs in mixture with both coniferous and broad leaved species. Deodar occurs naturally through out the Western Himalayas at elevations varying from 1,000 to 3,000 m but most commonly between 2,000 to 2,500 m. It is the most important timber species among indigenous conifers.

The natural regeneration of the species is influenced by a number of factors, viz., seeding conditions, germination, soil and climatic conditions, light, fire and grazing. Owing to increasing biotic interference, the natural regeneration of the species is becoming difficult and efforts are being made to supplement the same with artificial regeneration.

Direct sowing is usually preferred to transplanting from the nursery. The latter requires great care in order to avoid damage to the tender rootlets. Soaking the seed in water for twenty-four hours is said to stimulate germination because poor germination in Deodar seeds is generally observed (Troup, 1921 and Anonymous, 1985). The probable reason of poor germination could be physiological dormancy, which is commonly observed among the temperate tree species. The most effective pretreatment recommended to overcome this physiological dormancy is cold stratification (Willan, 1985). Chemical pre-

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treatment with gibberellic acid, citric acid and hydrogen peroxide are also known to overcome this internal dormancy.

In this paper the results of pretreatment on seeds of eleven families (Candidate plus trees) of Deodar to obtain maximum germination are being presented.

Material and Methods

Cones of Deodar were collected in September – October 1998 from eleven candidate plus trees marked under ICFRE-WB Project in 1998, spreading over five forest divisions of Kashmir region of J&K State as per the following details:

S.No.	CPT No.	Comptt. No.	Location	Forest Division
1	01/98	28/L	Batakote	Lidder
2	07/98	47/L	Pahalgam	Lidder
3	15/98	38/L	Arthnari	Lidder
4	22/98	11/D	Batawooder	Peer Panjal
5	33/98	18/D	Neegu Branwar	Peer Panjal
6	42/98	22/D	Haijam	Peer Panjal
7	52/98	5/Rb	Haripora	Shopian
8	62/98	7/V	Sedow	Shopian
9	63/98	9/V	Sedow	Shopian
10	64/98	22/S	Kangan	Sindh
11	65/98	63/SL	Sogam	Kamraj

The study was carried out in Research Laboratory of SFRI, Srinagar. The cones in separate lots from selected trees were dried in sun for 7-8 days followed by shaking and twisting of cones for manual extraction of seeds. Germination test was conducted in February, 1999 under the following three different pre-treatments.

T1: GA (100 mg/litre) ppm for 48 hours followed by cold stratification at 3-5°C for 15 days

T2: H_2O_2 1% V/v for 48 hrs followed by cold stratification at 3-5°C for 15 days.

T3: Soaking in distilled water for 48 hrs (control)

Four replications of 50 seeds each were taken from each seed lot and treatment. The test was conducted by "Between Paper" method (Gupta *et al.*, 1975). Seeds were kept between moist non-toxic germination papers in plastic boxes in BOD incubator maintained at temperature 20 ± 1°C. The first count on germination was made on 7th day and thereafter observations were recorded daily at 11.00 A.M till the end of the experiment, i.e., 35 days, when final germination was recorded. Seed was considered germinated when radical attained 1 cm length. To study the speed of germination, germination value (GV) was calculated as GV = PV x MDG (Czabator, 1962), where PV is the peak value of germination and MDG is mean daily germination.

The data thus obtained was subjected to analysis of variance and least significant differences (LSD) were calculated. The families were ranked for the variables studied using computer software program 'SX'.

Results and Discussion

The effects of various treatments, family differences and their interactions (Table 1) were observed to be highly significant for both the parameters studied, viz., germination percent and germination value. Of the three treatments, T1 performed the best for both the parameters. The treatment increased the germination by 33.29% and germination value by 89.70% over control.

Out of the eleven families studied, family F3 performed the best with 78.56% germination, which was found to be statistically at par with F1, having 76.33% germination. Family F3 also gave maximum germination value (4.71), which was statistically at par with families F6 (4.37) and F2 (4.36). Minimum germination value was observed in family F10 (2.36) which was at par with F5 (2.48) in ascending order.

Regarding interaction effects, F3T1 produced maximum germination percent and value. The study has shown that treatment T1 (GA_3) gave best performance for both the parameters studied. The results are in line with the findings of a number of researchers who reported significant improvement in germination when seeds were pretreated with GA_3. The germination of dormant seeds of *Eucalyptus delegatensis, E.fastigata* and *E.regnans* could be improved by treatment with GA_3 (Bacheland, 1967). The immersion of seeds of *Nathofagus obliqua* in GA_3 for 24 hrs had given rapid and complete germination in 14 days against a normal period of 28-42 days required for the species (Gordon 1979). GA_3 was also reported to be effective in releasing dormancy of 21 days stratified seeds of *Pinus taeda* (Biswas *et al.*, 1972).

Table 1. Germination behaviour of families under different pre-sowing treatments

Family/ Treatment	T1	T2	T3	Mean	
		Germination percent			
F1	82.50	81.49	65.00	76.33	
F2	81.50	84.50	60.00	75.33	
F3	88.50	84.50	62.70	78.56	
F4	76.00	72.00	53.00	67.00	
F5	65.00	58.01	47.01	56.67	C.V% =14.01
F6	73.50	78.00	57.99	69.83	F. test = ***
F7	76.50	73.50	54.00	68.00	S.E. ±1.23
F8	87.00	72.50	53.00	70.83	C.D.(5%)=2.45
F9	79.00	71.50	58.00	69.50	
F10	60.00	56.01	51.00	55.67	
F11	83.50	77.00	56.00	72.17	
Mean	77.54	73.55	56.16		

C. V% = 15.00 F. Test = *** S.E ± 0.71 C.D. (5%) = 1.49

		Germination values			
F1	5.03	2.26	3.20	3.50	
F2	5.03	5.32	2.73	4.36	
F3	5.81	5.32	3.01	4.71	
F4	4.35	3.93	2.14	3.47	
F5	3.20	2.55	1.68	2.48	C.V% =5.11
F6	6.01	4.55	2.55	4.37	F. test = ***
F7	4.41	4.08	2.76	3.75	S.E. ± 0.10
F8	5.68	4.08	2.00	3.86	C.D(5%)=0.20
F9	4.68	3.89	2.55	3.66	
F10	2.73	3.75	1.98	2.36	
F11	5.24	2.38	2.38	4.043	
Mean	4.74	3.86	2.45		

C.V% = 4.84 F. Test = *** S.E. ± 0.087 C.D.(5%) = 0.163

These results suggest that in hormonal control of dormancy, gibberellins play a primary role in regulation of germination and for release of dormancy. Owing to

large amount of variation observed among the families, it is also desirable to include germinability as one of the criteria for selection of plus trees of Deodar.

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