

Effect of Seed Weight on Germination and Seedling Quality of *Prosopis juliflora* (SW) DC

Neeta Mutha, Uday Burman, J C Tiwari & L N Harsh
Central Arid Zone Research Institute, Jodhpur 342 003, India

Prosopis juliflora (a native of Latin America), is one of the important sources of fuel and fodder in arid and semi-arid parts of Rajasthan (Muthana & Arora 1983). Increasing human and livestock populations have forced forest department to undertake large scale plantation programmes. Success of such programmes depend largely on the quality of seedlings. Seedling vigor and seed weight have been found to be positively correlated in some tree species (Gonzalez 1993, Ponnamal *et al.* 1993) while in others such a trend was lacking (Kuser & Ching 1981, Wrzesniewski 1982). No such information is available for mesquites. Thus the need was felt for specific study on *P. juliflora* to ascertain relationship between seed weight, germination and seedling vigor.

The seeds of *P. juliflora*, collected from 50 km area around Mandavi, were taken from Gujarat Development Corporation. These were classified into seven groups A,B,C,D,E,F and G based on their hundred seed weight which were 1.07, 1.46, 1.93, 2.64, 3.21, 3.44, 4.00 g, respectively. Single seed of each group was sown on Sept. 29, 1993 in 12 x 22.5 cm polythene bags filled with F.Y.M., soil and sand (1:1:2) in triplicate. There were 35 polythene bags in each replicate. Data were analysed following completely randomised design. Wherever necessary prior to analysis values were angular transformed.

Germination was recorded daily upto six days. Germination value (GV) was calculated as the simple product of peak values (PV) and mean daily germination (MDG). $GV = PV \times MDG$, where PV was highest value calculated as per cent germination divided by the number of days and MDG was total germination percentage divided by the total number of days (Czabator 1962).

After 15 days of sowing (DAS), height and stem diameter of five randomly selected seedlings from each group were measured. The shoot and root were separated and oven dried at 80-85°C for 72 hours. The quality of seedlings obtained from each group of seed, was assessed based on the data collected on 36 DAS through Dickson Quality Index (DQI) as described by Dickson *et al.* (1960). The DQI was calculated by the formula:

$$DQI = \frac{\text{Total seedling dry weight (g)}}{\text{height (cm)}/\text{stem diameter (mm)}} + \frac{\text{shoot dry weight (g)}}{\text{root dry weight (g)}}$$

During the period under experimentation day temperature, night temperature, relative humidity, daily evaporation and sunshine were 31.6 to 39.4°C, 15.6 to 24.3°C, 32 to 89%, 3.4 to 7.4 mm and 8.2 to 10.6 hours, respectively.

Bold and heavy seeds showed early germination and had higher per cent germination and MDG. These parameters were least in group A and maximum in group G (Table 1). GV also followed a similar trend. Further, seedling quality was comparatively poor from seeds of A, B and C groups (DQI < 4.0) but it was better in seedlings from D,E,F and G groups (DQI > 4.0). Seeds with higher 100-seed weight produced seedlings with more shoot and root dry weight. This may partially be due to greater nutrient reserve in large seeds (Kathju *et al.* 1978). The dry weights increased progressively with increase in the 100 seed weight. Seedlings from seeds of A, B & C groups were weak and had 58.5 to 75.0 and 55.1 to 77.0 percent less shoot and root dry weight compared to the seedlings produced by seeds of G group. Similar trend was reported for *Virola koschnyi* (Gonzalez 1993) and

Table 1 Effect of seed weight on per cent germination, MDG, GV and DQI of *Prosopis juliflora*

Seed weight groups	Percent germination (Angular Transformed Value)	MDG	GV	DQI
A	26.2 (30.88 ^a)	7.14 ^a	93.95 ^a	3.30 ^{ab}
B	73.0 (58.71 ^b)	12.11 ^b	248.67 ^b	2.76 ^a
C	75.7 (60.52 ^{bc})	12.60 ^{bc}	286.91 ^c	2.71 ^a
D	82.8 (65.51 ^{bc})	13.80 ^{bc}	350.52 ^d	4.21 ^{bc}
E	82.0 (64.92 ^{bc})	13.62 ^{bc}	391.77 ^e	4.82 ^c
F	76.8 (61.24 ^{bc})	12.82 ^{bc}	316.06 ^c	4.84 ^c
G	87.4 (69.26 ^c)	14.46 ^{bc}	379.98 ^{de}	4.36 ^{bc}

Means with different letter(s) are significantly different at 5% level

LSD at 5% for germination 8.16; MDG 1.90; GV 34.45 and DQI 1.14

Hardwickia binata (Ponnamal *et al.* 1993). Significant differences in the growth and vigor of seedlings justify the grouping of seeds on weight basis.

It may be concluded that culling the seeds of groups A, B and C (accounting for approximately 33.6% of the total *P. juliflora* seed stock) at the time of sowing will ensure better success of plantation programmes and help in achieving a more homogeneous development of seedlings with greater vigor.

Acknowledgements

Financial help from ICAR under Cess fund scheme No. 5 (9)/93-SW&DF is duly acknowledged. Thanks are also due to Mr. JD Peshwah, T-4 and Mr. Dau Lal, T-1 of the Silviculture Section of the Institute.

References

- Czabator FJ 1962 Germination value- An index combining speed and completeness of Pine seed germination. *Forest Science* 8 386-393
- Dickson A, Leaf AL & Hosner JF 1960 Seedling quality soil fertility relationship of white spruce and red and white fruits in nurseries. *Forestry Chronicle* 36 237-241
- Gonzalez JE 1993 Effect of seed size on germination and seedling vigor of *Virola koschnyi* Warb. *Forest Ecology and Management* 57 275-281
- Kathju S, Lahiri AN & Shankarnarayan KA 1978 Influence of seed size and composition on dry matter yield of *Cenchrus ciliaris*. *Experientia* 34 848-849
- Kuser JE & Ching KK 1981 Provenance variation in seed weight, cotyledon number and growth rate of western hemlock seedlings. *Canadian Journal of Forest Research* 11 662-670
- Muthana KD & Arora GD 1983 *Prosopis juliflora* (SW) DC a fast growing tree to bloom the desert. *CAZRI Monograph No. 22*, pp.19
- Ponnamal NR, Arjunan MC & Antony KA 1993 Seedling growth and biomass production in *H. binata* Roxb. as affected by seed size. *Indian Forester* 119 59-62
- Wrzesniewski W 1982 Physiology of Scotpine seedlings grown from seeds of different weights II. Imbibition, germination, respiration and early growth. *Acta Physiologiae Plantarum* 4 43-51