

Short Communication

Detrimental Effects of Gamma Irradiation on Seed Germination and Leaf Morphology of Date Palm

R. Sharma, H.R. Mahla and J.P.S. Pundir

Agricultural Research Station, Beechwal, Rajasthan Agricultural University, Bikaner 334 006, India

The commercial cultivation of date palm is feasible in drier areas of Rajasthan where ample canal and underground water is available. A number of germplasm evaluation studies in the arid regions of India have reported suitability of some genotypes (Srivastava and Dhawan, 1981; Chandra and Chaudhury, 1990; Chandra *et al.*, 1990, 1994; Chandra and Pareek, 1992; Kalra and Jawanda, 1992; Pundir and Porwal, 1999).

Though there is evidence for the economic viability of date palm cultivation in Thar Desert of Rajasthan, we lack a desirable variety suited to arid agroclimatic conditions and rainfall pattern. The pind quality deteriorates if rains occur during fruit ripening. A variety fruiting in winter or maturing in early June would avoid rains during fruiting. Barring cultivation through seeds near Rann of Kachchh, which generated some selectable stocks at farmers' fields, no systematic improvement work has been taken up for this crop in the country. In addition to long life cycle, dioecious nature restricts selection of proven genotypes for recombinant breeding. Mutation breeding could be a better option for increasing the range of variability in a single generation. Capability of date palm to reproduce through vegetative means (root suckers) can be

exploited for the maintenance and perpetuation of elite genotypes once produced and selected right in M_1 generation. The availability of *in-vitro* micro-propagation of protocols further ensures mass multiplication of the elite genotypes (Sharma *et al.*, 1984, 1991; Shakib *et al.*, 1994). Present study was therefore taken up to assess the extent of damage caused by gamma irradiation on seeds in M_1 generation and induce drastic change in M_1 through high doses of irradiation with a view to induce earliness and dwarfism.

Higher doses of gamma irradiation at 40 KR, 80 KR and 120 KR were applied to seeds of CV Khuneizi for inducing drastic changes in growth, flowering pattern, height, etc. Each treatment, including control, had 400 seeds. Seeds did not germinate in two treatments, viz., 80 and 120 KR. Forty per cent seeds germinated in 40 KR dose and 82% of these germinated seeds survived (Table 1). This dose was almost double of the reported LD_{50} dose (20 KR) (Kgazal, 1989). The germination in control was 85% and all of them survived. In treated seeds germination was delayed and growth was also poor. The length of first leaf ranged from 4.5 to 20 cm for treated and 10 to 31 cm in control plants. The mean first leaf length observed after 3 months of

Table 1. Effect of gamma rays (40 KR) on leaf morphology recorded on 162 seedlings germinated out of 400 seeds sown

M ₁ phenotype	Seeds germinated	Survival	Dead
Expanded leaf	19	19 (100%)	0
Partially expanded leaf	99	93 (94%)	6
Unexpanded leaf	13	8 (61%)	5
Needle like	11	5 (45%)	6
Curly leaf	17	7 (41%)	10
Browning of the leaf blade	03	1 (33%)	2
Total	162 (40.5%)	133 (82.1%)	29

germination was 12.28 cm for treated seedlings, which was approximately half of the control (21.92 cm). There was no change in variance, but compared to mean, coefficient of variance doubled, i.e., 30.0 for treated as against 16.9 for control for first leaf length.

In addition to drastic reduction in survival percentage (33.25) the 40 KR dose induced morphological changes in the first leaf (Table 1). Only 19 (11.7%) seedlings had normally expanded leaf for which survival was 100%. Most of the seedlings had leaves partially expanded (61%). The survival of seedlings was reduced with more drastic morphological disorders. It was least for seedlings having dead lesions in leaf (33%), followed by seedlings with curly leaf (41%) and needle-like leaf (45%). The recovery of most of the plants in partially expanded leaf group suggests that normal unaffected or mildly affected seeds were very less (19 of 400, i.e., less than 5%), and more drastically affected seeds failed to germinate or the seedlings died. It seems that a dose of 40 KR has detrimental effect on germination and efficiently induced changes at seedling stage. Lower doses of irradiation may be tried for less drastic effects.

References

- Chandra, A. and Chaudhary, N.L. 1990. Performance of datepalm cultivars in Thar desert. *Current Agriculture* 14: 1-4.
- Chandra, A., Chaudhary, N.L. and Manohar, M.S. 1994. A note on the performance of datepalm cultivars at Bikaner. *Haryana Journal of Horticulture Science* 23: 131-134.
- Chandra, A. and Pareek, O.P. 1992. A note on the performance of different datepalm cultivars under Bhojka (Jaisalmer) conditions of Rajasthan. *Haryana Journal of Horticulture Science* 21: 205-207.
- Chandra, A., Swaminathan, R., Chaudhary, N.L., Manohar, M.S. and Pareek, O.P. 1990. Performance of datepalm cultivars in the Thar desert. *Indian Journal of Horticulture* 47: 28-33.
- Kalra, S.K. and Jawanda, J.S. 1992. Fruit characters and quality assessment of some promising date varieties at Abohar. *Punjab Horticultural Journal* 12: 39-43.
- Kgagal, M.A. 1989. Radiosensitivity of datepalm pollen, seed and seedling. *Indian Journal of Horticulture* 46: 338-343.
- Pundir, J.P.S. and Porwal, R. 1999. Performance of different datepalm cultivars under hyper-partially irrigated western plains of Rajasthan (India). *Proceedings of the First International Conference on Datepalm held at UAE University AL-AIN on 8-10th March*, pp. 329-336.
- Shakib, A.M., Khoskam, S. and Majidi, E. 1994. Plant regeneration of datepalm variety estamaran by tissue culture. *Seed and Plant* 9: 8-11.

- Sharma, D.R., Chowdhary, J.B., Neelam, R.Y. and Chowdhary, V.K. 1991. *In vitro* multiplication of female dateplam (*Phoenix dactylifera* L.). *Bulletin-de-la-Societe-Botanique de-France-Actualite Botaniques* 137: 15-23.
- Sharma, D.R., Dawra, S. and Chowdhary, J.B. 1984. Somatic embryogenesis and plant regeneration in datepalm (*Phoenix dactylifera* L.). *Indian Journal of Experimental Biology* 24: 763-766.
- Srivastava, H.C. and Dhawan, S. 1981. Performance of some date varieties in Haryana. *Agriculture Science Digest* 1: 76-78.