

Investigations on Longevity of *Piper Barberi* Seeds

MR RANJITH LAYOLA^{1*}, CR CHITRA¹, S BINDU¹, MATHEW DAN² AND C ANILKUMAR¹

¹Division of Conservation Biology, ²Division of Plant Genetic Resources
Jawaharlal Nehru Tropical Botanic Garden and Research Institute,
Palode, Thiruvananthapuram - 695562, India
*rimr66@gmail.com

(Received : February 2018; Revised : March 2018; Accepted : May 2018)

Piper barberi Gamble is an endemic medicinal plant of the pepper family Piperaceae. The species is included as rare in the Red Data Book of Indian plants [1], critically endangered in the 100 Red Listed Medicinal Plants of Conservation Concern in South India [2] and endangered in the Red Data Book of IUCN [3]. The main reasons for this endangerment are habitat loss, tree felling and anthropogenic activities. Cytological investigation revealed that it has a somatic chromosome number of 52(2n), which is most pre-dominant in south Indian *Piper* species [4]. The plant parts have been reported to be dried, powdered and used in the treatment of post-delivery complaints [5]. In the present study, the morphology of fruits and seeds were noted. In an attempt to conserve the seeds, effect of moisture content and temperature on seed viability, germination and storage were studied.

Fresh ripened fruits of *P. barberi* were collected from natural habitat during the months of July and August. Drupes were de-pulped and washed thoroughly with tap water. Cleaned seeds were surface dried under fan by spreading over a blotting paper for 4 - 5 hours. Initial seed moisture content (MC) was determined by high constant temperature oven method since for a short-lived seed high constant method is advisable [6]. Moisture content was expressed as percentage of dry weight. These experiments were replicated five times, each with randomly selected five seeds in each.

Five replicates of ten seeds each were placed in 9cm diameter petridishes on filter paper wetted with distilled water and kept in seed germinator maintained at 30 ± 2°C/ 80% RH in dark. Germination was monitored at two day intervals. Percentage germination was calculated at the end of the trial. Seeds were desiccated in laboratory condition (28 ± 2°C/ 70% RH). Fast

desiccation is deleterious for this short lived seeds. To study the effect of storage temperature on the viability of seeds with initial moisture content, seeds were stored hermetically in polycarbonate bottles at different temperatures viz., 30, 20, 10, 0 and -10°C on the same day of depulping. Seeds kept open at laboratory condition served as the control.

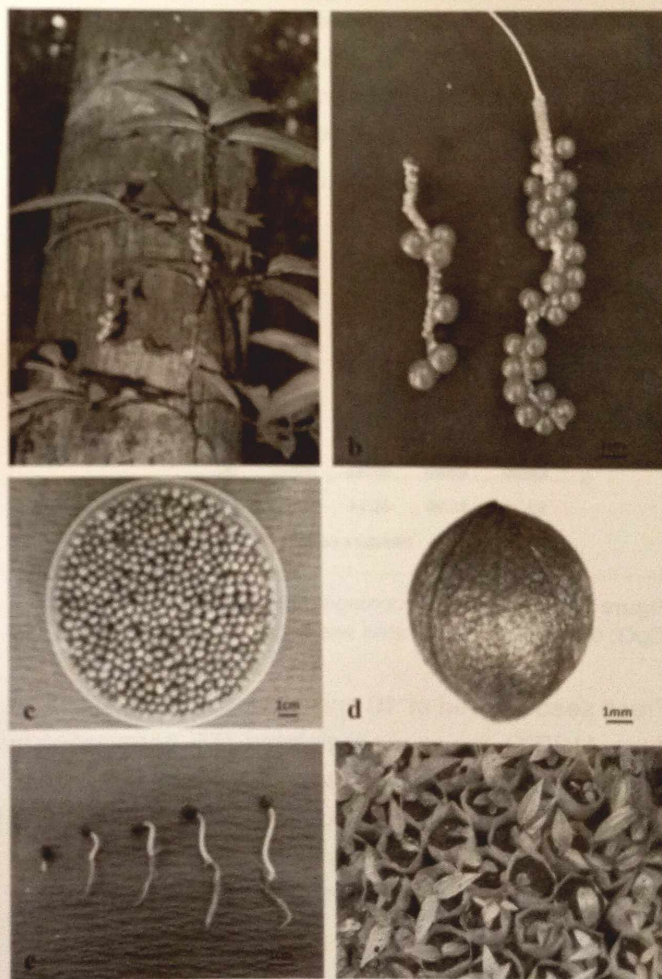


Plate 1: Different characters of *P. barberi*; a, Habit; b, Inflorescence; c & d, Seeds; e, Germinated seeds; f, Seedlings establishing at nursery.

P. barberi is a small, dioecious, slender, glabrous climber. The populations of the species remain scattered among the altitudinal range of 200 to 500 m in the evergreen forests of southern Western Ghats. Flowering and fruiting period ranges from February to September. The sessile drupaceous globose fruits are produced in spikes that measures up to 29 cm length and are arranged spirally. The long peduncle and elliptic leaves are the demarcating characters of *P. barberi* from other species of *Piper*. Fruits are red, globose on ripening and 5 - 8 mm in diameter having 0.15 - 0.18 g weight. Seeds are brownish orange and obovoid with 3-5 mm in diameter having 0.03 - 0.05 g weight (Plate 1).

Fresh seeds with 33.21% moisture content (MC) registered 96% germination in 12 days of sowing with highest germination speed of 8. The desiccation at laboratory condition showed gradual decline in both germination percentage and germination speed of seeds (Fig 1). When desiccated for four days, MC was reduced to 24.69% with 56% germination. After six days of drying MC was reduced to 21.26% and germination declined to 24%. Seeds lost viability completely after 10 days of desiccation when MC reached 14.85% level (Figure 1).

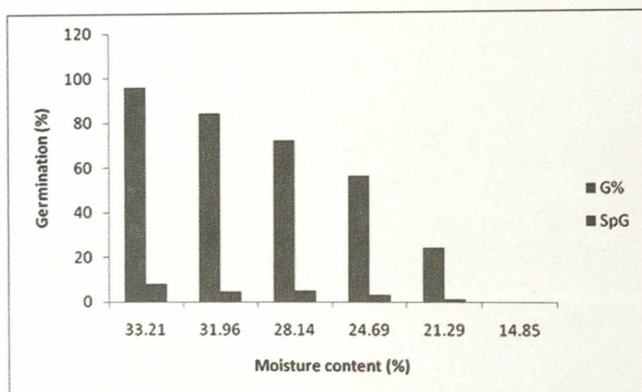


Figure 1: Germination percentage (G%) and speed of germination (SpG) of fresh and desiccated seeds of *P. Barberi*

Fresh seeds stored at -10 and 0°C lost viability within 30 days. At 30°C, the seeds registered 76% germination in first month, but completely lost viability by the second month. Seeds stored for two months at 10°C had 40% viability. At 20°C, the viability was prolonged up to three months with 66% germination. Control seeds lost viability within a week (Table 1).

The desiccation studies showed that the critical MC of *P. barberi* seeds was 28.14%. Maximum viability was obtained with seeds kept at 20°C, which was found to

Table 1. Effect of storage temperature on germination of *Piper barberi* seeds

Temperature °C	Storage period (days)	Moisture content (%±SE)	Germination (%±SE)
-10	7	24.68 ± 0.4	10 ± 5.8
	15	23.44 ± 0.6	6 ± 2.9
	30	22.37 ± 0.5	0
0	7	22.16 ± 0.05	66 ± 2.9
	15	21.33 ± 0.3	56 ± 2.9
	30	10.14 ± 0.08	0
10	7	24.87 ± 0.5	86 ± 2.9
	15	23.96 ± 0.3	56 ± 3.3
	30	19.45 ± 0.2	50 ± 5.8
	60	16.70 ± 0.4	40 ± 5.8
	90	12.98 ± 0.3	0
20	7	30.84 ± 0.1	100
	15	26.32 ± 0.1	96 ± 2.9
	30	24.83 ± 0.3	80 ± 2.9
	60	22.20 ± 1.1	74 ± 8.8
	90	18 ± 0.4	66 ± 1.7
	120	11.33 ± 0.2	0
30	7	31.97 ± 0.3	86 ± 3.3
	15	28.55 ± 0.08	80 ± 5.8
	30	22.75 ± 1.7	76 ± 2.9
	60	12.70 ± 0.1	0
Control	7	21.29 ± 0.5	24 ± 2.5
	15	14.85 ± 0.3	0

be the optimum temperature for short-term storage. *P. nigrum* seeds lose viability severely under cryostorage [7]. Similar result was also found in the storage study of *Syzygium cumini* a recalcitrant species [8]. The viability of non-desiccated seeds was extended from 20 days to 170 days when stored at 10 and 20°C. Studies on another recalcitrant species, *Myristica malabarica* showed viability only for a week under natural conditions. Seeds with 27% moisture content stored in polyethylene bags at 30°C / 80% RH retained viability for an year [9]. High initial MC and critical MC of *P. barberi* seeds along with its sensitivity towards desiccation ensured its recalcitrant nature. In natural open condition, seeds lose viability after four days. The present study on viability and seed storage will support the conservation of this endangered wild relative of pepper.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode for the extended facilities and Ministry of Environment

forest and Climate Change, Delhi for project support. The Kerala Forest department is duly acknowledged for the forest entry permit.

REFERENCES

1. NAYAR MP AND ARK SASSTRY (1988). Red Data Book of Indian Plants, Prabartak Printing & Halftone Ltd, Calcutta, India. p: 268.
2. RAVIKUMAR K AND D VED (2000). 100 Red Listed Medicinal Plants of Conservation Concern in South India, Foundation for Revitalization of Local Health Traditions, Bangalore, India. p: 467.
3. SAHAD, D VED, K RAVIKUMAR AND K HARIDASAN (2015). *Piper barberi*, The IUCN Red List of Threatened Species.
4. NIRMAL BK, N RAMAKRISHNAN, KG JOHNSON AND PN RAVINDRAN (1992). *Journal of Spices and Aromatic Crops*, 1(1): 88-93.
5. RAO RR (2010). Medicinal plants of India: Diversity, conservation and bio prospection – A priority agenda for 21st century (In: Chemistry, biochemistry and Ayurveda of Indian medicinal plants, I P Tripathi (ed.) International E-publication) pp: 13-40.
6. ANONYMOUS (2008). International Rules for Seed Testing. ISTA, Secretariat, Zurich, CH-Switzerland.
7. CHAUDHURY R, AND KPS CHANDEL (1994). Germination studies and cryopreservation of seeds of black pepper (*Piper nigrum* L.) - A recalcitrant species. *Cryoletters* (UK), 15: 145-150.
8. ANANDALAKSHMI R, V SIVAKUMAR, RR WARRIER, R PARIMALAM, SN VIJAYACHANDRAN AND BG SINGH (2005). Seed storage studies in *Syzigium cuminii*. *Journal of Tropical Forest Science*, 17(4): 566-573.
9. ANILKUMAR C, KP BABU AND PN KRISHNAN (2002). Seed storage and viability of *Myristica malabarica* Lam. an endemic species of Southern Western Ghats (India). *Seed Science and Technology*, 30(3): 651-657.