Indian J. Pl. Genet. Resources 12(3): 430-432, 1999

Short Communication

EFFECT OF SHELL ON CONSERVATION OF SEED-VIABILITY IN GROUNDNUT, *Arachis hypogaea* L

A.K. SINGH[1], Genetic Resources Division, ICRISAT, Patancheru, (Andhra Pradesh)
[1]Present address : National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi 110 012

There are genotypic differences among groundnut accessions for maintenance of longevity of seed-viability in storage in relation to the shell of pods. Only six accessions showed that significant difference in longevity of seed, hence, groundnut accessions can be conserved equally safe as of seeds in seed genebank under medium-term conditions depending on genotype. However, more accessions need study to confirm these observations.

Key words : *Arachis hypogaea*, conservation, seed viability

Groundnut seeds are typically orthodox and withstand desiccation to low moisture content. Seed storage therefore, is the most convenient method of conservation. However, the high oil content (31.8 to 41.0%) of seeds, makes it a poor storer. The viability of seeds during long-term storage in seed banks has not been investigated and the seed storage conditions, which maximise seed-longevity, still remain unresolved. Bass (1968) reported that hand-shelled groundnut seeds can be stored for 5 years or longer without loss of viability at 10°C and 50 per cent RH. Norden (1981) observed appreciable loss in germination of shelled seeds, stored for 10 years with less than 6 per cent moisture content in sealed containers at low temperatures (2° to 5°C). Baskin (1979) indicated that seed-viability is maintained better when stored with shell, while Navarro *et al.* (1989) observed genotypic differences in longevity in relation to the shell. These studies, include only few genotypes, representing only a small spectrum of the total variability. Further, seeds were stored only for a short duration.

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) holds the world collection of germplasm of groundnut, totaling about 15,000 accessions from 91 countries. Most of the germplasm is conserved as active collections in medium-term stores (4°C and 30% RH) in plastic containers as pods. Under these conditions, the seed-viability has been maintained fairly well over times. However, pods require greater space, and the quality of seeds remain concealed, having implications on large-scale conservation. In the present investigation, the seed longevity of shelled and unshelled groundnut was studied.

Nineteen accessions of groundnut, representing four of six known botanical varieties were used in the study (Table 1). They were planted in the post-rainy (PR) season of 1990-91 under controlled conditions. Regular plant protection measures were taken to minimise biotic stresses and enable production of healthy seeds. The pods were harvested at maturity. Fifty per cent of pods were hand shelled while the remaining were kept unshelled. Both pods and seeds were dried to 10 per cent seed moisture level and stored separately in cloth bags in a single plastic container at 4°C and 30 per cent RH. After 5 years of seed storage, the viability of both shelled and unshelled seeds was tested. Two replicates of 50 seeds each were placed between two layers of moist paper towels (Non-toxic standard towels, Seed-buro) and incubated at 25°C. Germination counts were made 7 days after incubation. The seed of accessions of subspecies *hypogaea* were treated with 20 ppm of etheral solution (2-4 Dichloroethyle-phosphonic acid) to break dormancy. The data were analysed statistically using the Complete Randomised Block Design.

The germination at the start of seed storage ranged between 94 and 100 per cent (with a mean of 98.3%). After five years of storage, the viability of unshelled seeds varied between 70 and 98% (with a mean of 86.7%), while that of shelled seeds was between 56 and 98 per cent (with a mean of 85.9%) (Table 2).

The mean viability is marginally low, when accessions are conserved as seeds. However, a critical analysis of the results reflects the effect of shell on longevity of seed-viability. In 12 of 19 genotypes studied, seed-viability was better maintained when stored as pods, which was in line with previous observations of Baskin (1979). The groundnut seed has a thin seed coat, the shell in majority of accessions may be providing a protective covering to seeds from attacks of pathogens and from mechanical injuries. In the remaining seven genotypes, however, seed-viability was higher even when stored as seed (Table 2). Of these seven genotypes, three belong to subspecies *fastigiata* var. *fastigiata*, three to subspecies *hypogaea* var. *hypogaea* type runner, and one to var *hypogaea* type bunch. Most of these genotypes have smaller seed size indicated by lower 100 seed weight, thin shell: indicated by

Table 1. Identities, biological and taxonomic status of accessions

ICRISAT identity	Botanical variety	Biological Status	Country of origin	100 seed weight (g) (Rainy)	Oil content (%)	Shelling (%)
ICG 3078	*vulgaris*	Landrace	Sudan	45.0	-	74
ICG 3244	*vulgaris*	Landrace	Tanzania	60.0	45.7	75
ICG 2978	*vulgaris*	Breeding line	U.S.A.	40.0	41.7	84
ICG 3034	*vulgaris*	Breeding line	India	32.0	-	77
ICG 10516	*fastigiata*	Landrace	Bolivia	37.0	-	77
ICG 10634	*fastigiata*	Landrace	Argentina	33.0	-	77
ICG 5988	*fastigiata*	Breeding line	U.S.A.	33.0	42.2	74
ICG 10217	*fastigiata*	Breedling line	Sudan	41.0	-	73
ICG 6646	*peruviana*	Landrace	Peru	45.0	45.6	67
ICG 10965	*peruviana*	Landrace	Peru	51.0	-	68
ICG 3841	hypogaea bunch	Landrace	India	40.0	42.1	70
ICG 3893	hypogaea bunch	Landrace	Tanzania	40.0	46.2	69
ICG 3019	hypogaea bunch	Breedling line	U.S.A.	76.0	44.6	69
ICG 3046	hypogaea bunch	Breeding line	India	49.0	45.0	73
ICG 4532	hypogaea bunch	Released cultivar	U.S.A.	40	39.9	72
ICG 2799	hypogaea runner	Landrace	U.S.A.	62.0	41.6	71
ICG 4129	hypogaea runner	Landrace	India	44.0	43.5	69
ICG 2829	hypogaea runner	Breeding line	India	48.0	43.0	67
ICG 4765	hypogaea runner	Breedling line	Taiwan	60.0 (PR)	-	70

PR : refers to post-rainy season

Table 2. Germination percentage of shelled and unshelled seeds after five years from storage

Accession ID[1]	Germination percentage after five years from storage			
	At the start of seed storage	in pod	in seed	Difference
ICG 3244	95.0	88.0	80.0	8.0
ICG 3078	85.0	70.0	56.0	14.0
ICG 3034	88.0	86.0	72.0	14.0
ICG 2978	90.0	86.0	72.5	13.5
ICG 10516	100	78.0	96.0	−18.0*
ICG 10634	100	92.0	94.0	−2.0
ICG 5988	95.0	72.0	90.0	−18.0*
ICG 10217	100	96.0	84.0	12.0*
ICG 10956	90.0	82.0	72.0	10.0
ICG 6646	100	94.0	84.0	10.0
ICG 3841	100	94.0	86.0	8.0
ICG 3893	100	98.0	94.0	4.0
ICG 3019	100	94.0	84.0	10.0
ICG 3046	95	92.0	86.0	6.0
ICG 4532	100	94.0	98.0	−4.0
ICG 2799	100	80.0	95.0	−15.0*
ICG 4129	98.0	70.0	94.0	−24.0**
ICG 2829	98.0	94.0	90.0	4.0
ICG 4765	100	88.0	98.0	−10.4*

[1]Accession ID = ICRISAT Groundnut (ICG) Accession number;
**Significant at 1%, *Significant at 5%

the high shelling percentage, and low oil content (Table 1). Thereby, suggesting that in these accessions of var. *fastigiata* (Valencia) and var. *hypogaea* type runner shell does not contribute significantly towards the maintenance of seed-viability and more than shell, some other characteristics, such as seed size, seed coat or chemical composition (less oil), probably confer significantly greater towards maintenance of seed-viability.

REFERENCES

Bass, L.N. 1968. Effect of temperature, relative humidity and protective packing on longevity of peanut seeds. *Proceedings of Association of Official Seed Analysis* 58: 58-62.

Baskin, C.C. 1979. The effect of shell on the viability and moisture content of peanut seeds in storage under alternating humidity. *Seed Research* 7: 1-4.

Navarro, S., E. Donahaye, R. Kleinerman and H. Haham. 1989. The influence of temperature and moisture content on the germination of peanut seed. *Peanut science* 16: 6-9.

Nordan, A.J. 1981. Effect of preparation and storage environment on life span of shelled peanut seed. *Crop Science* 21: 263-266.