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EFFECT OF SEED SIZE ON SEED RECOVERY AND SEED QUALITY IN CHICKPEA (*Cicer arietinum* L.) SA-1

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ABSTRACT

Seed grading is a process that helps to reduce the likelihood of planting poorer quality seed. The objective of seed grading is to improve the uniformity of the seed lot by removing seeds of the same species with low quality. The present study was carried out to find out the optimum sieve size for size grading of seeds of chickpea (*Cicer arietinum* L.) Super Annigeri-1. The effect of seed size on physiological parameters were evaluated using 4.75 mm, 5.00 mm, 5.50 mm and 6.00 sieves along with control. The chickpea seeds graded with 4.75 mm round sieve recorded higher seed recovery (93.80 %) than other sieves used with required germination (92.75%), 100 seed weight (19.39 g), and seedling vigour index (2536). Hence, seeds of chickpea seeds could be size graded using 4.75 mm sieve (R) for more seed recovery with required seed quality standards as compared to other sieve sizes and ungraded seeds.

Key words : Chick pea cv. SA-1 Seed recovery, Seedling vigour index, Size grading.

Introduction

Chickpea (*Cicer arietinum* L.) is one of the most important grain legumes as it ranks third in the world after dry bean (*Phaseolus vulgaris* L.) and field pea (*Pisum sativum* L.) (FAO, 2004). It is an important source of protein, carbohydrate, B-group vitamins, and certain minerals (Williams and Singh, 1988), particularly to the populations of developing nations. There are about 60 domesticated grain legume species in the world (Hedley, 2001). Chickpea solely contributes nearly 50% of the Indian pulse production. The chickpeas market is expected to grow $19.19 billion in 2027 at a CAGR of 6.50%. The share of India in global chickpea production was 73.46% during 2020 (Tridge, 2023).

Seed size is a key yield component that influences cultivar adaptation to various conditions, while also affecting seed vigour (Morrison and Xue, 2007). Seed size plays a unique function in crop yield among genetically determined parameters. Between the genetically factors, seed size has a special role in seed or crop production. Studies of Roozrokh *et al.* (2005) on chickpea showed that large seeds of chickpea had high germination percentage and more seedling dry weight in compare with small seeds. The effect of seed size continues to predominate in determining field stand and uniform crop growth (Dubey *et al.*, 1989). Seed size affected the germination, vigour and emergence potential. In addition, to obtain homogeneous or market appealing seed lot, size grading is inevitable. Seed size also influences the yield (Bhingarda and Dumbre, 1993). Size is a widely accepted measure of seed quality and large seeds have high seedling survival growth and establishment (Jerlin and Vadivelu, 2004).

At present the sieve size for all chickpea varieties as per the minimum seed certification standards is 4.75 to 6.00 mm, the same range has been suggested by Seed Certification Agency. It is often observed that the seed growers are losing considerable quantity of good seed which is treated as a rejection and considering the huge demand from farmers for certified seed production. Now a day, newly released chickpea varieties had more differences in seed size as compared to older varieties. Hence, the alteration is needed in grading screen size while seed processing for getting good quality seeds to confirm the physical purity standards set by IMSCS while processing of chickpea seeds. Therefore, there is need to standardize the sieve size for seed grading chickpea variety Super Annigeri. Thus a study was conducted to standardize the optimum sieve size for seed grading of chickpea cv. SA-1 seeds on the basis of large scale seed processing.

Materials and Methods

The experiment was conducted at Seed Unit, University of Agricultural Sciences, Raichur, during the year 2020 and 2021. The bulk seeds of chickpea cv. SA-1 harvested from the seed production block, seed unit, UAS, Raichur constituted the materials for the study. The collected seeds were tested for seed recovery percentage, germination percentage, physical purity percentage, 100 seed weight (gm), seedling vigour index and pure live seed. The pre cleaned seeds of chickpea cv. SA-1 were graded with slotted shape sieve of 4.75 mm, 5.00 mm, 5.50 mm and 6.00 mm and unprocessed as control. The Seeds retained over each sieve size were collected separately and tested for quality parameters *i.e.* seed recovery percentage and physical purity percentage (Anonymous, 2013), 100 seed weight (Anonymous, 2013) was expressed in gram. For germination percentage 100 seeds were germinated at the temperature of 25±2°C and 90±2% of RH in four replications. After 14 days the seedlings were evaluated and normal seedlings were counted and expressed in per cent as per ISTA (Anonymous, 2013). The observations on various seed quality parameters *viz.*, seed germination (%), seedling vigour index were recorded as per the methods and procedures described by (Abdul-Baki and Anderson, 1973), the quality parameters were calculated using following formula:

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds placed for germination}} \times 100$$

$$\text{Pure Live Seed (\%)} = \frac{\text{Physical purity (\%)} \times \text{Germination (\%)}}{100}$$

$$\text{Seed recovery (\%)} = \frac{\text{Weight of seeds retained in each sieve}}{\text{Total weight of seeds}} \times 100$$

$$\text{Physical purity (\%)} = \frac{\text{Weight of the pure seed fraction}}{\text{Total working sample weight}} \times 100$$

Statistical analysis

The data collected from experiment was statistically analyzed using a completely randomized design with four replications as procedure given by Panse and Sukatme (1978). The critical differences (CD) were calculated at 1% level of probability.

Results and Discussion

The purpose of grading is to improve the homogeneity of the seed lot by removing seeds of the same species with low quality during size grading. The small seeds are discarded which are believed to include empty, underdeveloped and low vigorous seeds. Importance of seed size was reported by Menaka and Balamurugan (2008). Seed size is an important physical indicator of seed quality that affects vegetative growth and is frequently related to yield, market grade factors and harvest efficiency.

The results of the pooled analysis was found significantly differed for seed recovery and physical purity due to seed size grading in chickpea *cv.* SA-1 (Table 1). The seed recovery percent was ranged from 74.85 to 93.80 among the different graded sieves. As the sieve size increases the recovery percent was decreases (Fig. 1). The highest seed recovery percentage (93.80) was recorded in 4.75 mm sieve. These results are in conformity with Ramaiah (1994) in sunflower and Ramanadane and Gyanasekar (2024) in Black gram.

Physical purity was highest in 6.00 mm (99.69%) and minimum in bulk seed (95.36%). The physical purity percentage difference is very negligible between sieves. All the graded seeds in different sieve size meets the minimum seed certification standards except bulk seeds indicating size grading is mandatory for planting seeds.

The data on seed germination and test weight were significantly influenced by sieve size (Table 2). The highest seed germination percentage (98.13) was recorded in 6.00 mm sieve and reduced with decrease in sieves size and lowest in bulk seed. However, all the sieves size has recorded more than the minimum germination (85.00%) recommended for chickpea by MSCS. Increased germination percentage was observed with increase in sieve size (Fig. 1). These results are in agreement Gunaga *et al.* (2007) have recorded higher seed germination and seedling vigour by using bigger sized seeds in *Pongamia pinnata* and *Vateria indica* and Suma

Table 1 : Seed recovery and physical purity as influenced by size grading in chickpea *cv.* SA-1.

Sieve size (mm)	Seed recovery (%)			Physical purity (%)		
	2020	2021	Pooled mean	2020	2021	Pooled mean
Bulk seed	100.00	100.00	100.00	95.74	94.99	95.36
4.75	94.10	93.50	93.80	98.54	98.64	98.59
5.00	90.50	89.38	89.94	99.13	99.21	99.17
5.50	81.40	79.25	80.33	99.45	99.51	99.48
6.00	74.13	75.58	74.85	99.66	99.73	99.69
SEm ±	0.59	0.53	0.38	0.27	0.24	0.24
CD @ 1%	2.44	2.22	1.57	1.14	1.00	1.00

Table 2 : Test weight and germination as influenced by size grading in chickpea *cv.* SA-1.

Sieve size (mm)	Test weight (g)			Seed germination (%)		
	2020	2021	Pooled mean	2020	2021	Pooled mean
Bulk seed	19.35	17.97	19.18	80.25	80.50	80.38
4.75	19.41	19.37	19.39	93.00	92.50	92.75
5.00	19.45	19.66	19.50	94.25	95.50	94.88
5.50	19.77	19.82	19.79	96.00	97.25	96.63
6.00	19.88	22.79	20.21	97.50	98.75	98.13
SEm ±	0.19	0.13	0.11	0.88	0.92	0.68
CD @ 1%	0.78	0.54	0.47	3.67	3.82	2.52

Table 3 : Seedling vigour index and pure live seed as influenced by size grading in chickpea *cv.* SA-1.

Sieve size (mm)	Seedling vigour index			Pure live seed (%)		
	2020	2021	Pooled mean	2020	2021	Pooled mean
Bulk seed	2114	2214	2140	76.83	76.48	76.66
4.75	2519	2559	2536	91.64	91.24	91.44
5.00	2603	2697	2621	93.43	94.75	94.09
5.50	2852	3083	2967	95.47	96.78	96.12
6.00	3105	3183	3144	97.17	98.48	97.82
SEm ±	43.10	31	23.79	0.94	1.00	0.72
CD @ 1%	179.59	127.62	99.12	3.90	4.15	3.01

et al. (2014) in sesame. The highest hundred seed weight was recorded in 6.00 mm (20.21 g) and least in bulk seed (19.18 g). The higher germination in large seeds may due to higher amount of food reserves and increased activity of redox enzymes in the seeds helping in breaking down the complex food reserves into simple soluble sugars. Similarly, significant differences were observed in standard germination test (Fig. 1 and Photo 1). The positive association of seed size and seed weight was reported by Ganiger *et al*. (2016) in greengram. Similarly, Suma *et al*. (2014) reported in sesame where in seed size and seed weight was positively related.

Seedling vigour index and pure live seed index was varied with seed size (Table 3). The highest seedling vigour index in sieve size of 6.00 mm (3144) and lowest in control (2140). The highest Pure live seed percentage was recorded in 6.00 mm sieve (97.82) and lowest in bulk seed (76.66). Seed weight and seedling vigour index were related to the size of seed and food storage, as the sieve size increases, seed size also increases. Larger seeds containing more food in seeds compare to small size seeds, meanwhile 100 seed weight and seedling dry weight was maximum in large size seeds compare to small size seeds. Larger seed not only has greater vigour but emerges faster. The speed of germination and emergence is a powerful factor because it occurs early in the growth of the crop. Early emerging seedlings have a high probability of being larger at stem elongation and of producing more seedss than those that emerge a few days later. These results are in confirmative with Farhoudi (2010) in safflower. The positive association between size and weight of seeds was reported Suma *et al*. (2014) in sesame and Ramanadane and Gyanasekar (2024) in Black gram Pure live seed percentage was highest in

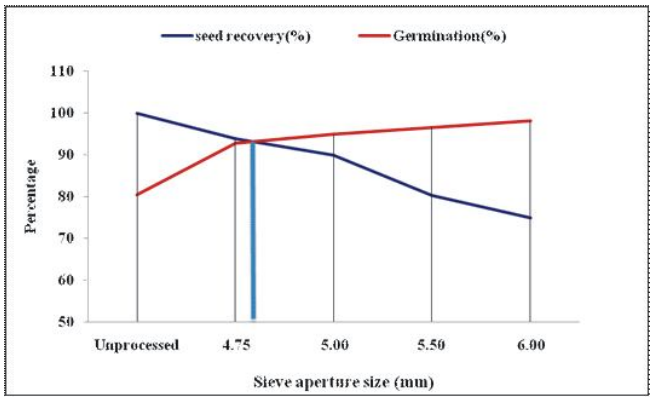


Fig. 1 : Effect of size grading on seed recovery and germination as influenced by size grading in chickpea.

6.00 mm sieve size (97.82 %) followed by 5.50 mm (96.12%) sieve size seeds.

Thus, the study inferred that, a sieve size of 4.75 mm (R) registered highest seed recovery, physical purity, seed germination and seedling vigour index, which is above the minimum seed certification standards. Hence, the chickpea cv. SA-1 can be graded using 4.75 mm (R) grading sieve for better seed recovery and quality. The seed producer is economically benefitted by higher seed recovery without compromising Indian minimum seed certification standards.

References

Abdul-Baki, A.A. and Anderson J.D. (1973). Vigour determination in soybean seeds by multiple criteria. *Crop Sci*., **13**, 630-633.

Anonymous (2013). International Rules of Seed Testing. *Seed Sci. Technol*., **27**, 25-30

Bhingarde, M.T. and Dumbre A.D. (1993). Effect of seed size on growth and yield components in green gram (*Vigna radiata* L. Wilczek) under summer conditions. *Seed Res*., **21(2)**, 104-106.

Dubey, A.K., Singh P., Goyal R.D. and Katiar R.P. (1989). A comparison of vigour between large and small seeds in Mustard. *Seed Res*., **17(2)**, 204-207.

FAO (2004). *Production Yearbook 2003*. Food and Agricultural Organization of the United Nations, Rome, Vol. 58.

Farhoudi, R. and Motamedi M. (2010). Effect of salt stress and seed size on germination and early seedling growth of safflower (*Carthamus tinctorius* L.). *Seed Sci. Technol*., **38**, 73-78.

Ganiger, B.S., Basave Gowda G.Y., Lokesh and Rekha (2016). Standardization of screen sizes for green gram seed processing. *The Bioscan*, **11(4)**, 2379-2381.

Gunaga, R.P., Hareesh T.S. and Vasudeva R. (2007). Effect of fruit size on early seedling vigour and Biomass in White Dammer (*Vateria indica*): A vulnerable and economically important tree species of the Western Ghats. *J. NTFPs*, **14**, 197-200.

Hedley, C.L. (2001). Carbohydrates in grain legume seeds: Improving nutritional quality and agronomic characteristics. Wallingford, Oxon, GBR: CABI Publishing, pp. 1-14.

Jerlin, R. and Vadivelu K.K. (2004). Effect of fertilizer application in nursery for elite seedlings production of pungam (*Pongamia pinnata* L. Picrre). *J. Trop. Agri. Res. Extension*.

Menaka, C. and Balamurugan P. (2008). Seed grading techniques in Amaranthus cv. CO5. *Plant Archives*, **8**, 729-731.

Morrison, M.J. and Xue A.G. (2007). The influence of seed size on soybean yield in short- season region. *Canadian J. Plant Sci*., **87**, 89-91.

Panse V.G. and Sukhatme P.V. (1978). *Statistical Methods for Agricultural Workers*. ICAR, New Delhi, pp: 162-174.

Ramaiah, H. (1994). Studies on some seed technological aspects of sunflower (*Helianthus annuus* L.) hybrids and their parents. *Ph.D. thesis* submitted to Univ. Agric. Sci., Bangalore, India.

Ramanadane, T. and Gnanasekar R. (2024). Standardization of Optimum Grading Sieve Size for Seed Processing in Black Gram [*Vigna mungo* (L.) Hepper] varieties. *Indian J. Agricult. Res*. https://arccjournals.com/journal/indian-journal-of-agricultural-research/A-6122

Roozrokh, M., Shams K. and Vghar M. (2005). Effects of seed size and seedling depth on seed vigor of chiek pea, First National Legume Congress. Mashhad Ferdowsi. University, Mashhad, Iran.

Suma, N., Srimathi P. and Sumathi S. (2014). Influence of size grading on seed and seedling quality characteristics of *Sesamum indicum*. *Int. J. Curr. Microbiol. App. Sci*., **3(6)**, 486-490.

Tridge (2023). https://iipr.icar.gov.in/chickpea-crop/