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INFLUENCE OF SIZE GRADING ON PHYSIOLOGICAL PARAMETERS IN CHICKPEA CV. BGD 103

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Abstract– The influence of seed size on physiological seed quality characters were evaluated in Chickpea cv.BGD 103 using seeds retained on 6.00 mm, 6.75 mm, 7.00 mm, 7.25 mm, 7.50 mm and 7.75 mm, round aperture metal sieves. On the basis of two years data, the results revealed that the 6.75 mm sieve recorded high seed recovery (96.31 %) than other sieves with better seed quality parameters like germination percentage (96.50 %), 100 seed weight (33.41 g), pure live seed (94.72 %), physical purity (98.15 %) and seedling vigour index (2501). Hence, seeds of chickpea *cv.* BGD 103 could be size graded with 6.75 mm(R) sieves for more seed recovery with Minimum Seed Certification standard (MSCS) for seed approval by Govt. of India.

INTRODUCTION

Chickpea (*Cicer arietinum* L.), a cool season crop, is the most important food legume in India. There are about 60 domesticated grain legume species in the world (Hedley, 2001). Based on seed market type, chickpea is classified into two groups namely desi and kabuli. Seeds of desi chickpea cv. BGD 103 are bigger in size. The desi type is more prominent and accounts up to 80% of global chickpea production. During 2017-18, globally it was grown on 149.66 lakh ha area, with the total production of 162.25 lakh tonnes (FAOSTAT, 2019) and average productivity of 1252 kg/ha. Out of which, 71 per cent of global area with 70 per cent of global production of *chick pea* is contributed by India as it ranks 1st in area and production but lags behind several countries in terms of productivity because of poor adoption of improved varieties and production technologies by farmers'. They are a significant source of protein, carbohydrates, vitamins, minerals and unsaturated fatty acids. Chickpeas not only possess characteristics for a balanced diet, especially for poor populations throughout the world (Upadhyaya *et al.,* 2016; Jimenez-Lopez *et al.,* 2020; Sab *et al.,* 2020), but are also important for sustainable agriculture since fixing atmospheric nitrogen to soil via special bacteria provides rotational value to subsequent crops (Marques *et al.,* 2020).

Seed size is one of the important yield component, successful seed production depends on rapid establishment and uniform crop stand in field, To ensure that, high quality seeds are normally recommended for sowing. Also, seed size has effective role on cultivar adaptation to different condition with affecting the seed vigour (Morrison and Xue, 2007). Between the genetically factors, seed size has a special role in crop production. Physical grading of seed based on morphological characters, primarily the seed size is widely used trait for selection of vigorous seed from the lot (Agrawal, 1996). Studies of Roozrokh *et al.* (2005) on chickpea showed that large seeds of chickpea had high germination percentage, more seedling dry weight and better electrical conductivity in compare with small seeds. Verma *et al.* (2005) showed that large seeds expressed high seedling vigour index than small seeds in redgram. The effect of seed size

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continues to predominate in determining field stand and uniform crop growth (Dubey *et al.,* 1989). Manonmani *et al.* (1996) and Gunaga *et al* (2007) have recorded higher seed germination and seedling vigour by using bigger sized seeds in *Pongamia pinnata* and *Vateria indica*. Seed size also influences the yield (Bhingarda and Dumbre, 1993).

At present the sieve size of 4.75 to 6.0 mm (R) has been suggested by Seed Certification Agency to process the Chickpea seeds. 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. Therefore, there is an urgent need to standardize the sieve size for grading chickpea seed. Hence the present research on optimum sieve size and type of screen for grading chickpea seed was planned and undertaken. Thus a study was conducted to standardize the optimum sieve size for processing of chickpea cv. BGD 103 seeds on the basis of large scale seed processing.

MATERIALS AND METHOD

The experiment was conducted at Seed Unit, University of Agricultural Sciences, Raichur, during the year 2019 and 2020. The bulk seeds of chickpea cv. BGD 103 harvested from the crop raised at seed unit, seed production plot, 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. BGD 103 were graded with round shape sieve of 6.0 mm, 6.75 mm, 7.0 mm, 7.25 mm, 7.50 mm and 7.75 mm size (Fig.1). For grading the seeds "Cleaner cum grader" having two screens and one fan were used. The Seeds retained over each sieve size were collected separately and tested for quality parameters *i.e.* recovery percentage and physical purity percentage, 100 seed weight (ISTA, 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 (2013). The observations on various seed quality parameters *viz.*, seed germination (%), seedling vigour index were recorded as per the methods and procedures described by ISTA, 2013.

The Pure live seed percentage was calculated

Table 1. Effect of seed size grading on quality parameters of Chickpea cv. BGD 103

Treat-ments	2019						2020						Pooled					
	Recovery (%)	PP (%)	Germi-nation (%)	100 seed wt. (g)	SVI	PLS (%)	Recovery(%)	PP (%)	Germi nation (%)	100 seed wt. (g)	SVI	PLS (%)	Recove-ry(%)	PP (%)	Germi-nation (%)	100 seed wt. (g)	SVI	PLS (%)
(S1) 6.0 mm	99.06	96.88	88.25	33.04	2148	85.49	99.13	96.68	88.50	32.56	2196	85.56	99.09	96.78	88.38	32.80	2172	85.53
(S2) 6.75 mm	96.00	98.14	97.00	35.19	2504	95.20	96.63	98.16	96.00	33.78	2499	94.24	96.31	98.15	96.50	33.41	2501	94.72
(S3) 7.0 mm	94.25	98.34	97.75	35.27	2444	96.13	95.25	98.26	97.75	33.87	2595	96.05	94.75	98.30	97.75	34.53	2520	96.09
(S4) 7.25 mm	91.40	98.58	98.25	35.75	2487	96.86	91.94	98.52	98.25	33.90	2763	96.79	91.67	98.55	98.25	34.58	2625	96.83
(S5) 7.50 mm	85.00	99.10	98.50	35.98	2716	97.62	82.60	99.03	98.50	34.73	3047	97.54	83.80	99.07	98.50	35.24	2882	97.58
(S5) 7.75 mm	62.75	99.74	98.50	36.83	3006	98.24	72.69	99.38	99.50	36.81	3219	98.88	67.72	99.56	99.00	36.82	3113	98.56
	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
SEM	0.28	0.07	0.71	0.10	97.58	0.70	1.49	0.19	0.77	0.12	59.09	0.79	0.71	0.10	0.66	0.10	71.54	0.66
CD 1%	1.14	0.29	2.89	0.41	397.21	2.86	6.07	0.78	3.13	0.49	240.56	3.23	2.88	0.39	2.68	0.39	291.24	2.70

using following formula:

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

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

The experiment was laid out in a completely randomized design with four replications. The results were subject to analysis of variance and expressed at 1% level of probability.

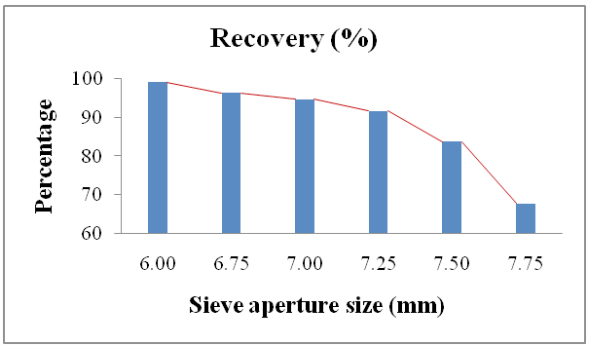
RESULTS AND DISCUSSION

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.

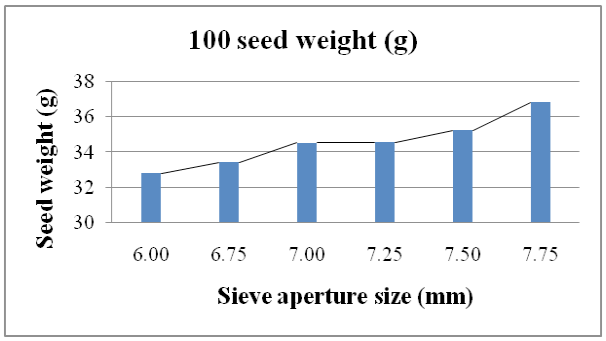
The quantity of seeds retained on each sieve decreases with increase in sieve size (Table 1 and Fig.1a). The seeds retained by 6.75 mm sieve recorded more recovery percentage with Minimum Seed Certification standard (MSCS) for seed approval by Govt. of India. Similar observations of improved seed recovery and quality have been reported by many workers (Renugadevi *et al*., 2009 in cluster bean, Anupama angadi and Vinod kumar, 2016 in fodder sorghum and Ganiger *et al*., 2018 in soyabean, Ganiger *et al*., 2020 in chickpea).

Physical purity was highest in 7.75 mm (99.56 %) and lowest in 6.00 mm (96.78 %). And 6.75 mm sieve size seeds recorded 98.15 % physical purity and difference is very negligible in other sieves. Pure live percentage of seeds was 94.72 percent in 6.75 mm sieve size seeds followed by 7.50 mm sieve size seeds (96.09 %) (Fig.1d).

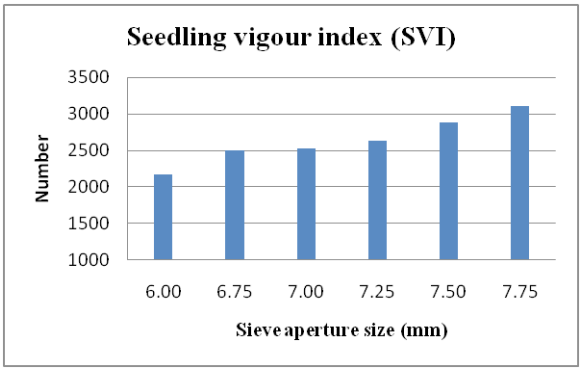
Germination percentage was more than 88 percent in all sieve size (range 88-99 %), and there was significant difference between germination percentage (Table 1). Increase in germination percentage was observed with increase in seed size (Fig.2). Highest germination percentage was



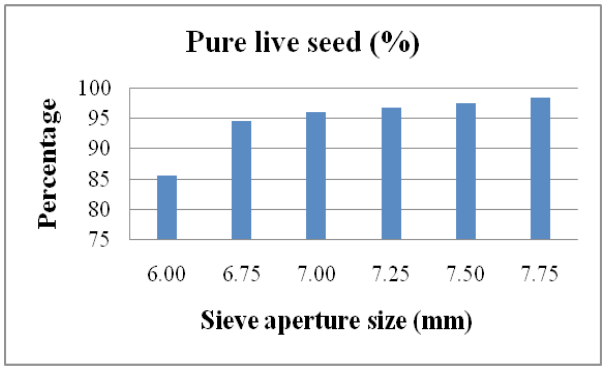
(a)



(b)



(c)



(d)

Fig. 1. Effect of size grading on (a) seed recovery (%), (b) 100 seed weight, (c) Seedling vigour Index and (d) pure live seed in Chickpea cv. BGD 103

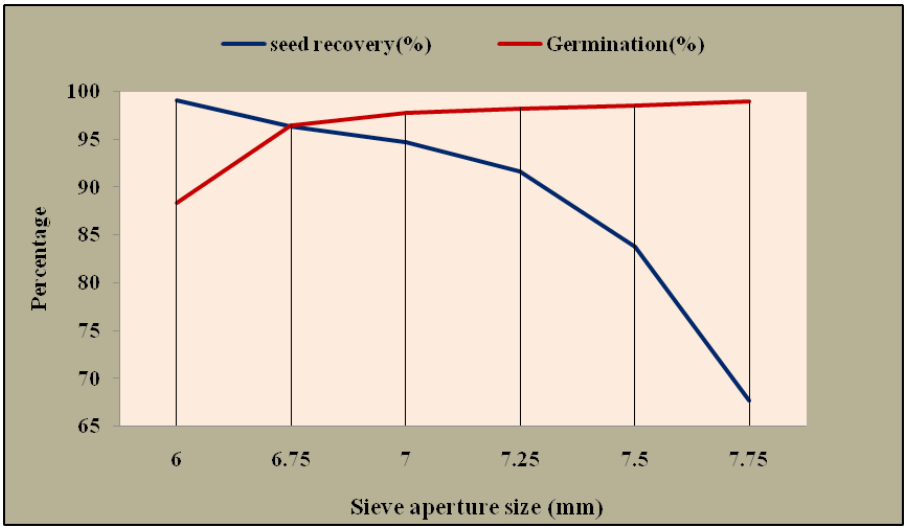


Fig. 2. Effect of sieve aperture size distribution curve on recovery percentage and germination percentage of Chickpea cv. BGD 103

observed in 7.50 & 7.75 mm (98.50 and 99 %). Farhoudi (2010) reported no significant difference between seed size on germination and for both seed sizes and all salinity treatments were greater than 90% (range 90-97%) in safflower. Rukavina (2002) in barley reported same results. These results are in agreement with our findings. For instance, Gunaga *et al.* (2007) have recorded higher seed germination and seedling vigour by using bigger sized seeds in *Pongamia pinnata* and *Vateria indica.* 6.00 mm sieve size recorded highest recovery percentage followed by 6.75 mm, even though 6.00 mm recorded highest recovery percentage but lowest germination percentage, but 6.00 didn't meets the minimum physical purity seed certification standard, and hence 6.00 mm sieve size was rejected and 6.75 mm is optimum for processing.

Seedling vigour index and 100 seed weight was increases with increase in sieve size (Fig 1b & 1c), highest seedling vigour index in sieve size of 7.75 mm (3113) and lowest in 6.0 mm (2172). 100 seed weight was significantly higher in 7.75 mm (36.82 g.) and lower in 6.0 mm (32.80 g.). 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 was maximum in large size seeds compare to small size seeds. These results are in confirmative with Wilenborg *et al* (2005) and Farhoudi (2010) in safflower, Ghorbani (2008) in wheat. The positive association between size and weight of seeds was reported by Debchoudhury *et al.* (1995) in rapeseed, Kumar *et al.* (2005) in Indian mustard and Suma *et al.* (2014) in sesame.

As the screen size increased from 6.00 to 7.75 mm, the per cent seed recovery was decreased (99.09 to 67.72). Thus, the study indicated that, a sieve size of 6.75 mm (Fig. 2) found effective, economical and to be considered as optimum for processing of chickpea *cv*. BGD 103 with more recovery percentage (96.31), with seed quality parameters in acceptable limits of seed standard.

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