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STANDARDIZATION OF SCREEN SIZES FOR GREEN GRAM SEED PROCESSING

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ABSTRACT
Seed grading is the important practice for better crop and also useful in separation of quality seed in a seed lot. In this context the present study on tracing optimum sieve size for size grading, maximum recovery of seeds and seed quality values in green gram *cv.* BGS-9 using oblong/slotted shape sieve of size 2.4, 2.6, 2.8, 3.00 and 3.2 millimeter (mm) size. On the basis of two years data, the results revealed that the 2.4mm sieve recorded high seed recovery (94.81%) than other sieves with seed quality parameters like germination percentage (87.74%), 100 seed weight (4.76), pure live seed (87.97%) and physical purity (98.53%).The recovery of good seed is found to increase to extent of 3.0 to 4.0 per cent. Hence, seeds of Green gram cv. BGS-9 could be size graded with 2.4mm(S) sieves for more seed recovery with Minimum Seed Certification standard (MSCS) for seed approval by Govt. of India.

INTRODUCTION

Pulse is one of the major nutritive food crop of India. India ranks first interms of production, consumption and acreage of pulses. The major constraint in pulse production is the lower productivity per unit area, which as been focused to the use of poor quality seeds for sowing (Anbarsan *et al*., 2015).

In India, presently farmers grow more than a dozen of pulses. Among them chickpea, pigeon pea, urdbean, greengram, lentil, fieldpea, lathyrus are important. Among the kharif/ summer pulse crops, green gram (*Vigna radiata* L.) has special importance in intensive crop production of the country for its short growing period (Ahmed *et al*., 1978). India is the largest producer and consumer of pulses in the world contributing around 25-28% of the total global production. The country grows a variety of pulse crops, such as chickpea, pigeonpea, greengram, blackgram, dry peas and lentils under a wide range of agro-climate conditions. The green plants can also be used as animal feed and its residues have the capacity to improve the physical, chemical and biological properties of soil thus increase the productivity of land. It can also fix atmospheric nitrogen through the symbiotic relationship between the host greengram roots and soil bacteria and thus improves soil fertility.

Seed size is one of the important physical character that improved significantly during domestication of many crop species. It is not only an important primary component of grain yield but also a valuable seed parameter of seedling establishment and crop growth. Seed size is reported to be positively associated with grain yield in several crops.

Of the several factors that influence the emergence ability of the 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 and emergence potential (Dharmalingam and Ramakrishnan, 1978). 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.) Successful crop production depends on the rapid establishment and uniform stand of the crop. To ensure such stand even under adverse condition, high vigour and uniform sized seeds must be planted. Seed size is reported to be positively.

Grading of seed either mechanically or manually adopting the seed morphological features such as size, weight and colour are of regular post harvest management techniques for all crops, as the specifications required for grading vary with crop (Agarwal, 1995). Determination of optimum sieve size is one of the criteria in the Minimum Seed Certification Standard (MSCS) for seed approval by Govt. of India. The sieve size recommended for processing for different crop seeds is differ, under the minimum seed certification standard appear more general and not appropriate for all the new varieties resulting in poor seed recovery (Anonymous, 1998). Thus a study was conducted to standardize the optimum sieve size for processing of green gram cv. BGS-9 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 2013-14. The bulk seeds of Green gram cv. BGS-9 harvested from the crop raised at seed unit, UAS, Raichur during 2013 and 2014 constituted the materials for the study. The collected seeds were tested for seed recovery percentage, germination percentage, physical purity percentage, 100 seed weight (gm). The pre cleaned seeds of green gram cv. BGS-9 were graded with slotted shape sieve of 2.4 mm, 2.6 mm, 2.8 mm, 3.00 mm and 3.2 mm size. 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 (ISTA, 1993), 100 seed weight (ISTA, 1999) 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 8 days the seedlings were evaluated and normal seedlings were counted and expressed in per cent as per ISTA (1999).

The Pure live seed percentage was calculated using following formula:

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

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

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. An Arcsine transformation was used for percentage data.

RESULTS AND DISCUSSION

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 Ambika *et al*. (2014). 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 vigour seeds. Among the different sieve sizes, highly significant variation was observed for almost all the characters under study.

The results of large scale processing of Green gram cv.BGS-9 seeds indicated that the highest seed recovery percentage was observed in 2.4 millimeter (mm) (97.08) and lowest in 3.2 mm (60.64) in 2013; in 2014 highest seed recovery percentage was observed in 2.4 mm (92.55). The pooled data also shows that seed recovery percentage was highest in 2.4 mm (94.81%) to 3.2 mm (64.95 %).

The seed quality parameters of the present study revealed that seed size had positive association with seed weight. The 100 seed weight observed with different sieve size exhibited a reduction with reduction in size of sieve. In both the years 2.4mm recorded lowest 100 seed weight (4.75gm and 4.78) but recovery percentage was higher *i.e.* 97.08 and 92.55 respectively. Under pooled analysis study also 2.4mm recorded lowest 100 seed weight (4.76 gram (gm)) but recovery percentage was highest (94.81) followed by 2.6mm sieve size. The positive association between size and weight of seeds

Table 1: Seed quality as influenced by size of seeds in Greengram/BGS-9

Size grades	2013 Recovery(%)	Physical Purity (%)	Germination (%)	100 seed Weight (gram)	Pure live Seed (%)	2014 Recovery (%)	Physical Purity (%)	Germination (%)	100 seed Weight (gram)	Pure live Seed (%)	Pooled data Recovery (%)	Physical Purity (%)	Germination (%)	100 seed Weight (gram)	Pure live Seed (%)
S1 (2.4mm)	97.08 (80.16)	98.57(83.13)	81.00(64.16)	4.75	79.84(63.33)	92.55(74.17)	98.48(82.79)	94.49(76.66)	4.78	93.05(74.88)	94.81(76.84)	98.53(83.04)	87.74(69.51)	4.76	87.97(68.41)
S2 (2.6mm)	96.73 (79.58)	98.76(83.61)	80.25(63.61)	4.87	79.26(62.92)	92.25(73.84)	98.66(83.31)	94.88(77.26)	4.89	93.61(75.61)	94.49(76.43)	98.71(83.52)	87.57(69.39)	4.88	87.85(68.43)
S3(2.8mm)	91.77 (73.33)	98.92(84.03)	84.00(66.42)	4.92	83.10(65.73)	90.05(71.64)	98.86(83.66)	94.68(76.95)	5.00	93.61(75.61)	90.91(72.47)	98.89(83.98)	89.34(70.97)	4.96	89.46(70.07)
S4(3.00mm)	86.49 (68.43)	99.38(85.48)	85.50(67.62)	5.41	84.97(67.24)	81.15(64.27)	99.36(85.55)	91.00(73.58)	5.43	90.43(72.94)	83.82(66.28)	99.37(85.50)	88.25(70.13)	5.42	88.73(69.64)
S5(3.2mm)	60.64 (51.14)	99.30(85.20)	86.25(68.23)	5.62	85.64(67.77)	69.25(56.33)	99.38(85.43)	91.25(73.48)	5.73	90.68(72.82)	64.95(53.70)	99.34(85.36)	88.75(70.47)	5.68	88.74(69.93)
Treatment	S	S	S	S	S	S	S	NS	S	NS	SS	NS	S	NS	
S.Em+	0.49	0.47	0.67	0.14	0.69	0.38	0.24	2.45	0.11	2.35	0.27	0.33	0.98	0.12	0.99
CD 1%	2.05	1.96	2.79	0.58	2.86	1.57	1.01	10.23	0.45	9.78	1.13	1.38	4.10	0.51	4.12

Figures in parenthesis are arc sine values

was reported by Debchoudhury *et al*. (1995) in rapeseed, Kumar *et al*. (2005) in Indian mustard and Suma *et al*. (2014) in sesame.

The analysis of seed quality in the laboratory, indicated that the parameters like 100-seed weight, seed recovery (%), germination (%), pure live seed (%), decreases significantly with increase in sieve size from 2.4 to 3.2 mm. Increase in germination percentage was observed with increase in seed size. Highest germination percentage was observed in 2.8mm, recorded moderate recovery percentage but 2.4 mm sieve size recorded lowest germination percentage among the treatments but meet the recommended germination percentage and recorded highest recovery percentage, hence selection of highest recovery percentage seed size is efficient. Higher and quicker germination in bigger sized seeds could be due to the presence of higher amount of carbohydrates and other nutrients than in small sized seeds. Similar observations also been recorded in many tropical species. 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*.

Physical purity shows meager difference between different sieve size, however highest physical purity percentage was recorded in sieve size 3mm fallowed by 3.2mm. But pure live seed percentage has non significant difference but highest pure live percentage was recorded in 2.8mm followed by 3.2mm. But 2.4mm sieve size seeds recorded 98.53 physical purity and 87.97 pure live percentage. Similar observations of improved seed recovery and quality have been reported by many workers (Hanumantharaya, 1991 and Ramaiah, 1994).

Thus, the study indicated that, a sieve size of 2.4 mm(S) can be considered as optimum for processing of Green gram cv.BGS-9 seeds for more recovery (94.81%) with seed quality parameters in acceptable limits of seed standards and with an additional seed recovery (3-4%) over the presently recommended sieve size 2.8mm(S).

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