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Research Article

Standardization of Sieve Sizes for Grading of Redgram/TS 3R Seeds

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ABSTRACT

Seed grading is the important practice for better crop establishment and to improve recovery percentage of seeds and also useful in separation of quality seed in a seed lot. In this context the present study was conducted to know the influence of size grading using different sieves of 3.75 mm, 4.00 mm, 4.3 mm, 4.50 mm and 4.75 mm size. The results revealed that seed recovery in 3.75mm sieves was higher than the seeds retained other sieves but the quality of seeds retained in 3.75mm sieves was higher than the Minimum Seed Certification Standard level for germination. Hence, grading of redgram cv., TS 3R size graded with 3.75mm (S) sieve recorded more seed recovery with Minimum Seed Certification standard (MSCS) for seed approval by Govt. of India.

Keywords: *Redgram cv., TS 3R, Grading, sieve size, seed recovery (%), mm- Millimetres.*

INTRODUCTION

Pulses are one of the major nutritive food crops of India. India ranks first in terms production, consumption and acreage of pulses. The major constraint in pulse production is the lower productivity per unit area, which has been focused to the use of poor quality seeds for sowing. In India, presently farmers grow more than a dozen of pulses. Among them chickpea, pigeon pea, urdbean, greengram, lentil, fieldpea, lathyrus are important.

Pigeon pea is second most important pulse crop of India after chickpea which is well balanced nutritionally. It is a multipurpose crop providing food, fodder, feed, fuel, functional utility, forest use and fertilizer in context of sustainable agriculture. It is an excellent source of protein [21.7g /100g], dietary fibres [15.5g /100g], soluble vitamins, minerals and essential amino acids (Gowda et al., 2015). The total area under pigeon pea cultivation during 2014-15 was ~3.9 million hectares producing around 2.81 million tonnes of pigeon pea with an average national productivity of 729 kg/ha (Indiastat, 2015).

Pigeon pea is often cross pollinated crop. It is very difficult to maintain genetic purity of seed at farm level. Therefore, well-organised seed production plan in each agro-climatic zones by involving farmers and other stakeholders is necessary for multiplication and supply of seeds of improved and high yielding varieties to farmers.

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It was observed that in recent past a number of improved varieties of pulses have been released for cultivation. The farmers still use traditional/their own saved and developed varieties of seeds.

Scientific seed production recognizes the importance of seed processing to maintain the physical purity of seeds besides recovery of optimum sized seeds for uniform crop establishment and growth. Seed size is an important parameter of seed vigour as it influences the performance of seed in soil. As per the minimum seed certification standards as mention in the blue book published by central seed committee, they are monitoring the change between 3.25 to 4.00 mm. So that different agency using different sizes based on this they are required by the presently using sieve size *i.e.* 4 mm for grading redgram seed is based on old varieties these sieves are not matching with any of the high yielding varieties which are under cultivation. Present method of grading aims to remove the non-viable seeds so that sound healthy disease free seed of uniform size will be available for sowing, which will give rise to optimum plant population and higher yields. It is often observed that the seed growers are loosing considerable quantity of good seed which is treated as a rejection and considering the huge demand from farmers for certified seed of redgram. Hence the present research on optimum sieve size and type of screen for grading redgram seed was planned and undertaken.

MATERIALS AND METHODS

The experiment was conducted at Seed Unit, University of Agricultural Sciences, Raichur, during the year 2015 and 2016. The bulk seeds of redgram cv. TS 3 R harvested from the crop raised at seed unit, UAS, Raichur during 2015 and 2016 constituted the materials for the study. 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. The graded seeds were tested for seed recovery percentage, germination percentage, physical purity percentage, test weight (g). The pre cleaned seeds of redgram cv. TS 3 R were graded with round shape sieve of 3.75 mm, 4.00 mm, 4.30 mm, 4.50 mm and 4.75 mm size.

Size grading. The bulk seeds were graded with round sieves of size *viz*., 3.75 mm, 4.00 mm, 4.30 mm, 4.50 mm and 4.75 mm. The seeds retained on the sieves were analyzed for seed recovery in percentage and for the seed and seedling quality characters.

Seed recovery (%): The weight of seeds retained in each sieve was recorded and seed recovery was calculated in percentage using the following formula.

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

Test weight (g): Eight replicates of hundred seeds were drawn from each treatment, weighed in sensitive electronic balance and expressed in milligrams (ISTA, 1999).

Germination percentage (%): Four replicates of hundred seeds were tested using between paper method and kept under the test conditions of 25° ± 1°C and 95° ± 3 per cent relative humidity maintained in a germination room illuminated with fluorescent light. After the test period of seven days the normal seedlings were counted and the mean values expressed as percentage (ISTA, 2013) to the total number of seeds placed for germination.

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

Seedling Vigour index: The Vigour index values were computed, adopting the procedure of Abdul Baski and Anderson (1973) as given below and expressed as whole number.

Seedling Vigour index I = Germination (%) x Total seedling length (cm)

Seedling Vigour index II = Germination (%) x seedling dry matter (mg)

Pure live seed percentage: was calculated using following formula:

$$\text{Pure live seed percentage} = \frac{\text{Physical purity (\%)x Germination (\%)}}{100}$$

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. Statistical analysis was done based on the procedure prescribed by Panse and Sukhatme (1999).

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 vigour seeds. Among the different sieve sizes, highly significant variation was observed for almost all the characters under study. The importance of seed size has been reported by Menaka and Balamurugan (2008).

Grading is one of the important post harvest management techniques that homogenize the seed lot resulting in uniform germination with higher planting value (Suma et al., 2014).

The results of large scale processing of redgram cv.TS-3R seeds indicated that the highest seed recovery percentage was observed in 3.75 (mm) (91.63) and lowest in 4.75 mm (48.43). As the screen size decreased from 4.75 to 3.75 mm, the per cent seed recovery was increased (48.43 to 91.65) (Fig 1). This is in conformity with the findings of Kumar et al. (2014) and B. S. Ganiger et al. (2016) in green gram.

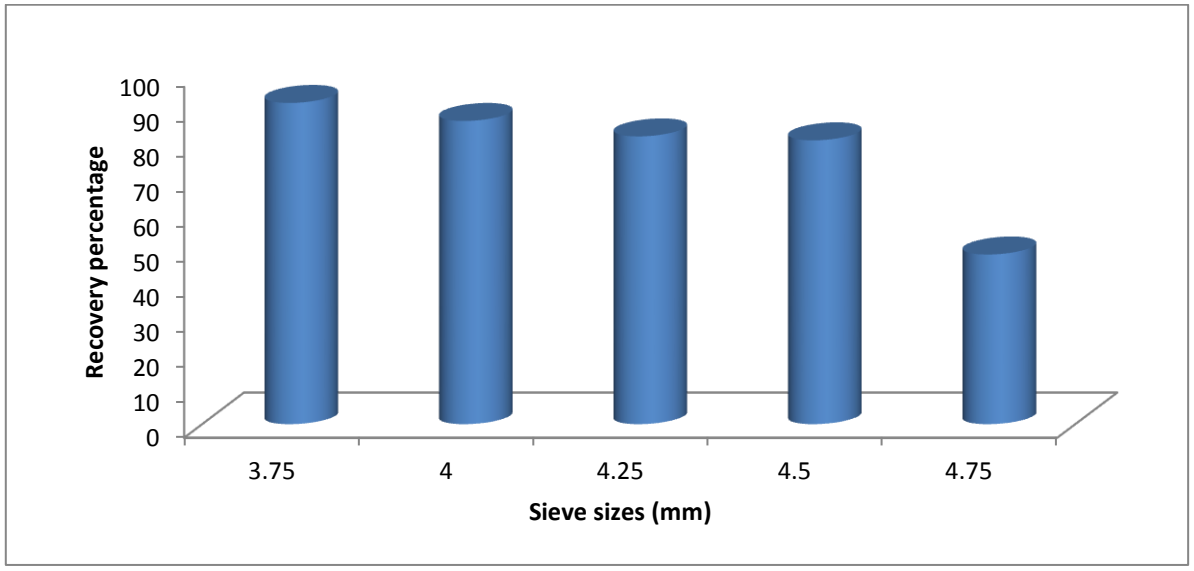

Fig. 1: Influence of size grading on seed recovery (%)

Physical purity and pure live seed percentage recorded non significant difference between different sieve size, however highest physical purity percentage and pure live seed percentage was recorded in sieve size 4.75mm (99.15 and 92.92). Similar observations of improved seed recovery and quality have been reported by many workers (Hanumantharaya, 1991, Ramaiah, 1994 & Ganiger et al. (2016). Germination percentage in all different sieve sizes was greater than 91 and germination values increase by increase in seed size and

they were in the range of 91-94% and there were no significant differences to standard germination test (Fig 2). The seeds retained in 4.75mm sieve recorded highest germination (94%) followed by 4.50mm, 4.30mm, 4.00mm (92%) and 3.75mm recorded (91%) germination percentage which is above the minimum seed certification standards. Jerlin et al. (2004) in pongamia reported a non significant difference in germination between the larger and medium sized seeds. This is in confirmatory with research findings of Gunaga et al. (2007). 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 sugurs (Gurbanov & Berth, 1970).

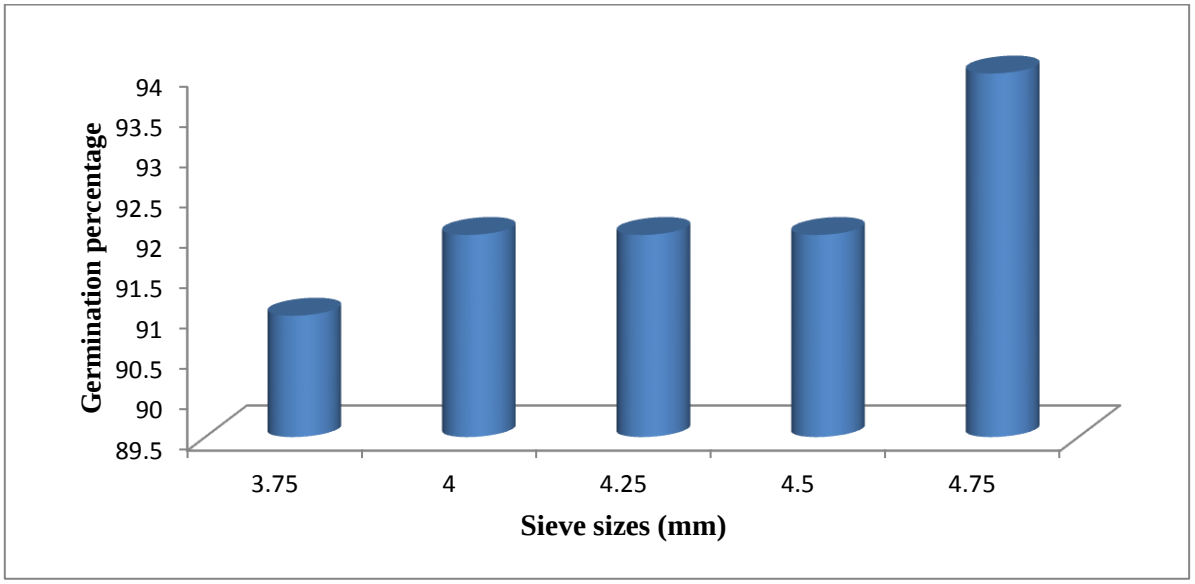

Fig. 2: Influence of size grading on seed germination (%)

The evaluated seed quality characters of the present study revealed that seed size had positive association with seed weight. Test weight observed with different sieve size exhibited a reduction with reduction in size of sieve. The highest test weight was recorded in 4.75mm (13.17g) and least in 3.75mm (11.95g) sieve size seeds. As the size of the seed varies food reserves stored in the seed also varies. The positive association of seed size and seed weight was reported by Sabir-Ahamed et al. (2003) in sunflower, B. S. Ganiger et al. (2016) greengram, Kumar et al. (2005) in Indian mustard and Suma et al. (2014) in sesame.

Seedling vigour index recorded meagre difference between different sieve size seeds and seedling vigour index was highest in 4.75mm and least in 3.75mm sieve size seeds. But Nachimuthu (1997) in gingelly and B. S. Ganiger et al. (2016) in greengram reported that seed size, seed weight and seed quality characters are positively related to each other. All the evaluated vigour parameters exhibited a significant reduction with large, medium, smaller sized seeds. Pollock and Roos (1972) reported that larger seeds possessed more vigour than smaller seeds due to the presence of more of food material. Rajesekaran (2001) in niger also observed that seedling vigour characteristics were positively correlated with seed size and seed weight.

Table. Effect of sieve size on seed quality parameters of Redgram/TS-3R

	2015						2016						Pooled data					
Treatments	Recovery (%)	PP (%)	Germination (%)	100 seed wt. (g)	SVI	PLS (%)	Recovery (%)	PP (%)	Germination (%)	100 seed wt. (g)	SVI	PLS (%)	Recovery (%)	PP (%)	Germination (%)	100 seed wt. (g)	SVI	PLS (%)
(S1) 3.75 mm	**91.90 (73.48)**	**98.10 (74.22)**	**88.25 (69.97)**	**11.49**	**2135**	**86.57 (68.52)**	**91.35 (72.92)**	**98.00 (81.93)**	**93.00 (74.44)**	**12.42**	**3548**	**90.89 (72.56)**	**91.63 (73.21)**	**98.05 (82.01)**	**91.00 (90.50)**	**11.95**	**2842**	**88.78 (70.44)**
(S2) 4.0 mm	86.25 (68.24)	98.26 82.44)	90.00 71.58)	11.83	2280	88.44 (70.13)	86.75 (68.66)	98.54 (83.07)	93.50 (75.36)	12.45	3689	92.13 (73.52)	86.50 (68.46)	98.40 (82.74)	92.00 (91.75)	12.14	2984	90.16 (71.73)
(S3) 4.3 mm	82.25 (65.09)	98.39 (82.71)	90.50 (72.11)	12.01	2394	89.04 (70.72)	81.93 (64.85)	98.55 (83.09)	94.00 (75.84)	12.64	3573	92.64 (74.10)	82.09 (64.95)	98.47 (82.90)	92.00 (92.25)	12.33	2984	90.76 (72.31)
(S4) 4.5 mm	81.25 (64.34)	98.41 (82.77)	90.50 (72.14)	12.05	2397	89.06 (70.77)	80.69 (63.93)	98.58 (83.15)	94.00 (75.02)	12.76	3624	92.66 (74.17)	80.97 (64.05)	96.53 (80.33)	92.00 (92.25)	12.41	3011	90.78 (72.34)
(S5) 4.75mm	45.48 (42.40)	99.11 (84.61)	91.50 (73.23)	12.24	2396	90.69 (72.38)	51.38 (45.79)	99.19 (84.98)	96.00 (78.65)	14.10	3805	95.22 (77.39)	48.43 44.20)	99.15 84.74)	94.00 (93.75)	13.17	3101	92.92 (74.68)
	S	NS	NS	NS	S	NS	S	S	NS	S	NS	S	S	NS	NS	S	NS	S
SEM	0.43	3.53	0.99	0.13	29.41	0.95	0.33	0.36	0.98	0.24	145.48	0.81	0.35	1.27	0.64	0.14	71.02	0.64
CD 1%	1.78	14.73	4.13	0.54	122.55	3.95	1.37	1.51	4.09	1.02	606.24	3.36	1.45	5.29	2.66	0.58	295.97	2.66

CONCLUSION

Thus, the study inferred that, a sieve size of 3.75 mm (R) registered recovery (91.63%), Physical purity (98.05%), germination (91.00%), 100 seed weight (11.95 gm), pure live seed (88.78%) and vigour index (2842) which is above the minimum seed certification standards and with an additional seed recovery of 4-5 per cent over the presently using sieve size of 4.00 mm. Hence the Redgram/TS-3R can be processed using 3.75 mm (R) grading sieve for better seed recovery and quality.

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