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Standardization of Sieve Size for Grading of Olitorius Jute Seeds

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Abstract: An investigation was carried out to find out the optimum sieve size for size grading of seeds of olitorius jute cv. JRO 524 and JRO 8432. Pre cleaned seeds of both the cultivars were size graded using BSS 12×12, BSS 14×14 and 16×16 wire mesh sieves. The jute cv. JRO 524 seeds graded with BSS 16×16 recorded high seed recovery (59.45%) than other sieves used with required germination (96%), seedling length (11.75 cm), drymatter production (7.5 mg/10 seedlings) and vigour index (1132). The same trend was also observed in JRO 8432. Hence, seeds of olitorius jute cv. JRO 524 and JRO 8432 could be size graded using BSS 16×16 sieves for more seed recovery with required seed quality standards.

Key words: Sieves, seed recovery, seed quality, size grades

INTRODUCTION

For a successful crop production, the use of good quality seed is very essential, which increase the yield by 15-20%. The extent of this increase is directly proportional to the quality of seed that is being sown. The seeds of a seed lot may differ by size, weight and density due to production environment and cultivation practices. The objective of seed cleaning is to improve the purity by eliminating non seed material and foreign seed from the seed lot. Apart from seed cleaning, size grading can be useful to assure more uniform germination. Size is a widely accepted measure of seed quality and large seeds have high seeding survival, growth and establishment (Jerlin and Vadivelu, 2004). According to the resource allocation principle, increased investment in seed size results in decreased investments to other functions when resources are limited. The importance of seed size grading in improving physical and physiological quality of the seeds was reported by Sabir-Ahamed (1989) in soybean and Sokolowska *et al.* (1997) in carrot. Suresha *et al.* (2007) reported that in soap nut, the larger size seeds possessed higher percentage (98%) of germination. In canola and wheat, large seeds showed early germination and vigorous plants that are more likely to produce higher yields (CSIRO, 2005). Bicer (2009) stated that in chickpea effect of seed size on yield and 100 seed weight was positive. Stougaard and Xue (2005) opined that 18% of increased yield could be obtained by larger seeds in wheat. Tawaha and Turk (2004) in field pea noted that plants produced from heavier seeds had 100 seed weight that is 12% greater than those produced from lighter seeds. Menaka and Balamurugan (2008) proved that larger seeds of amaranthus possess higher physiological

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quality. With these backgrounds, present study was carried out to find out the optimum sieve size for grading of seeds of jute var JRO 529 and JRO 8432 and its effect on sowing quality of seeds.

MATERIALS AND METHODS

The bulk seeds of olitorius Jute cv. JRO 524 and JRO 8432 harvested from the crop raised at the Seed Centre, TNAU, Coimbatore during 2007-08 constituted the materials for the present study. Pre cleaned seeds of both the cultivars were size graded using BSS 12×12, BSS 14×14 and 16×16 wire mesh sieves. The seeds retained in each of the sieves were weighed and expressed as respective percentage of total quantity of seeds processed. The retained seed of BSS 12×12, BSS 14×14 and BSS 16×16 sieves were denoted as 12×12 (R), 14×14 (R), 16×16 (R) and passed seeds from BSS 16×16 sieves denoted as 16×16 (P). The following determination were made on the above size grades as well as the control (precleaned but not size graded) viz., 100 seed weight (International Seed Testing Association, 1999) was determined by recording the mean of eight replications and expressed in gram. For germination percentage 100 seeds were germinated at the temperature of 25±2°C and 90±2% of relative humidity in four replications. After 5 days the seedlings were evaluated and the normal seedlings produced were counted and expressed in percent as by International Seed Testing Association (1999). From the germinated seedlings, root length (cm), shoot length (cm), dry matter production (mg/10 seedlings) were observed. The vigour index was calculated using the following formula as per Abdul-baki and Anderson (1973) and expressed in whole number:

$$\text{Vigour index (VI)} = \text{Germination (\%)} \times \text{Seedling length (cm)}$$

The results were subjected to analysis of variance and tested for significance according to Panse and Sukatme (1985). Data were analyzed using an Analysis of Variance (ANOVA). Means were separated on the basis of Least Significant Difference (LSD) only if F-test of ANOVA for treatments was significant at the 0.05 or 0.01 probability level. Percentage data were arcsine transformed before analysis.

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. The importance of seed size has been reported by Ramesh (1996) and Menaka and Balamurugan (2008). The seeds retained by BSS 16×16 sieve recorded more recovery in both the varieties 59.45 and 55.16%, respectively than those seeds retained by BSS 12×12 and BSS 14×14 sieves. Menaka and Balamurugan (2008) reported that in amaranthus cv CO5, the seeds retained in BSS 22×22 sieve recorded higher recovery (54%) than those seeds retained by BSS 18×18 and BSS 20×20 sieves. The 100 seed weight showed distinct and consistent decrease with reduction in seed size in both JRO 524 and JRO 8432 jute varieties. The seeds retained by BSS 12×12, 14×14 and 16×16 sieves recorded more weight than by BSS 16×16 passed seeds. Sabir-Ahamed (1989) in soybean, Jerlin (1998) in Pungam reported a positive association between size and weight of seeds.

(a) BSS 16H16 Retained seeds (b) BSS 16H16 Passed seeds

Fig. 1: Germination of size graded seeds using BSS 16×16 sieve in jute cv. 524

Table 1: Seed quality as influenced by size of seeds in jute variety JRO 524

Size grades	Recovery (%)	100 seed weight (g)	Germination (%)	Shoot length (cm)	Root length (cm)	Drymatter production (mg/10 seedlings)	Vigour index
12×12 (R)	4.96	0.277	97	6.74	5.47	8.0	1185
14×14 (R)	31.93	0.223	95	6.57	5.27	7.9	1116
16×16 (R)	59.45	0.176	94	6.47	5.24	7.2	1107
16×16 (P)	3.46	0.137	59	4.87	4.07	4.9	528
Control	-	0.158	85	5.12	4.75	6.6	839
SEd	10	0.012	1.5	0.024	0.035	0.2	50
CD (p = 0.05)	20	0.024	3	0.048	0.07	0.4	100

Table 2: Seed quality as influenced by size of seeds in jute variety JRO 8432

Size grades	Recovery (%)	100 seed weight (g)	Germination (%)	Shoot length (cm)	Root length (cm)	Drymatter production (mg/10 seedlings)	Vigour index
12×12 (R)	2.30	0.292	98	7.17	5.61	8.4	1257
14×14 (R)	38.95	0.193	97	6.47	5.34	7.9	1146
16×16 (R)	55.16	0.160	96	6.44	5.31	7.5	1132
16×16 (P)	3.66	0.126	72	4.74	4.12	5.1	622
Control	-	0.145	83	5.23	4.65	6.8	820
SEd	9.000	0.010	2.000	0.044	0.025	0.300	62.000
CD (p = 0.05)	18.000	0.020	4.000	0.088	0.050	0.600	124.000

The germination increased progressively (Fig. 1a, b) with increasing seed size. In Jute var. JRO 524, the larger seeds retained by BSS 12×12 sieve recorded the highest germination (97%) followed by the seeds retained by BSS 14×14 and 16×16 sieves and ranged between 95 and 94% (Table 1), respectively. Whereas the control seeds recorded 85% of germination. Similar trend was also observed in the Jute var. JRO 8432 (Table 2). This is in conformity with the research findings of Palanisamy and Karivaratharaju (1989) in tomato. The higher germination in large seeds may be due to the higher amount of food reserves and increased activity of redox-enzymes in the seeds helping in breaking down the complex food reserve into simple soluble sugars (Gurbanov and Berth, 1970).

The root length of different grade of seeds differed significantly. The present investigation revealed that the larger seed tends to produce longer roots. In JRO 524 the lengthiest root of 5.47 cm was recorded by the seeds retained in BSS 12×12 sieves followed by the seeds retained in BSS 14×14 and 16×16 sieves. The control seeds recorded the root length of 4.75 cm. In case of JRO 8432, the seeds retained by BSS 12×12, 14×14 and 16×16 recorded the lengthiest root of 5.61, 5.34 and 5.31 cm, respectively. Shoot length of the graded seeds also followed similar trend as that of root length in both varieties.

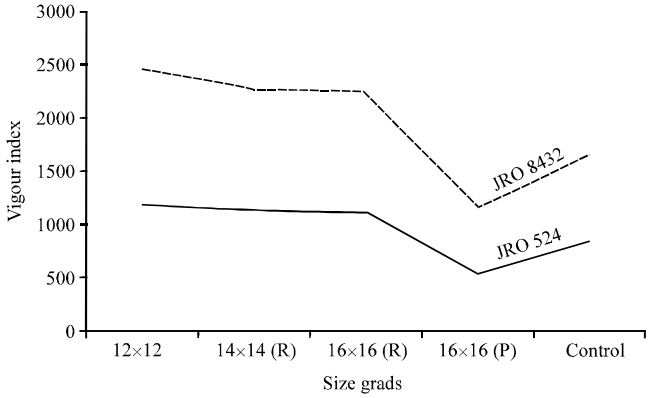

Fig. 2: Vigour index of different size grade seeds in jute varieties. R: Retained seeds, P: Passed seeds

The dry matter production varied significantly between different size of seeds. In the case of JRO 524 jute variety those seedlings produced from the seeds retained in BSS 12×12, BSS 14×14 and BSS 16×16 sieves recorded maximum dry weight and it ranged between 7.2-8.0 mg/10 seedlings. Whereas ungraded bulk seeds (control) recorded 6.6 mg/10 seedlings of drymatter production. The seeds which passed through the BSS 16×16 sieve were found to be inferior in quality and recorded the drymatter production of 4.9 mg/10 seedlings. The similar results also observed in jute variety JRO 8432.

The size of the seeds significantly influenced the vigour of the seeds. The vigour of the seed is directly proportional to the size of the seeds (Fig. 2). In JRO 524, the vigour index value was maximum (1185) in seeds retained in BSS 12×12 sieve and it was 1116 and 1107 in the seeds retained by BSS 14×14 and BSS 16×16 sieves. In the case of control seeds it was 839 whereas in JRO 8432, the seeds retained by 12×12 sieves recorded the highest vigour index value of 1257, followed by the seeds retained in BSS 14×14 and BSS 16×16 which gave the vigour index value of 1146 and 1132, respectively. The seeds passed by BSS 16×16 sieve recorded the lowest vigour index value (622) when compared to control (820) and other size grades. This could be ascribed to the more mature embryo containing adequate nutrient reserves both contributing its physiological stamina or vigour factors residing in it (Pollack and Roos, 1972). The same result also reported by Anuradha *et al.* (2009) and they stated that larger seeds retained on 19/64 round perforated metal sieve recorded the maximum germination and seedling vigour in bengalgram. But in soybean the size had not significant influence on the seed quality and yield potential (Pedersen, 2006).

CONCLUSION

It is concluded that though, the seed quality was high in BSS 12×12 retained seeds, the seed recovery was very low. Since, the seeds graded with BSS 16×16 recorded high seed recovery with required seed quality, it may be recommended for grading of *Olitorius* jute seed.

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