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A Cast Study :

Enhancing the sowing quality of seed by grading in onion (*Allium cepa var. aggregatum*)

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ABSTRACT

Size grading of seeds with BSS 12×12 was optimum for onion cv. COON5. Seed size had positive association with seedling quality characters. Upgrading of size graded seeds using specific gravity separator revealed that selection of heavy and medium seeds under the machine settings of vertical, horizontal slope of 1, 1 and air blow rate of 4 was optimum for onion cv. COON5. The germination improvement of graded seeds was found to be 12 per cent higher than the ungraded seeds. Seedling vigour was also higher in graded seeds.

Key words : Onion, Size grading, Density grading, Seed size, Vertical slope, Horizontal slope, Air blow rate.

In most of the vegetable crops due to longer period of flowering and ripening, earlier formed seeds differed from later formed ones in quality due to exposure to different environmental conditions like air, temperature and moisture stress and also differential supply of the essential nutrients (Ovcharov and Kisilova, 1966) and thus considerable variation in seed size occurred within the same plant (Whalley *et al.*, 1966) necessiating the grading of seeds for quality enhancement. Dharmalingam, (1982) also expressed that the method of grading and processing aims at removing presumably the non-viable seeds and ensure that those final produce were uniform in size and shape. Gregg *et al.* (1970) also opined that seed size is the commonest phenomenon considered for grading the seeds while Paul and Ramaswamy, (1979) and Srimathi *et al.* (2003) stressed that the optimization of sieve size based on the recovery of quality seed is warranted for better economic utility of the seed with good quality.

Size grading uses techniques of separation by width and thickness in which holes with a certain cross section are set in screens or cylinders (e.g. round holes for onion). Ferguson and Turner (1971) reported that grading by size alone was not adequate to remove inferior seeds from seed lot and an efficient method has been warranted based on the filling of seeds, while Tupper *et al.* (1971) opined that seed lot grading based on density was more effective than based on size. Hence, standardization of sieve size and upgrading by using density variations for recently released onion (COOn5) becomes necessary since the seed size varies significantly with genotypes.

MATERIALS AND METHODS

Size grading :

The pre-cleaned seeds were processed using BSS 10x10 and BSS 12x12 hand sieves. The seeds retained on each sieve and those passed through the BSS 12x12 sieves were weighed and the recovery percentage computed to the total seed weight. The graded seeds were tested for quality using the following parameters such as seed recovery,100 seed weight, germination percentage, vigour index and field emergence per cent

Density grading :

Size graded seeds were subjected to specific gravity separator (WESTRUP LA-K No.89036) at 550 rpm. In order to identify the appropriate machine settings, the vertical height (0, 1, 2, and 3), horizontal height (0, 1, 2, and 3) and air blow rate (0, 2, and 4) adjustments were tried in all possible combinations. The experiment was formulated in completely randomized block design with four replications.

The oscillating movement of the table 'walks' the heavy seeds in contact with the deck uphill, while the air floats the light seeds downhill. The seeds traveling to the edge of the table ranged from light at the lower end to heavy at the upper end and discharged into 5 density fractions designated as A,B,C,D and E, where A was the heaviest seed and E was the lightest seed fraction. After grading, the seeds were evaluated for the following

observations such as seed recovery,100 seed weight, germination percentage, speed of germination**,** seedling length, drymatter production, vigour index and field emergence per cent.

RESULTS AND DISCUSSION

Size grading :

In the present investigation, the onion seeds were graded with BSS sieves of size 10x10 and 12x12. The results expressed that the recovery of the seeds was the maximum with 12x12 retained seeds (76 %) followed by the seeds retained in 10x10 (20 %) and only 4 per cent of seeds passed through BSS 12x12 sieve indicating the occurrence of higher quantum of larger size seeds in the seed lot. The test weight observed with different size grades exhibited a rhythmic reduction with reduction in size of the sieve, indicating the positive association exerted on seed weight by seed size in onion. Vijayakumar and Dharmalingam (1988) in onion noted significant differences in 100 seed weight. The seeds retained in BSS 10x10 sieve recorded the highest seed germination (90 %) followed by seeds retained in BSS 12x12 sieve (88 %). However, the seeds passed through BSS 12x12 recorded the lowest seed germination of 61 per cent, which was 20 per cent lesser than the bulk seeds. But the seeds recovered with BSS 10x10 and 12x12 sieves, recorded 8 and 7 per cent, respectively higher germination than the bulk seeds. The higher germination in larger seeds might be due to the higher amount of food reserves (Ashby, 1936) and increased activity of redox-enzyme in the seeds helping in breaking down of the complex food reserve materials into simple soluble sugars (Gurbanov and Berth, 1970). The lower values obtained for smaller seeds could partly be due to the inclusion of higher proportion of shrivelled and immatured seeds resulting from incomplete seed development (Crocker and Barton, 1953). Seed vigour is the stamina of the seed for better performance at field. In the present study, the seed vigour evaluated through seedling characters *viz.,* root length, shoot length and drymatter production observed a positive association with seed size as that of germination and 100 seed weight. The vigour index values were almost at par with seeds retained in BSS 10x10 (1361) and BSS 12x12 (1223) indicating slight variation in seed quality between these sieves. Srimathi and Vanangamudi (1993) also reported that either the germination was influenced with initial capital of seed or not, the vigour was positively influenced by the initial source. Pollack and Roos (1972) also expressed the association of high vigour with large sized seeds due to the occurrence of higher proportion of matured embryo and adequate nutrient reserves for contributing the physiological stamina residing in it.

Thus the study highlighted that in onion seed size and seed quality characters are positively related and grading of seeds through BSS 12x12 improved the seed and seedling quality characters.

Density grading :

Upgrading of size graded seeds using specific gravity separator with different combinations of machine settings *viz.,* 0, 2, 4 ; 1, 1, 4 and 1, 2, 2 levels of vertical, horizontal and air blow rate, respectively, resulted in five grade fractions in which vertical height adjustment level, horizontal height level and air blow rate as 1, 1, 4, respectively was found to be the best which recorded maximum 100 seed weight and germination per cent. In this above adjustment levels, the heavier fractions recorded higher recovery (54.21 %), 100 seed weight (284 mg), germination (92 %), speed of germination (18.8) and vigour index values (1477) than the lighter fractions. Similar results were obtained by Pandita *et al.* (2002) in brinjal, chilli and okra. The other parameters like seedling length and drymatter production were also higher in heavier fractions than ligher fractions as reported by Nascimento (1995) in peas. The higher germination percentage in high density seeds might be due to well developed embryo and good filling of seeds and the efficient utilization of large food reserves for production of energy that expressed through seedling vigour (McDaniel, 1969). From this study, it could be inferred that the heavier fractions of 1, 1, 4 machine settings could be advocated to upgrade the physical and physiological seed quality characters.

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