

## Original Research Article

### Studies on Sieve Size for Grading of Soybean/DSB 21 Seeds

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#### ABSTRACT

The influence of seed size on seed quality parameters were evaluated in soybean *cv.* DSB 21 seeds using 3.75mm, 4.00mm, 4.25mm, 4.5mm and 4.75mm of slotted perforated metal sieves. The study revealed that larger sized seeds are obtained from 4.5mm and 4.75mm sieves with maximum germination and seedling vigour. Seed recovery percentage in 3.75mm sieve was higher than other sieves and also quality of seeds obtained in 3.75mm sieves was higher than the Indian Minimum Seed Certification Standards. The graded seeds obtained from the sieve 3.75 mm recorded the highest recovery (88.90%), physical purity (98.48%), germination (80.00%), 100 seed weight (12.54 g), pure live seed (78.29%) and vigour index (3095). Hence, grading soybean *cv.* DSB 21 cultivar with 3.75mm (s) sieve is more effective and economical than presently recommended 4.0 mm sieve. Using the proposed sieve of 3.75mm the higher recovery of good seed with germination percentage and physical purity percentage above acceptable limits of IMSCS.

#### Keywords

Soybean *cv.*,  
DSB 21,  
Grading, sieve  
size, seed  
recovery (%)

#### Introduction

Soybean is a rich source of protein and oil content together account for 56% of dry soybeans weight (36% protein and 20% fat). One of the major problems encountered in soybean production is lack of good quality seeds. The poor quality seeds maybe due to poor handling of seed during postharvest time lead to poor and erratic field emergence and failure of seedling establishment in the field which subsequently results into low productivity. Use of proper sieves for obtaining maximum seed recovery with higher seed quality is an important objective of seed processing. Though, sieve sizes for soybean processing recommended, many times it needs to be changed with release of new varieties. Sometimes, the production conditions are such that, the seed produced will have varying sizes. If such seeds are

processed with recommended sieves, it may lead to rejection of lot of seeds, which may otherwise be of good quality and vice-versa. Therefore, it is desirable to determine the optimum size of seed that promote better germination, growth, vigour and yield.

The total area under soybean cultivation in India during 2015-16 was 11604.54 thousand ha producing around 8569.80 metric ton of soybean with an average national productivity of 738 kg/ha [Ministry of Agriculture, Government of India, 2015].

Although seed quality is governed by their genetic make-up, the quality of seeds however, is deteriorated during storage period (Barua *et al.*, 2009). Seed size is an important parameter of seed vigour as it

influences the performance of seed in soil. At present the sieve size of 4.0 mm has been suggested by Seed Certification Agency to process the soybean seeds and it is based on old varieties. It is often observed that the seed growers are losing considerable quantity of good seed which is treated as a rejection. Hence the present research on standardisation of optimum sieve size grading of soybean seeds was undertaken.

### **Materials and Methods**

The experiment was conducted at Seed Unit, University of Agricultural Sciences, Raichur, during the year 2015-16. The unconditioned seeds of soybean cv. DSB 21 harvested from the crop raised at seed unit, ARS, Bidar, constituted the material for 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, 100 seed weight (g). The unprocessed seeds of soybean cv. DSB 21 were graded with slotted hole sieve of 3.75 mm, 4.00 mm, 4.25 mm, 4.50 mm and 4.75 mm size. A sieve of 8.0 mm (r) were used as a top screen

### **Size grading**

The seeds were graded with slotted sieves of size *viz.*, 3.75 mm, 4.00 mm, 4.25 mm, 4.50 mm and 4.75 mm. The seeds retained on the sieves were analyzed for seed recovery percentage and for the other seed quality parameters.

### **Seed recovery (%)**

The weight of seeds retained in each sieve was recorded and seed recovery was calculated in percentage using the following formula

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

### **Test weight (100 seed weight in g)**

Four replicates of hundred seeds were drawn from each treatment, weighed in sensitive electronic balance and expressed in grams (ISTA, 1999).

### **Germination (%)**

In the standard germination test four replicates of hundred seeds were placed within two sheets of standard weight of germination paper moistened with deionized water.

The germination paper was rolled and placed upright in a walk in germinator at  $25^{\circ} \pm 1^{\circ}\text{C}$  and  $95\% \pm 3$  per cent relative humidity maintained in a germination room. 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.

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

### **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.

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

### Pure live seed percentage

Was calculated using following formula:

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

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. All percentage data were analysed using data transformed Arcsine square root. Statistical analysis was done based on the procedure prescribed by Panse and Sukhatme (1978).

### Results and Discussion

Non availability of quality seed is one of the major constraints in increasing the productivity of agricultural crops. Seed grading is an integral part of seed production for enhanced planting value. In addition to obtain uniform seed size within a variety, size grading is essential.

Seed size exerted a significant influence on the seed recovery, 100 seed weight, germination (%), seedling vigour index, pure live seed and physical purity (%) (Table). The seed recovery ranged from 67.35 per cent to 88.90 per cent among the size grades. The recovery of larger size seeds (seeds retained on 4.75mm sieve) was 67.35 per cent while the recovery of medium sized seeds retained in 3.75mm sieve was 88.90 per cent. As the screen size decreased from 4.75 to 3.75 mm, the per cent seed recovery was increased (67.35 to 88.90) (Fig 1). This is in conformity with the findings of Anuradha *et al.*, (2009), Kumar *et al.*, (2014) and Ganiger *et al.*, (2016) in green gram.

Physical purity recorded non-significant difference between different sieve size,

however highest physical purity percentage was recorded in sieve size 4.75mm (98.66) followed by 4.5mm (98.56). Pure live seed percentage has non-significant difference but highest pure live seed percentage was recorded in 4.75mm (85.84) followed by 4.5mm (85.26). Similar observations of improved seed recovery and quality have been reported by many workers (Hanumantharaya, 1991, Ramaiah, 1994 and Ganiger *et al.*, (2016).

The evaluated seed quality characters of the present study revealed that seed size had positive association with seed weight, the hundred seed weight observed with different sieve size exhibited a reduction with reduction in size of sieve. The highest hundred seed weight was recorded in 4.75mm (13.43g) and least in 3.75mm (12.54g) sieve size seeds. The positive association of seed size and seed weight was reported by Ganiger *et al.*, (2016) greengram, Kumar *et al.*, (2005) in Indian mustard and Suma *et al.*, (2014) in sesame reported that seed size and seed weight was positively related

### Germination Percentage

Germination percentage in all different sieve sizes was greater than 80 and Germination values increase by increase in seed size and they were in the range of 80-87% and there were significant differences to standard germination test (Fig 2).

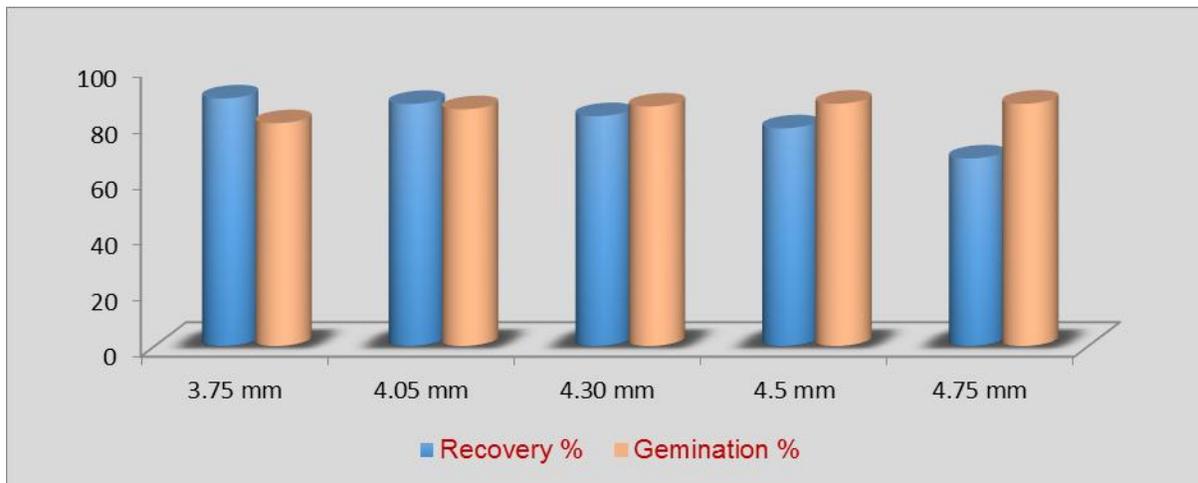
The seeds retained 4.5mm and 4.75mm sieve recorded highest germination (87%) followed by 4.30mm (86%), 4.0 mm (85%) and 3.75mm recorded (80%) germination percentage which is above the minimum seed certification standards. Jerlin *et al.*, (2004) in pongamia reported a non-significant difference in germination between the larger and medium sized seeds.

**Table.1** Effect of sieve size on seed quality of Soyabean/DSB 21

Treatments	Recovery (%)	Physical purity (%)	Germination (%)	100 seed weight (g)	Vigour index	Pure live seed (%)
3.75mm (S1)	88.90 (70.54)	98.48 (82.91)	80.00 (63.10)	12.54	3095	78.29 (62.24)
4.0 mm (S2)	86.90 (68.78)	98.51 (82.99)	85.00 (67.02)	12.70	3355	83.49 (66.03)
4.3 mm (S3)	82.54 (65.30)	98.54 (83.05)	86.00 (67.84)	13.05	3430	84.49 (66.83)
4.5 mm (S4)	78.17 (62.15)	98.56 (83.11)	87.00 (68.48)	13.40	3497	85.26 (67.45)
4.75 mm(S5)	67.35 (55.15)	98.66 (83.37)	87.00 (68.88)	13.43	3656	85.84 (67.91)
SEM+	0.20	0.06	0.61	0.10	60.46	0.58
CD 1%	0.82	0.24	2.55	0.40	251.96	2.43

\*Values in parenthesis indicates the arc sine values

**Fig.1** Influence of size grading on seed recovery (%) and seed germination (%)



This is in confirmatory with research findings of Gunaga *et al.*, (2007). The higher potential of larger and medium sized seeds might due to the initial capital and more amount of nutrients available for germination as stated by Ashby (1936). 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 sugars (Gurbanov and Berth, 1970).

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 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.

Thus, the study inferred that, a sieve size of 3.75 (S) mm registered recovery (88.90%), Physical purity (98.48%), germination (80.00%), 100 seed weight (12.54 gm), pure live seed (62.24%) and vigour index (3095) which is above the minimum seed certification standards. Hence the Soybean/DSB 21 can be processed using 3.75 mm (S) grading sieve for better seed recovery and quality.

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