

## Effectiveness of Specific Gravity Separation and Packaging Material in Enhancing the Planting Value of Onion (*Allium cepa* L.) Seeds

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**ABSTRACT** Onion (*Allium cepa* L.) seed crop (variety Patna Red) was raised in two consecutive years during 2002 and 2003 winter season and the seeds so recovered during summer 2003 and 2004, respectively, were first subjected to screen cleaner-cum-grader and further to specific gravity separator. The seeds so obtained were assessed for seed quality parameters immediately after processing. Thereafter, these were stored in high density polyethylene (HDPE) and cloth bag packaging up to next planting season. The seed quality parameters were also assessed before next planting season. Though screen processed seeds show superiority in the performance of all the seed quality parameters over the unprocessed seeds, yet specific gravity separation showed significant improvement in quality parameters over the performance of screen-processed seeds. Only 6 per cent reduction in seed recovery was observed after specific gravity separation in both the years, but the germination improved by 7 to 10 per cent, physical purity by 3 to 5 per cent, field emergence by 10 to 12 per cent, test weight by 0.08g to 0.06g and vigor index by 221 to 294, in two years of study, respectively. Further the HDPE packaging of these seeds maintained their quality parameters for a period of about 6 months by exhibiting only 3 to 4 per cent loss in germination and field emergence over the fresh initial seed, otherwise, which declined to 32-40 per cent in cloth bag packaging.

**Key words:** Field emergence, HDPE packaging, onion, seed processing, storage

Generally the seeds of various vegetable crops are processed by using air screen grading machines. In these machines the seeds are graded on the basis of their size. These cleaned and graded seeds also contain poor quality seeds. However, further upgradation in seed quality can be obtained by using specific gravity separator, which removes the undesirable seeds like, insect damaged, empty, poorly developed, mouldy and decayed, that are usually similar in size and shape to good seeds but have lower specific gravity. The storage of processed onion seeds in large quantities is also generally practiced in cloth bags at least for one planting season, which also declines the seed quality due to the changes in ambient climatic conditions including temperature and relative humidity. However, the reduction in seed quality

due to these changes can also be controlled if stored in proper packaging material. Otherwise these poor quality seeds, exhibit poor germination with abnormal seedlings that ultimately reflects decrease in crop yields. Thus, the basic objective of the present study was to evaluate the performance of specific gravity separator and packaging material in maintaining the seed quality of onion for longer storage duration.

### MATERIALS AND METHODS

Seed plots of onion variety Patna Red were raised during two consecutive winter seasons of 2002 and 2003 at the Seed Production Farm of CSK HP Krishi Vishvavidyalaya, Palampur, India. Fully mature umbels were harvested at appropriate stage during

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April 2003 and 2004, respectively. These seeds were extracted through stick beating after drying the harvested umbels. These were later cleaned and winnowed. Two kg seed in four replications thrice were first processed on two screen seed cleaner-cum-grader using standard sieve size (Junior Model OSAW, India, make Seed Grader). The processed seed so obtained was fed to laboratory model of specific gravity separator, where three seed grades (light, middle and heavy) were obtained. All the three product samples along with recovered from screen grading, were assessed for recovery per cent, test weight (1000-seed weight), vigor index, germination per cent and physical purity as per ISTA [1]. Seed vigor was computed as suggested by Abdul-Baki and Anderson [2]. All the processed seed categories (screen grader, light, middle and heavy seeds) were stored immediately after processing (May) in two kg packaging of HDPE and cloth bags separately. Before storing in HDPE and cloth bags each, the seed moisture was ensured to be 7 per cent through sun drying. The samples from all these stored packaging were drawn before sowing (October, 2003 and 2004 for the produce of respective years) of each year and assessed for germination per cent, vigor index and field emergence. Field emergence was studied by sowing 100 seeds of each treatment in four replications in the well-prepared seedbed. Seedlings emerged were counted in each replication.

## RESULTS AND DISCUSSION

Screen grading improved physical purity of the seeds by 12.6 per cent, but through specific gravity separator it could further be improved by 3 to 5 per cent i.e. obtained about 99 per cent physical purity of the seeds in the produce of both the years (Table 1). By rejecting the light weight seeds, the recovery after specific gravity separation was reduced over screen graded seeds merely by 6 per cent in both the years. The performance of the seeds recovered in middle and heavy categories was not significant but was significantly superior to screen processed seeds during both the years. Hence the results on middle and heavy seeds have been discussed by combining their performance. Specific gravity separation improved the germination by 7 per cent in year I (2003) and 10 per cent in year II (2004) produce over the screen

graded seeds. Similarly, after specific gravity separation significant improvement in test weight (0.08g and 0.06g), field emergence (10% and 12%) and vigor index (221 and 294) was also observed over the screen-graded seeds during year I and year II, respectively. Thus, all the seed quality parameters along with seed recovery, in middle and heavy seeds put together showed significant improvement over the screened processed seeds. This suggests the urgency of specific gravity separation of the onion seeds in improving their seed quality.

Storage of the seeds in HDPE packaging for six months after harvest showed a decline of 7 per cent and 6 per cent germination in screen processed seeds whereas this decline was 4 per cent and 3 per cent after specific gravity separation in year I and year II respectively. However, the decline in germination was much high in the seeds stored in cloth bags i.e. 35 per cent and 32 per cent in screen processed and 36 per cent and 40 per cent in specific gravity separated seeds in year I and year II, respectively. Similarly, decline in field emergence was high (7% and 10%) in year I and year II, respectively in screen processed seeds than specific gravity separated seeds (3%) in both the years, whereas this decline was about 40 per cent in the seeds stored in cloth bags. The reduction in vigor index was in the same order in both the years. HDPE packaging material proved to be very effective over the cloth bags for storing the onion seeds, since it yielded 28 to 37 per cent more germination, 25 to 38 per cent more field emergence and 395 to 642 vigor index.

It is thus, quite obvious, that by subjecting the low volume and high value seeds of onion to specific gravity separation, though 6 per cent seed recovery is reduced, yet a significant improvement in its seed quality parameters bring them to a category of very high quality seeds. Furthermore, by packing the seeds in HDPE packing, maintains these quality parameters during storage, otherwise which are lost in short storage period of six months in cloth bags.

Size grading have been reported to improve seed quality in several crops [3,4,5]. The results obtained on the processing of onion suggest that screen grading improves seed quality significantly.

Table 1. Effect of screen and specific gravity grading and packaging material on seed recovery and quality of onion seeds

Year	Parameter	Screen grading		Specific gravity separation of processed seed			CD (5%)	Blend of heavy & middling seeds
		Unprocessed	Processed	Light	Middle	Heavy		
<b>2003 Initial fresh seed (April, 2003)</b>								
	Recovery (%)	100	92.4	13.7	47.6	38.7	9.97	86.3
	Test weight (g)	3.39	3.67	3.52	3.72	3.78	0.08	3.75
	Physical purity (%)	82.7	95.3	91.4	98.2	99.1	2.04	98.6
	Germination (%)	76	87	51	94	95	2.11	94.5
	Vigor index	813.2	1078.8	489.6	1250.2	1349.0	98.7	1299.6
	Field Emergence (%)	64	82	32	91	94	6.14	92.5
<b>Stored in HDPE bags (Test at sowing time, October, 2003)</b>								
	Germination (%)	-	80	46	89	92	5.57	90.5
	Vigor index	-	976.0	441.6	1157.0	1288.0	71.4	1222.5
	Field Emergence (%)	-	75	40	88	90	3.62	89.0
<b>Stored in cloth bags (Test at sowing time, October, 2003)</b>								
	Germination (%)	-	52	32	56	61	6.87	58.5
	Vigor index	-	514.8	278.4	677.6	780.8	47.6	729.5
	Field Emergence (%)	-	42	24	52	57	6.12	54.5
<b>2004 Initial fresh seed (April, 2004)</b>								
	Recovery	100.0	89.3	16.7	44.5	38.8	7.92	83.3
	Test weight (g)	3.46	3.63	3.56	3.68	3.70	0.06	3.69
	Physical purity (%)	79.7	93.5	89.2	97.8	99.3	1.87	98.5
	Germination	74	84	46	92	96	4.63	94.0
	Vigor index	703.0	957.6	400.2	1177.6	1324.8	127.7	1251.2
	Field emergence	63	80	38	90	95	9.24	92.5
<b>Stored in HDPE bags (Test at sowing time, October, 2004)</b>								
	Germination	-	78	37	90	93	5.64	91.5
	Vigor index	-	873.6	310.8	1122.4	1236.9	78.4	1179.6
	Field emergence (%)	-	70	30	86	92	7.38	89.0
<b>Stored in cloth bags (Test at sowing time, October, 2004)</b>								
	Germination (%)	-	52	24	51	57	4.74	54.0
	Vigor index	-	478.4	151.2	494.7	581.4	89.3	538.5
	Field emergence (%)	-	45	22	49	53	5.14	51.0

Density grading further upgraded seed quality. Superiority of density grading of seed lots have been well established earlier in some crops [6, 7, 8, 9]. To maintain the seed quality parameters, the use of packaging material, like HDPE, immediately after harvest have earlier been worked and reported by Sharma, *et al.* [10]. Therefore, some high value vegetable crops like onion, where generally germination percentage falls below the MSCS, specific gravity separation and HDPE packaging will be useful in maintaining the seed quality for a longer duration.

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