Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5863

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (5):** 644-648 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Effect of Different Seed Processing Methods on Seed Recovery and Seed Quality of Onion cv. Arka Kalyan

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Received: 11.09.2017 | Revised: 16.10.2017 | Accepted: 18.10.2017

ABSTRACT

India is the largest producer of vegetables from temperate to humid tropics and from sea level to snowline regions. Vegetable play a vital role in the human health and nutritional security of human beings in addition to improve the economy of the farmers. With the rising vegetable consumption within the country, the emphasis laid out to the export of vegetables. Therefore, there is an urgent need to increase the production of vegetables through the use of quality seed. In this context, supply of good quality seed is an important crucial point and it becomes imperative to evolve a strategy to produce quality seeds and make them available in time at a reasonable price to the farming community. Quality seeds can be achieved through better post harvest operations apart from maintaining seed quality by adopting effective principles of seed production. In this regard seed processing is an important segment of seed industry and plays a vital role in improving overall seed quality either for further storage, production or marketing of seeds. Hence an experiment was conducted to study the effect of different seed processing methods on seed quality during 2015-16 and 2016-17. The experiment consisted of eight different treatment combinations of air screen cleaner, specific gravity separator and indent cylinder. The experiment was laid out in Complete Block Design (CBD). The experimental results revealed the significant effect of different seed processing methods. Significantly highest values were recorded for the parameters like seed physical purity (99.58 %), thousand seed weight (4.12 g), seed rejection (18.66 %), seed germination (97.90 %), seedling vigour and less seed recovery (81.34 %) was recorded in combination of all three equipments (P_7) followed by combination of P_1+P_2 (P_4) compared to in ungraded (P_8).

Key words: *Air screen cleaner, Onion, Seed processing, Specific gravity separator*

INTRODUCTION

Onion (*Allium cepa L.*) is one of the major spice bulb crops of the world and India. It has great economic importance due to its medicinal and dietetic values. Onion is a biennial crop. It completes vegetative phase with bulb production in the first year. The bulbs are used as planting material for production of true seed in the second year.

Cite this article: Lamani, K. and Deshpande, V.K., Effect of Different Seed Processing Methods on Seed Recovery and Seed Quality of Onion cv. Arka Kalyan, *Int. J. Pure App. Biosci.* **5(5):** 644-648 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5863

The demands of quality true seeds are increasing day by day and the price of quality seeds is also high. Seed processing is a vital part of the seed production and important segment of seed industry required to move the improved genetic materials of the plant breeder into commercial channels for feeding the rapidly expanding world population. In fact, many seed lots contain weed or crop seed or inert material that make them unfit for sale without processing. Crop seed also frequently have stems, awns, clusters or other structures, which prevent from flowing through the drill freely.

Physical characteristics used to separate seed include size, length, weight, shape, surface texture, colour, affinity for liquids and electrical conductivity. Seed processing can broadly be divided into various steps. As the seed is received into the processing plant, it goes either directly into the cleaning process or into storage to await processing. Drying may be necessary. As processing begins, the first phase (conditioning and pre-cleaning) consists of scalping, debearding, shelling or any other operation necessary to make the seed flow easily. The second phase (cleaning and grading) includes the removal of inert materials, weed seed, other crop seed and broken seed that are larger or smaller than the crop seed and obtain the seed mass in the uniform size range of perforations of top and bottom screen. After the desired purity is obtained, seed enters the final processing phase of separation based on the specific characteristics like length, weight etc and treating and packaging. Processed seed is stored for later sale.

Further, density grading of seed lots can also aid in the up gradation of seed quality. Comprehensive information on upgrading of onion seeds by using density growing will be helpful to the onion seed growers. Keeping these aspects in view, it was considered worthwhile to evaluate the performance of the specific gravity separation for enhancement of seed quality and planting value in onion[7]. Keeping all these above facts in view, the present investigation "effect of different seed processing methods on seed recovery and seed quality of onion cv. Arka Kalyan" was undertaken.

MATERIALS AND METHODS

The experiment was conducted at Seed Processing Unit, Seed Unit, University of Agricultural Sciences, Dharwad, Karnataka state during 2016 and 2017 to study the effect of eight different methods of seed processing involving three equipments either individual or in combination with four replications as detailed in treatment details i.e., P_1: Grading through air screen cleaner, P_2: Specific gravity separator, P_3: Indent cylinder, P_4: Combinations of (P_1+P_2), P_5: Combinations of (P_1+P_3), P_6: Combinations of (P_2+P_3), P_7: Combinations of (P_1+P_2+P_3), P_8: Ungraded *i.e*. bulk control. The laboratory experiment was carried out in Completely Randomized Design (CRD) with four replications.

RESULTS AND DISCUSSION

The data on physical purity (%), thousand seed weight, seed recovery (%), seed rejection (%), and germination (%) of onion cv. Arka Kalyan during the year 2016, 2017 and in pooled over two years due to effect of different seed processing methods are presented in Table (1 to 3). On an average, all physical quality parameters were more in 2017 than in 2016 year, over processing methods.

Irrespective of the processing methods, the pooled results showed the significant variations on physical quality parameters due to the different seed processing methods. Significantly more physical purity (99.58 %), thousand seed weight (4.12 g), seed rejection (18.66 %), seed germination (97.90 %) and optimum seed recovery (81.34 %) was recorded in combination of all three equipments (P_7) followed by combination of P_1+P_2 (P_4) (98.44, 4.01, 16.40, 96.59 and 83.64) Significantly lower physical purity (78.54 %), thousand seed weight (3.07 g), seed rejection (0.80 %), seed germination (81.09 %) and more seed recovery (99.20 %) in ungraded (P_8). Similar

trend was followed during the individual years of 2016 and 2017.

It might be due to air screen cleaner cleaning principle *viz*., aspiration, scalping and grading. The first air system removes the dust and light chaff before the seed reaches the first screen. The first screen allows the good seed to drop onto the second screen. The large foreign materials ride over the first screen and is discarded. The second screen is a grading screen. Along with specific gravity separator, seed of same size and general shape can often be separated because they differ in specific gravity. This difference is very useful in removing light immature seed or heavy sand and rocks to improve the purity and germination of crop seed and Indent cylinder where seed of the same width and thickness can sometimes be separated by taking advantages of difference of length. Indent cylinder can do very precise separation by using length difference. The indented cylinder separator is a rotating almost horizontal cylinder with a movable horizontal separating trough mounted inside it. The similar results recorded in 2016 and 2017-year experiment. Similarly, in studies of *Brachiaria brizantha* seeds processing[4], rice[6], soybean[8], maize[2] and forage radish[5], also predominated as impurities straws, stones, soil clods, weed seeds and immature seeds; but also damaged and attacked seeds by fungi and insects.

In the present study the seed quality improvement due to grading through the combination of equipments [(P_1+P_2+P_3) *i.e.* Air screen cleaner, specific gravity separator and indent cylinder] in seed germination accounted for 21 per cent higher than ungraded seeds. Similar results were also obserbved by Geetarani[3] in onion who also noticed higher seedling vigour index in graded seeds. Mechanical seed processing improves physical purity as well as grade the seed according to size and specific gravity. This also improves test weight, germination and vigour by discarding shrivel, shrunken, diseased, under and over sized and chaffy seeds. The results obtained are in accordance to the work done by Bansal and Lohan[1], in onion and Singh *et al*[9]., in tomato, brinjal and chilli reported the effective advantage of mechanical seed processing.

Table 1: Effect of different processing methods on physical purity and thousand seed weight of onion cv. Arka Kalyan

Treatment	**Physical purity (%)**			**Thousand seed weight (g)**		
Processing methods (P)	**2016**	**2017**	**Pooled**	**2016**	**2017**	**Pooled**
P_1 : Grading through air screen cleaner	92.00	92.78	**92.39**	3.52	3.68	**3.60**
P_2:Specific gravity separator	95.20	95.98	**95.59**	3.66	3.86	**3.76**
P_3 : Indent cylinder	87.20	87.98	**87.59**	3.44	3.59	**3.51**
P_4 : Combinations of (P_1+P_2)	98.05	98.83	**98.44**	3.94	4.09	**4.01**
P_5 : Combinations of (P_1+P_3)	92.20	92.98	**92.59**	3.75	3.92	**3.84**
P_6 : Combinations of (P_2+P_3)	96.45	97.23	**96.84**	3.86	4.01	**3.94**
P_7 : Combinations of (P_1+P_2+P_3)	99.50	99.65	**99.58**	4.04	4.20	**4.12**
P_8 : No grading i.e. bulk (control)	78.85	78.23	**78.54**	3.05	3.56	**3.07**
Mean	**82.16**	**82.63**	**82.40**	**3.25**	**3.43**	**3.32**
S. Em. ±	**1.06**	**1.16**	**1.11**	**0.036**	**0.021**	**0.032**
C. D. (P=0.01)	**2.95**	**3.25**	**3.09**	**0.10**	**0.06**	**0.09**

NS: Non significant

Note: Grading through air screen cleaner (screen aperture size in mm) (top screen 3.80 mm round and bottom screen 2.00 mm round)

Table 2: Effect of different processing methods on seed recovery percentage and seed rejection percentage in onion cv. Arka Kalyan

Treatment	**Seed recovery (%)**			**Seed rejection (%)**		
Processing methods (P)	**2016**	**2017**	**Pooled**	**2016**	**2017**	**Pooled**
P_1:Grading through air screen cleaner	95.40	92.63	**94.01**	4.60	7.38	**5.99**
P_2: Specific gravity separator	91.98	89.13	**90.55**	8.10	10.88	**9.49**
P_3: Indent cylinder	93.43	93.93	**93.68**	6.58	6.58	**6.58**
P_4: Combinations of (P_1+P_2)	85.03	82.25	**83.64**	15.05	17.75	**16.40**
P_5 : Combinations of (P_1+P_3)	90.58	88.65	**89.61**	9.43	11.63	**10.53**
P_6 : Combinations of (P_2+P_3)	90.23	87.75	**88.99**	9.98	12.25	**11.11**
P_7: Combinations of (P_1+P_2+P_3)	81.93	80.75	**81.34**	18.08	19.25	**18.66**
P_8: No grading i.e. bulk	99.20	99.20	**99.20**	0.80	0.80	**0.80**
Mean	**80.86**	**79.36**	**80.11**	**8.07**	**9.61**	**8.84**
S. Em.±	**0.49**	**0.47**	**0.46**	**0.49**	**0.48**	**0.47**
C. D. (P=0.01)	**1.36**	**1.31**	**1.29**	**1.37**	**1.35**	**1.33**

NS: Non significant

Note: Grading through air screen cleaner (screen aperture size in mm) (top screen 3.80 mm round and bottom screen 2.00 mm round)

Table 3: Effect of different processing methods on seed germination and speed of seed germination in onion cv. Arka Kalyan

Treatment	**Seed germination (%)**		
Processing methods (P)	**2016**	**2017**	**Pooled**
P_1 : Grading through air screen cleaner	86.76	87.61	**87.19**
P_2 : Specific gravity separator	89.85	90.70	**90.28**
P_3 : Indent cylinder	85.76	86.61	**86.19**
P_4 : Combinations of (P_1+P_2)	95.74	96.59	**96.16**
P_5 : Combinations of (P_1+P_3)	91.60	92.45	**92.03**
P_6 : Combinations of (P_2+P_3)	93.41	94.26	**93.84**
P_7 : Combinations of (P_1+P_2+P_3)	97.48	98.33	**97.90**
P_8 : No grading i.e. bulk (control)	80.75	81.09	**80.92**
Mean	**80.15**	**80.85**	**80.50**
S. Em.±	**0.66**	**0.63**	**0.64**
C. D. (P=0.01)	**1.84**	**1.77**	**1.79**

NS: Non significant

Note: Grading through air screen cleaner (screen aperture size in mm) (top screen 3.80 mm round and bottom screen 2.00 mm round)

CONCLUSION

Processing study revealed that seed processing through single equipment can't improve overall seed quality, one must use the combinations of different machines after seed threshing. Seed are to be subjected to processing machines for cleaning and grading in a sequence of combination of machines *viz.*, under different machines combinations *viz*., air screen cleaner, specific gravity separator and indent cylinder improves higher percentage of physical purity, germination and other quality parameters with satisfactory seed recovery which was followed by combinations of both air screen cleaner and specific gravity separators.

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