

Effect of Screen Size on Seed Quality in Sunflower

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ABSTRACT Three sunflower varieties viz. SS-56, Morden and EC 68414 were graded with screen size 1.85, 2.50, 2.80 and 4.00 mm (oblong) for different quality parameters. It was observed that screen size 2.50 mm (oblong) gave maximum recovery 90.00, 83.00 and 78.00 per cent, thousand seed weight 44.18, 45.32 and 47.50 g, bulk density 413.7, 414.7 and 405.0 kg/m³, physical purity 99.60, 99.48, 98.97 per cent, germination 87.50, 94.50 and 80.40 per cent (well above seed certification standard) and vigour index 1920, 1875, 1870 for SS-56, Morden and EC 68414 varieties, respectively. Hence, it is recommended that screen size 2.50 (oblong) is best for processing of sunflower seed.

Keywords : Sunflower, seed processing, size grading

Sunflower (*Helianthus annuus* L.) is a major oilseed crop grown in India and its production depends on quality of seed. The use of quality seed is the most essential basic input in crop production as this helps in maintaining required plant population per unit area. Seed processing is one of the method to improve quality of seed. During processing undesired seed and foreign material is removed. Only good quality product is packed as seed for marketing.

The effect of seed size on germination, vigour and yield was studied by many research workers for sunflower [1-5] and for ash gourd [6]. Hence, the present study was carried out to know the effect of screen size on seed quality parameters such as seed recovery, thousand seed weight, bulk density, purity per cent and germination per cent and vigour index for three sunflower genotypes.

MATERIAL AND METHODS

Sunflower seed of three genotypes Morden, SS-56 and EC 68414 were procured from the Director of Farms, Mahatma Phule Krishi Vidyapeeth, Rahuri. Initial moisture content of seed as measured with standard method [7] was 9.5 per cent (w.b.). For each experiment 100 kg of seed of each varieties was processed with the help of screen-cum-grader (Hedia make) having 1.85, 2.50, 2.80, 4.00 mm (oblong) as bottom screen and 4.50 mm (round) as top screen. The samples were collected from the

outlets of the machine for quality analysis. The unprocessed sample of each variety was taken as control. Each experiment was replicated three times. The seed recovery per cent was calculated as a ratio of weight of good seed to the initial weight of sample. Thousand seed weight was measured with the help of analytical balance. Bulk density was measured by standard method [8]. Germination percentage and physical purity was determined as per procedure laid down ISTA [9, 10]. Vigour Index was computed adopting the formula by Mini *et al.* [6]. Completely randomised design was used for statistical analysis [11].

RESULTS AND DISCUSSION

The statistical analysis revealed significant differences among screen size for seed recovery, thousand seed weight, bulk density, physical purity, germination and vigour index.

Seed Recovery : It is seen from Table 1 that recovery per cent is affected by screen size for three varieties under study. By increasing screen size the recovery per cent decreased because all undesirable material, low graded seeds are dropped through screen provenance. The optimum recovery was 90, 83, 78 % for 2.50 mm screen size for SS-56, Morden and EC-68414 varieties, respectively. Anon [12] reported 90.87, 83.15, 78.14 per cent seed recovery with 2.50 mm oblong screen in sunflower and further observed as screen size increases the recovery

Table 1. Effect of screen size on different seed quality parameters of sunflower

Screen size (mm) oblong	Seed recovery (%)	1000 Seed wt (g.)	Bulk density (kg/m ³)	Physical purity (%)	Germination (%)	Vigour index
SS-56						
Unprocessed	100.00 (90.00)	40.00	397.5	99.18 (84.93)	85.50 (67.76)	917
1.85	93.87 (75.76)	41.15	405.0	99.56 (86.23)	92.00(68.22)	1315
2.50	90.00(71.56)	44.18	413.7	99.50 (86.20)	87.50 (69.57)	1920
2.80	81.50(64.52)	42.20	402.5	99.52 (85.91)	88.50 (70.79)	1915
4.00	4.25 (11.86)	42.10	378.7	99.72 (86.72)	86.00 (68.27)	1713
S.E.	0.55	0.40	0.34	0.36	2.24	3.28
L.S.D. P=0.05	1.87	1.50	1.02	1.00	N.S.	1.86
CV.	0.88	0.70	0.84	0.42	3.26	0.78
Morden						
Unprocessed	100.00 (90.00)	38.00	387.5	97.10 (80.38)	95.50 (77.99)	820
1.85	88.00 (69.76)	41.00	408.2	98.76 (83.65)	97.00(80.16)	1211
2.50	83.00 (85.65)	45.32	414.7	99.48 (85.98)	94.50(78.30)	1875
2.80	71.00(57.42)	45.30	408.2	99.71 (86.99)	96.50 (79.50)	1850
4.00	17.00(24.33)	43.12	384.2	99.76. (87.22)	95.50 (77.85)	1769
S.E.	0.56	39.00	0.18	0.59	2.16	3.25
L.S.D. P=0.05	1.68	1.40	0.53	1.77	N.S.	1.30
C.V.	0.90	0.80	0.43	0.69	2.75	0.75
EC 68414						
Unprocessed	100.00 (90.00)	45.00	371.7	95.19 (77.41)	68.00(55.56)	740
1.85	85.25 (67.46)	46.10	395.0	97.97 (82.17)	73.50(59.04)	1850
2.50	78.00 (62.03)	47.50	405.0	98.97 (84.19)	80.40 (63.80)	1870
2.80	76.37 (60.24)	47.30	386.7	99.40 (85.59)	81.00(64.10)	1730
4.00	17.00(24.33)	47.20	374.5	99.50 (86.31)	81.50(64.52)	1740
S.E.	0.42	41.25	0.19	0.72	0.88	0.73
L.S.D. P=0.05	1.28	1.20	0.80	2.17	2.66	1.40
CV.	0.69	0.67	0.51	0.86	1.44	0.75

Figures in parentheses are arc sine values

per cent decreases for SS-56, Morden and EC 68414 varieties, respectively. Aiah *et al.* also reported similar results [13].

Thousand seed weight : Thousand seed weight increased with increasing screen size as compared to unprocessed seed. Maximum seed weight was 44.18, 45.32, 47.50 g for SS-56, Morden and EC-68414 varieties respectively from screen size 2.50 mm. The reason that under sized seed and other weed seed dropped through screen provenances and only over size seed retained on the screen. This over sized seed has more weight than under sized seed because

it has more food material inside the kernel and useful for increasing field emergence index. The field emergence rate index increased with increase in seed size as reported by Ahmed, *et al.* [5] for sunflower. The seed weight is directly related to seed size suggesting higher food reserves in larger heavier seeds in ash gourd [6]. With increase in screen size seed weight also increased in sunflower (1, 2, 3, 4).

Bulk density : The bulk density was maximum 413.7, 414.7, 405.0 kg/m³ for SS-56, Morden and EC-68414 varieties respectively from screen size 2.50 mm. Further increasing screen size from 2.80 to 4.00

mm the bulk density decreased, because the seeds retained on the screen though were large in size but had less weight as compared to undersized seed dropped through screen provenances. The bulk density is directly proportional to mass (weight) and inversely to volume of material. Anon [12] reported that by increasing screen size from 2.80 to 4.00 mm (oblong) the bulk density decreased from 402.5 to 378.7, 408.2 to 382.2 and 386.7 to 374.5 kg/m³ for SS-56, Morden and EC 68414 varieties, respectively.

Physical purity : Physical purity per cent of unprocessed seed of variety EC-68414 was 95.19 per cent which was below seed certification standards (98%) while for SS-56 and Morden it conformed to seed certification standards (Table 1). Whereas physical purity per cent of processed seed increased with increasing screen size for all the three varieties under study and was well above the seed certification standards. The physical purity 99.60, 99.48, 98.97 per cent is optimum for screen size 2.50 mm while correlating with seed recovery for SS-56, Morden and EC-68414 varieties, respectively. Similar correlations of recovery with physical purity was observed by Anon [12] from screen size 2.50 mm for SS-56, Morden and EC-68414 varieties.

Germination : The germination of unprocessed seed of variety EC 68414 was 68 per cent which was below seed certification standard (70%) while for rest two varieties it was above (Table 1). Due to processing, germination per cent improved for all varieties under study. While correlating with bulk density, recovery per cent and physical purity with screen size 2.50 mm the germination was 87.50, 94.50, 80.40 per cent for SS-56, Morden and EC-68414, respectively and was optimum. By increasing screen size germination per cent improved about 13 per cent over to unprocessed seed [12]. Ahmed *et al.* [5] observed that seeds retained on 5.00 mm and above sieves had more than 70% germination but variety wise situation was different in sunflower.

Vigour Index : The vigour Index for unprocessed seed was lowest for all varieties under study (Table 1). The maximum vigour index was observed for screen size 2.50 mm 1920, 1875, 1870 for SS-56, Morden and EC-68414 varieties, respectively and decreased as screen size decreased. Mean field emergence rate index in different seed grades of

Morden variety was maximum (20.30) in highest seed grade (7.0 mm) and gradually lowered down as screen size changes [5].

It can be concluded that screen size 2.50 mm (oblong) has maximum seed recovery per cent, thousand seed weight, bulk density, physical purity per cent, germination per cent and vigour index for all the three varieties. Hence, screen size 2.50 mm is best for processing sunflower varieties while considering seed quality parameters under study.

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