STUDIES ON STANDARDISATION OF SIEVE SIZE FOR PROCESSING OF KBSH-1 HYBRID SUNFLOWER SEEDS

K. Somasekhara, K.T.Krishnegowda, Chikkadevaiah, B.C. Channakeshava
V.P.Kalappa, and K. Seenappa
University of Agricultural Sciences,
GKVK, Bangalore - 560 065 (INDIA)
Fax : 091-080-3330277

SUMMARY

The processed seed yield of KBSH-1, a top yielding sunflower hybrid released from UAS, Bangalore, was poor owing to the poor seed recovery with the presently recommended bottom sieve size of 2.8 mm which is fixed on thumb rule basis. Investigations were therefore conducted during 1994-95 at GKVK Farm Bangalore to standardise the optimum sieve size for higher seed recovery without sacrifising the seed quality. Hybrid sunflower (F_1) seeds produced on the farmer's field during rainy season of 1994 were subjected to large scale processing using different sieve sizes (2.4, 2.6, 2.8, 3.0 and 3.2 mm) at seed processing unit of State Seed Corporation. The seeds recovered were evaluated for their performance in laboratory as well as field conditions. The results revealed that, the seed recovery decreased significantly with increase in sieve size from 2.4 mm (87.5%) to 3.2 mm (31.1%). The presently prescribed sieve size of 2.8 mm recorded a seed recovery of 63.3 per cent as compared to 84.9 per cent with 2.6 mm sieve size. The seed quality parameters like 100-seed weight, husk content and seedling dry matter and vigour index increased significantly with increase in sieve size from 2.4 to 3.2 mm. However, the vigour index between 2.6 mm (2174) and 2.8 mm (2227) sieve size were on par indicating no substantial loss in seed quality due to decreased sieve size up to 2.6 mm.

The field performance data of rainy season of 1995, also confirmed that the commercial grain yield decreased significantly with 2.4 mm (1401 kg/ha) compared to 2.8 mm sieve size, but the differences were on par between 2.6 mm (1477 kg/ha) and 2.8 mm (1597 kg/ha). Higher sieve size beyond 2.8 mm although recorded higher grain yield (1597-1655 kg/ha), the recovery of hybrid seeds was substantially poor (41.4 - 31.1%). The higher grain yield with larger sieve size of above 2.8 mm was mainly due to substantial improvement in seed quality parameters leading to better crop establishment and field performance, in terms of growth and yield parameters as compared to lower sieve size of 2.6 mm which however recorded moderate values, but with higher seed recovery. Thus, a bottom sieve size of 2.6 mm (slotted) can be considered as optimum for processing of KBSH-1 hybrid sunflower seeds with seed quality parameters within acceptable limits and with an additional seed recovery of 21.6 per cent over presently recommended sieve size of 2.8 mm.

INTRODUCTION

Scientific seed production recognizes the importance of seed processing to maintain the physical purity of seeds besides recovery of optimum sized seeds for uniform crop establishment and growth. The influence of seed size on crop growth and production potential has been reviewed comprehensively by Wood *et al.* (1977) and the review inferred that the effect of seed size on crop production still remain ambiguous. It has been the experience of the seed producers of Karnataka State that the recovery of KBSH-1 hybrid sunflower seeds is poor (less than 60%) with the presently prescribed bottom sieve size (2.8 mm slotted) which is fixed on tumb rule basis leading to substantial loss, as the seed size vary with the season and crop management.

Adame *et al.* (1985) observed no significant effect on seed quality parameters due to grading of sunflower seeds. However, several studies conducted in sunflower genotypes have suggested that the optimum sieve size is one that resulted in maximum seed recovery with seed quality parameters within the limits of acceptable standards (Hanumantharaya, 1991; Ramaiah, 1994 and Anon., 1995). Thus a study was conducted to standardize the optimum seive size for processing of KBSH-1 hybrid sunflower seeds on the basis of large scale seed processing.

MATERIAL AND METHODS

KBSH-1 hybrid sunflower seeds produced on the farmers field during rainy season of 1994, was subjected to large scale processing using different sieve sizes (2.4, 2.6, 2.8, 3.0 and 3.2 mm) at seed processing unit of state seed corporation. A quantity of 100 kg seeds were used for processing with each sieve size treatment. The seeds recovered were evaluated for performance in laboratory as well as field conditions. The field experiment was conducted at GKVK farm during rainy season of 1995, using Randomized Block Design (RCBD) with four replications. The soils of the experimental site was represented by red sandy clay loam texture, slightly acidic in soil pH, low in available N, medium in phosphorus and high in potassium. The seasonal conditions were normal during the crop growth period. The crop was raised following 60 x 30 cm spacing with a gross plot size of 5.4 x 3.0 m for each treatment and fertilized with an NPK dose of 63:75:63 kg ha^{-1}. The observations on seed quality parameters were recorded as per the standard procedures of ISTA (Anon., 1985). The vigour index was determined as a product of germination and dry weight of seedling (Abudul Baki and Anderson, 1973).

RESULTS AND DISCUSSION

Effect on seed recovery and quality

The results of large scale processing of KBSH-1 sunflower hybrid seeds indicated that the seed recovery decreased significantly with increase in sieve size from 2.4 mm (87.5%) to 3.2 mm (31.1%). The presently prescribed sieve size of 2.8 mm recorded a seed recovery of 63.3 per cent as compared to 84.9 per cent in 2.6 mm sieve size. The analysis of seed quality in the laboratory, indicated that the parameters like 100-seed weight, husk

content, germination, seedling dry matter and vigour index increased significantly with increase in sieve size from 2.4 to 3.2 mm. However, the vigour indexes between 2.6 mm (2174) and 2.8 mm (2227) sieve sizes were on par, indicating no substantial loss in seed quality due to decrease in sieve size up to 2.6 mm (Table 1). Similar observations of improved seed recovery and quality have been reported by many workers (Hanumantharaya, 1991 and Ramaiah, 1994).

Effect on field performance

The data generated on the field performance of the seeds recovered from different sieve sizes also confirmed that, the grain yield decreased significantly with 2.4 mm (1404 kg/ha) compared to 2.8 mm sieve size, but the differences were on par between 2.6 mm (1477 kg/ha) and 2.8 mm (1597 kg/ha). Larger sieve size beyond 2.8 mm although recorded higher grain yield (1597-1655 kg/ha), the recovery of hybrid seed was substantially poor (41.4-31.1%). The higher grain yield with seed size above 2.8 mm was mainly due to substantial improvement in seed quality parameters, leading to better crop establishment and crop performance in terms of growth and yield parameters as compared to lower sieve size of 2.6 mm, which recorded moderate values but with higher seed recovery (Table 2). The crop raised from medium sized seeds (2.6 mm), although showed an initial set back in the growth, could recover in the subsequent growth phase, through the compensatory mechanism under favorable environmental conditions leading to improved individual plant performance, resulting in grain yield almost comparable to that of larger seed size.

Thus, the study inferred that, a sieve size of 2.6 mm (slotted) can be considered as optimum for processing of KBSH-1 hybrid sunflower seeds with seed quality parameters in acceptable limits of seed standards and with an additional seed recovery of 21.6 per cent over the presently recommended sieve size of 2.8 mm.

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Table 1. Recovery of seeds on processing and seed quality parameters (*in vitro*) of KBSH-1 hybrid sunflower produced during rainy season (1994) as influenced by sieve sizes (bottom screen).

Treatments (sieve size)	Seed recovery* (%)	Seed quality parameters (laboratory performance)						
		100 seed weight (%)	Germi-nation (%)	Dry matter/ seedling (mg)	Vigour index	Husk content (%)	Oil content (%)	Protein content (%)
T_1 : Unprocessed (control)	100.00	4.95	88.30	19.00	1677	22.63	39.20	14.85
T_2 : 2.4 mm (slotted hole)	87.50	5.50	91.00	21.88	1991	22.73	38.80	15.16
T_3 : 2.6 mm (slotted hole)	84.90	5.98	93.50	23.25	2174	22.80	39.10	15.63
T_4 : 2.8 mm (slotted hole)	63.30	6.38	95.30	23.88	2227	23.13	38.80	15.63
T_5 : 3.0 mm (slotted hole)	41.40	6.63	95.50	27.00	2576	23.60	38.50	16.10
T_6 : 3.2 mm (slotted hole)	31.10	7.00	97.30	26.25	2553	24.10	39.20	15.94
S.Em±	0.73	0.08	0.42	0.31	28	0.11	0.30	0.40
CD (P = 0.05)	2.20	0.23	1.26	0.96	85	0.34	NS	NS

* On large scale processing at seed processing unit of Karnataka State Seed Corporation under normal processing standards using HEID, AG Austria Model Processing Machine.

Table 2. Field performance of KBSH-1 hybrid sunflower seeds in terms of growth, yield and economics as influenced by seed sizes during rainy season of 1995.

Treatments	Field germi-nation (%)	Final plant stand (`000/ha)	LAI at flower-ing	Total DM at maturity (g/plant)	Head dia-meter at maturity (cm)	Per cent seed filling	100-seed weigh t (g)	Grain yield		Net return (Rs./ha)	B : C ratio
								Per plant (g)	Per ha. (g)		
T_1 : Unprocessed (control)	81.60	48.60	2.71	121.00	12.70	79.70	4.53	24.50	1177	6244	1.79
T_2 : 2.4 mm (slotted hole)	91.40	50.90	3.01	124.00	14.20	81.30	4.97	27.83	1404	8968	2.14
T_3 : 2.6 mm (slotted hole)	91.20	50.90	3.82	129.67	14.50	81.50	5.13	29.50	1477	9328	2.18
T_4 : 2.8 mm (slotted hole)	92.60	53.20	3.80	132.17	15.20	82.20	5.25	30.17	1597	10778	2.43
T_5 : 3.0 mm (slotted hole)	93.60	53.20	3.95	135.92	16.50	82.80	5.33	31.17	1636	11752	2.49
T_6 : 3.2 mm (slotted hole)	94.70	53.20	4.21	135.00	16.50	83.00	5.37	31.50	1655	11980	2.52
S.Em±	1.04	1.00	0.19	2.70	0.42	0.60	0.04	1.23	77	-	-
CD (P = 0.05)	2.93	2.93	0.54	7.92	1.23	1.80	0.12	3.56	226	-	-