Madras Agric. J. 91 (7-12) : 457-459 July-December 2004
https://doi.org/10.29321/MAJ.10.A00134

Production potential of stored seeds of sunflower hybrids and its parental lines

P. BALAMURUGAN, P. SRIMATHI AND K. SUNDARALINGAM
Department of Seed Science and Technology, Tamil Nadu Agrl. University, Coimbatore- 641 003

Abstract : Studies were made to find the influence of hydration treatment with chemicals along with water for preservation of production potentiality and quality of resultant seeds of sunflower hybrid BSH 1 with its parental lines (CMS 234 A x RHA 274). The study revealed that midstorage correction given to five month old seeds with double the volume of seed to solution ratio for 3h. with p-hydroxy benzoic acid @ 10^{-5} M concentration improved the seed setting of both parents by 10 per cent and the hybrid seed yield by 14 per cent. The resultant seed quality characters were also positively influenced by this treatment.

Key words : Productivity - hybrid - p-hydroxy benzoic acid - resultant seed quality

Introduction

Perry (1977) reported that usage of less vigorous or deteriorated seed would result in economic yield loss. Basu (1976) reported that hydration and dehydration (HDH) treatment could be imposed on stored seed at the juncture of rapid reduction in seed quality characters, to prolong the shelf life of seed for one or two seasons. Hence, studies were made with the stored potential lines (CMS 234 A x RHA 274) for hybrid seed production of BSH 1.

Materials and Methods

The bulk seeds of parental lines of BSH 1 (CMS 234 A and RHA 274) were produced from Agricultural Research Station, Bhavanisagar. The uniformly size graded achenes were stored at Coimbatore and the germination had reduced to 75 per cent after five months of storage. At this stage, both the parental lines were imposed with hydration dehydration treatment with p-hydroxy benzoic acid (10^{-5} M), p-amino benzoic acid (10^{-3} M), sodium phosphate dibasic and monobasic (10^{-4} M), sodium chloride (10^{-3} M) and sodium thiosulphate (10^{-4} M) for 3 h in double the volume of solution. Then, the seeds were dried back to original moisture content of 8-9 per cent.

A field experiment for the evaluation of treatment effects on productivity was conducted during rabi 2000 in Randomised Block Design. The plot size adopted was 5 x 4 m, the treated achenes after subjecting to natural ageing for three months were sown with a spacing of 45 x 30 cm adopting a planting ratio of 3:1, each treatment was replicated thrice. A basal dose of N, P and K was applied @ 30:90:60 kg ha^{-1} before the seed were sown. The crop was top dressed with 30 kg N ha^{-1} after 30 days of sowing. Hand pollination was done during flowering on alternate days. All the recommended agronomic and plant protection measures were carried out as and when required. Ten plants were randomly marked for studying yield attributes in each plot and the mean values were recorded. The field observations on plant height (cm), head diameter (cm), seed filling (%) in both seed and pollen parent and the hybrid seed yield from seed parent was calculated and computed to kg ha^{-1}. After harvest, the achene weight, germination (%) (ISTA, 1999), seedling vigour in terms of root and shoot length, dry matter production and vigour index (Abdul Baki and Anderson, 1973) were observed. The data recorded were statistically scrutinized as per the method proposed by Panse and Sukhatme (1967).

Results and Discussion

The seed yield and plant growth characters expressed highly significant differences due to HDH treatments (Table 1). The treated seeds irrespective of chemicals recorded increase in plant height, head diameter, seed filling and seed yield. Among the chemicals, p-hydroxy benzoic acid (10^{-5} M) registered the maximum increment in head diameter (20%) and seed setting (10%). This treatment registered the maximum hybrid seed yield increase

Table 1. Influence of mid-storage treatments of parental lines on production potential of BSH 1 hybrid seeds

HDH treatments	Seed parent (CMS 234 A)			Pollen parent (RHA 274)			Hybrid seed yield (kg ha^{-1})
	Plant height (cm)	Head diameter (cm)	Seed filling (%)	Plant height (cm)	Head diameter (cm)	Seed filling (%)	
Control	131	12.4	72	114	6.9	69	764
Water	131	13.6	77	117	7.5	71	793
p-hydroxy benzoic acid (10^{-5} M)	139	14.7	82	123	8.5	79	873
p-amino benzoic acid (10^{-3} M)	139	14.0	79	117	8.1	71	817
Sodium phosphate monobasic (10^{-4} M)	131	13.6	78	115	7.9	70	795
Sodium phosphate dibasic (10^{-4} M)	138	14.1	80	120	8.2	74	822
Sodium chloride (10^{-3} M)	128	13.5	74	117	7.9	71	750
Sodium thiosulphate (10^{-4} M)	125	13.1	75	114	7.4	70	735
CD (P=0.05)	2.55	0.38	2.45	3.93	0.63	2.02	35

Table 2. Quality characteristics of resultant achenes raised from stored achenes after HDH treatment

HDH treatments	100 achene weight (g)	Germination (%)	Root length (cm)	Shoot length (cm)	Drymatter production mg seedling^{-1}	Vigour index
Control	3.99	79 (62.75)	15.3	13.3	40.1	3142
Water	4.39	81 (64.36)	17.3	13.8	46.8	3790
p-hydroxy benzoic acid (10^{-5} M)	4.91	89 (70.64)	19.7	15.8	55.8	4886
p-amino benzoic acid (10^{-3} M)	4.78	83 (65.87)	17.5	14.2	47.3	4021
Sodium phosphate monobasic (10^{-4} M)	4.70	82 (65.50)	17.8	14.1	46.9	3997
Sodium phosphate dibasic (10^{-4} M)	4.80	85 (67.63)	18.9	15.1	52.8	4477
Sodium chloride (10^{-3} M)	4.11	80 (63.62)	17.5	14.0	46.1	3680
Sodium thiosulphate (10^{-4} M)	4.06	80 (63.80)	17.1	13.9	46.1	3701
CD (P=0.05)	0.05	2.09	1.15	0.42	3.36	95

(Figures in parentheses indicate arcsine transformation)

r 14 per cent which was followed by sodium hosphate dibasic (10^{-4} M) treatment with 8 per cent ield increase over control. In pollen parent also, imilar improvement was evidenced and the mprovement in seed filling was upto 10 per cent. Basu (1976) also highlighted the beneficial influence f soaking the seeds in chemicals with antioxidant roperty for minimizing the deterioration rate by uenching the free radicals and inturn enhanced the eed quality. Mitra and Basu (1979) also reported hat HDH treatment activate the metabolic changes f the first phase of germination before sowing and hus it had the added advantage of better growth nd assured establishment of the crop in the field. n the present study, the HDH treatment with water lso found to be beneficial registering 5, 9 and 4 er cent improvement in seed filling, head diameter nd seed yield, respectively in seed parent. Similar crease in yield due to HDH treatments by influence f water and other chemicals had been reported by ay (1982) in wheat, Chatterjee and Singh (1983) barely, Geetha (1992) in rice and Basu and Dey (1983) in sunflower. Basu and Dey (1983) reported hat the increased yield might be due to the indirect effect broght about by reduction in the physiological deterioration of seeds.

The beneficial effects of hydration-dehydration treatments reflected increased 100 achene weight, germination and seedling vigour as manifested in root and shoot length, dry matter production and vigour index values (Table 2). Such increase in seed weight derived from the plants of treated achenes was reported by Basu and Dey (1983) in sunflower. Geetha (1992) also had reported increased seed weight, seed recovery, germination and seedling vigour in rice. In the present study, all the treatments improved the quality of the resultant achenes. Among the treatments, p-hydroxy benzoic acid and sodium phosphate dibasic recorded significantly higher values for quality parameters in the resultant achene than the other treatments. The increase in achenes weight, germination and vigour of resultant achenes may be due to increased vigour of the seedlings from the treated achenes in the field. The treatments have contributed in maintaining the energetics of growth, plant height and seed filling through the increased uptake of nutrients and their better utilization for ripening.

Thus, the study revealed that the production potentiality of the BSH 1 hybrid seed could be improved by imposing hydration dehydration treatments of five months stored parental seed with chemicals of antioxidant property. Among them, p-hydroxy benzoic acid (10^{-5} M) followed by sodium phosphate dibasic (10^{-4} M) were found to be the best suited which also found to improve the hybrid seed yield by 14 and 8 per cent, respectively. Simple water hydration dehydration treatment also found to improve the yield by 4 per cent. These treatments were also effective in improving the resultant seed quality characters.

References

Abdul Baki, A.A. and J.D. Anderson. (1973). Vigour determination of soybean seeds by multiple criteria. *Crop Sci.*, **13:** 630-633.

Basu, R.N. (1976). Physico-chemical control of seed deterioration. *Seed Res.*, **4:** 15-23.

Basu, R.N. and G. Dey. (1983). Soaking and drying of stored sunflower seeds for maintaining viability, vigour of seedlings and yield potential. *Indian J. Agric. Sci.*, **53:** 563-569.

Chatterjee, B.N. and A.I. Singh, (1983). Barley production from seeds treated before sowing. *J. Agric. Sci.*, **100:** 235-239.

Geetha, R. (1992). Seed invigouration treatment on production potential and storability of rice (*Oryza sativa* L.) cultivars. M.Sc., (Ag.) Thesis, TNAU, Coimbatore - 3.

ISTA. (1999). International Rules for Seed Testing. *Seed Sci and Technol.*, **21:**25-30.

Mitra, R. and R.N. Basu. (1979). Seed treatment for viability, vigour and productivity of tomato. *Seed Sci. Hort.*, **11:** 365-369.

Panse, V.S. and P.V. Sukhatme, (1967). Statistical method for agricultural workers. ICAR Publications, New Delhi.

Perry, D.A. (1977). A vigour test for seeds of Barley (*Hordeum vulgare*) based on measurement of plumule growth. *Seed Sci. and Technol.*, **5:** 709-719.

Ray, S. L. (1982). Maintenance of vigour, viability and yield potential of stored wheat seed. *Seed Res.*, **10:** 139-142.

(Received: December 2002; Revised: August 2004)