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Enhancing the Seed Longevity of Hybrid Sunflower (KBSH-53) by Coating with Synthetic Polymer Additives

Vijay Kumar[1], Lokesh, G. Y.[2*], Basave Gowda[3], Ganiger B. S.[4] and Rakesh C. Mathad[4]

[1]Assistant Professor, Dept of SST, Agriculture College, Raichur

[2]Junior Breeder, Seed Unit, UAS, Raichur

[3]Special Office (Seeds), UAS, Raichur, and

[4]Assistant Professor (SST), Seed Unit, UAS, Raichur

*Corresponding Author E-mail: lokeshgy@gmail.com

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ABSTRACT

Cultivation of the Sunflower has been increased over years due its wide adoptability to any of the climatic conditions and also importance in the consumption of the oil. The Sunflower hybrid KBSH-53, the seeds are dried to the safe moisture storage, and the seeds are treated with different polymers such as T_o – Untreated control, T_1 – Polymer coating (Polykote @ 3 m1/kg of seed diluted with 5 ml of Water, T_2 - Flowable thiram (Royal flow 40SC) @ 2.4 ml/kg seed, T_3 – Polymer + Flowable thiram (royal flow 40SC) @ 2.4 ml/kg seed and T1 + T2), T_4 – Vitavax 200 (containing thiram 37.5% and Carboxyl, 37.5%) @ 2g/kg of seed and T_5 – Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g/kg of seed. Hybrid seeds are treated with Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g of seed and stored in the HDPE bags has more storage potential than the all other chemicals*

Key words: *Sunflower, Chemicals, Hybrid, Polymers.*

INTRODUCTION

Sunflower (*Helianthus annuus)* is one of the major oil seed crop of the world and the area of the crop is keep on increasing due to its wide adoptability and has been used for the many purposes, among consumption is major because of the more PUFA and also the seeds are very rich in the Vitamin-E. Economic aspects of seed storage period are of considerable significance. The term "longevity" is considered as both, a biological and an economic category. Economic longevity, which defines the period during which the seed preserves the technological and market values, is of primary importance for agricultural production[4]. Viability, a period during which seed can be used for sowing and production depends on its genetic constitution and genotype[13]. Storage conditions and the period of storage have large influence on the quality of sunflower seed. The goal of storing is to provide optimum preservation of physiological and physical characteristics of seed, while poor storage conditions can lead to loss of seed viability[5].

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Indicators of seed vigor (germination energy, germination, and field emergence) determine directly the number of plants per unit area, which is one of the three basic components of yield in the world of plants. Besides, seed quality also affects the rate and uniformity of emergence, and on the dynamics of initial plant growth[3].

The main external factors causing seed damage during storage are the temperature, relative air humidity, and oxygen. Possibility to regulate these factors makes the basis for longer seed storage. Seed deterioration is inexorable and the best that can be done is to control its rate. Many factors contribute to the predisposition for seed deterioration. These include genetics where certain seeds are inherently longer lived than others. Seed structure can also influence seed deterioration. Simple differences in seed size can mean that smaller seeds with a greater surface area to volume ratio are more exposed to uptake of water that would make them prone to deterioration more than larger seeds.

Seed rich in lipids has limited longevity due to its specific chemical composition. During storage of oilseeds declining trend of total oil content and seed germination can be observed. A fatty acid composition is the most important factor which determines oils susceptibility to oxidation[10]. Quality parameters of seed such as oil content, fatty acid composition and protein content are significantly influenced by storage conditions and time[7]. For example, sunflower seed storage demands special care due to high oil content which can easily provoke processes that can lead to loss of germination and viability.

The objective of this research was to determine the effects of storage period, different chemical treatments, and containers on seed germination of sunflower hybrid seeds.

MATERIALS AND METHODS

The experiment was carried out by using the Sunflower hybrid KBSH-53, the seeds are dried to the safe moisture storage, and the seeds are treated with different polymers such as T_o – Untreated control, T_1 – Polymer coating (Polykote @ 3 m1/kg of seed diluted with 5 ml of Water, T_2 - Flowable thiram (Royal flow 40SC) @ 2.4 ml/kg seed, T_3 – Polymer + Flowable thiram (royal flow 40SC) @ 2.4 ml/kg seed and T1 + T2), T_4 – Vitavax 200* (containing thiram 37.5% and Carboxyl, 37.5%) @ 2g/kg of seed and T_5 – Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g of seed for each treatment one kg of hybrid seeds are treated and the same has been divided in to two parts and stored in two different containers one is Gunny bag and HDPE inter owen non fabric bags.

The initial observations are recorded and the same has been stored in room temperature for the further storage studies and all the data are statistically analyzed with the two factor CRD design.

RESULTS AND DISCUSSION

Seed chemistry influences the amount of free water available to seeds that increase deterioration rate. Seeds that possess mucilage around their seed coats such as Salvia under high relative humidity environments would be more likely to transfer that moisture into the seed causing more rapid deterioration. It has been known for a long time that a progressive fragmentation of embryonic nuclear DNA occurs during seed ageing. DNA damage can be due to an uncontrolled degradation following extensive DNA oxidation or to DNA laddering, as is commonly observed in active and genetically controlled programmed cell death (PCD). ROS have been widely cited as being the main factor causing seed ageing during their prolonged storage[12].

Seed rich in lipids has limited longevity due to its specific chemical composition. During storage of oily species declining trend of total oil content and seed germination can be observed. A fatty acid composition is the most important factor which determines oils susceptibility to oxidation[10]. Quality parameters of seed such as oil content, fatty acid composition and protein

content are significantly influenced by storage conditions and time[7]. For example, sunflower seed storage demands special care due to high oil content which can easily provoke processes that can lead to loss of germination and viability. The storage chemical, containers against the different storage periods are presented in the table. In the present experiment the treated hybrid seed are can be stored up to 4 months by using the Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g of seed. The highest germination was recorded in this treatment (92.45%) when compared to the control(79.42 %) and also the vigour and when compared the container when the seeds are store in the HDPE bags are storable up to long time when compared to the gunny bags and also the same results are obtained in the vigour index and also the % infestation was low in the Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g of seed when compared to the other treatments and also the all the observations are statistically significant.

The results are clearly showed that the when the hybrid seeds are treated with Polymer + Vitavax 200* (containing thiram 37.5% and carboxyl, 37.5%) @ 2g of seed and stored in the HDPE bags has more storage potential than the all other chemicals, the germination was almost lost in the control this shows the applicability of that chemical in the storage.

Longevity of seed in storage is influenced by the stored seed quality as well as stored conditions. Irrespective of initial seed quality, unfavourable storage conditions, particularly air temperature and air relative humidity, contribute to accelerating seed deterioration in storage. Hence, it's difficult to assess the effective storage period because the storability of the seed is a function of initial seed quality and the storage conditions[2,6,9]. Intensity of quality decreasing of stored seed is different among plant species and within plant species (genotypic variability), implying considerable influence of genetic (heritable) component on phenotypic expression of traits which determine seed quality[1,8,11]. With the polymer coated seeds were store in the container is giving the good results the declain in the seed quality when compared to the control is significant. The seeds kept in open environment i.e. is control has lost the germination after 4 months of storage (79.42 %) , seed storage container has also paled a very important role because it will not allow the seed moisture to get dried due to this combination the hybrid seeds can be stored in HDPE bags with polymer coating.

Table 1: Standardization seed coating technology with synthetic polymer and additives in Hybrid Sunflower: KBSH-53

S.N.	Treatments	Germination (%)					Field emergence (%)				
		Initial observation	2 months after storage		4 months after storage		Initial observation	2 months after storage		4 months after storage	
			C1	C2	C1	C2		C1	C2	C1	C2
1	**T_0**	97.00	92.0	90.45	89.35	79.42	94.0	**80.00**	**76.46**	**74.33**	**78.66**
2	**T_1**	99.33	96.66	95.66	91.33	82.67	97.0	82.00	78	75.66	74.25
3	**T_2**	96.67	96.00	95.60	80.35	79.43	93.0	82.00	80.00	77.66	81.00
4	**T_3**	96.33	94.25	92.46	90.35	91.25	97.67	91.0	82.00	80.33	80.45
5	**T_4**	98.67	97.00	95.00	89.45	90.45	94.33	87.0	81.0	79.00	85.33
6	**T_5**	98.45	**94.25**	**93.25**	**92.15**	**92.45**	94.33	87.33	83.66	81.66	85.33
	Average	97.11	96.22	95.66	93.56	90.06	95.6	85.00	80.28	83.11	78.11
			Treat	**Container**	**Treat**	**Container**		**Treat**	**Container**	**Treat**	**Container**
	SEm±	NS	0.14	0.58	0.86	1.22	NS	0.36	0.52	0.43	1.73
	CD 1%		1.63	2.31	3.45	4.88		1.47	2.07	1.80	2.45

S.N.	Treatments	Vigour Index					% Infestation				
		Initial observation	2 months after storage		4 months after storage		Initial observation	2 months after storage		4 months after storage	
			C1	C2	C1	C2		C1	C2	C1	C2
1	T_0	3182.67	3080.00	2941.00	2958.00	2807.66	13.33	34.0	43.66	45.33	50.33
2	T_1	3377.67	3358.33	3249.66	3237.66	3121.00	3.33	12.33	18.33	20.00	30.0
3	T_2	3666.33	3127.00	2956.00	2987.66	2839.00	0	2.33	4.33	6.3	8.6
4	T_3	3948.00	3979.66	3818.00	3833.00	3994.33	0	0	0	0.0	0.0
5	T_4	4327.33	3873.33	34.37	3737.00	3304.33	0	0	0	2.66	0.0
6	T_5	4624.67	**4453.00**	**4342.66**	4326.33	4213.66	0	0	0	0.2	0.0
	Average	3853.94	3645.22	2890.28	3457.50	3330	2.78	8.11	0	12.39	15.83
			Treat	Container	Treat	Container		Treat	Container	Treat	Container
	SEm±	445.04	77.52	309.19	77.93	110.24	0.51	0.79	1.11	1.11	4.55
	CD 1%	1058.52	109.64	437.26	77.73	439.66	2.20	3.15	4.46	4.46	6.44

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