INTERNATIONAL JOURNAL OF ADVANCES IN PHARMACY, BIOLOGY AND CHEMISTRY

Research Article

Influence of Seed Pelleting on Seed Quality of Sunflower hybrid seed production of KBSH-53(*Helianthus annus L.*)

Kiran S.P[1], Paramesh R[1], Nishanth G.K[2]*, Channakeshava[1], Niranjana Kumara B[2].

[1]Department of Seed Science and Technology, UAS, GKVK, Bengaluru-65, India.

[2]Department of Genetics and Plant Breeding,UAHS, Shimoga,India-57725

Abstract

A lab experiment on "Influence of seed pelleting on seed quality parameters of sunflower hybrid KBSH-53"(*helianthus annus l.*)wasconducted at Department of Seed Science and Technology, Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bangalore during kharif 2012.The study revealed that seed pelleted nutrients application during crop growth period influenced the seed quality parameters significantly. the seed quality attributes like germination (85.10 %), seedling length (27.15cm),Hundred seed weight(5.80 g),and seedling vigour index-I (2310) and II (5580),seedling dry weight (65.38 mg),lowest pH of seed leachate(5.84),electrical conductivity(387.16 dsm^{-1}),total dehydrogenase activity(0.901),seed density (0.685 g/cc),field emergence(88.00 %) and oil content(37.11 %) were significantly higher with seed pelleted with zinc sulphate(2%) over control and other treatments.

Keywords: sunflower, micronutrients, bio fertilizers and botanicals, quality.

INTRODUCTION

Sunflower (*Helianthus annus L.*) belongs to the family Astreaceae and one of the world's most important sources of vegetable oil. The native of sunflower is reported to be southern parts of USA and Mexico. Sunflower ranks third, next to groundnut and soyabean in the total production. In world it is cultivated on area of 18.12 million hectares with an annual production and productivity of 22.03 million tonnes and 1216 kg per hectare, respectively (Anon.2012).In recent years, India has emerged as second major sunflower producing country in Asia after china. In India, it is being grown in about 0.9 million hectares with annual production of 0.65 million tonnes and productivity of 696 kg per hectare (Anon, 2012).

It has been realized that high quality seed is stepping stone for higher productivity of the crops. In sunflower, seed production is somewhat complicated due to its highly cross pollinated nature demanding

for larger isolation distance to maintain genetic purity of the seed crop. Therefore, need to improve the performance of sunflower seed production in terms of productivity, quality and profitability. Low productivity in sunflower seems to be due to poor seed setting and high per cent of chaffy seeds especially in Centre of capitulum. The major causes for poor seed set is reported to be due to self-incompatibility, absence of pollen vectors, insufficient nutrient supply to the sink, moisture stress etc., during seed development resulting in the occurrence of high percentage of chaffy seeds. To overcome such problems seed treatment is essential, to promote good seedling establishment, to minimize yield loss, to maintain and improve quality and to avoid the spread of harmful organisms the seeds are

treated with micro and macro nutrients, fungicides, insecticides and botanicals besides seed pelleting.

Pelleting improves the chances of successful germination and seedling establishment under field conditions[1] and protect the seed from fungal and insect attack finally contributing to increased seed yield[12] besides economizing the cost of input and reducing the hazards to the environment of spray application[2].With this background the present investigation entitled *"Influence of seed pelleting on seed quality in sunflower (Helianthus annus L.) Hybrid KBSH-53"* is undertaken

MATERIAL AND METHODS

The sunflower crop was raised during Kharif, 2012 (August, 2012 to December, 2012) at plot E-6 of Department of Seed Science and Technology, UAS, GKVK. Bangalore, which is situated at 12º 15′ North latitude and 77º 35′ East longitude and at an altitude of 930 meter above the mean sea level. There were sixteen treatments laid out in factorial randomized block design with three replications. The treatments combinations includes

T_1B_1= Zinc sulphate (2%) + without botanicals and bio fertilizers, **T_1B_2**= Zinc sulphate (2%) +Ash (80g/kg of seed), **T_1B_3**= Zinc sulphate (2%) + Garlic paste (100g/kg of seed),**T_1B_4**= Zinc sulphate (2%) +Azotobacter (150g/kg of seed),**T_1B_5**= Zinc sulphate (2%) +Trichodermaviridae (6g/kg of seed),**T_2B_1**= Boron (0.5%) + without botanicals and bio fertilizers,**T_2B_2**= Boron (0.5%) + Ash (80g/kg of seed),**T_2B_3**= Boron (0.5%) + Garlic paste (100g/kg of seed).,**T_2B_4**= Boron (0.5%) + Azotobacter (150g/kg of seed),**T_2B_5**= Boron (0.5%) +trichodermaviridae (6g/kg of seed),**T_3B_1**= Gouch (3g per kg of seed) + without botanicals and biofertilizers,**T_3B_2**= Gouch (3g per kg of seed) +Ash (80g/kg of seed),**T_3B_3**= Gouch (3g per kg of seed) +Garlic paste (100g/kg of seed).,**T_3B_4**= Gouch (3g per kg of seed) + Azotobacter (150g/kg of seed),**T_3B_5**= Gouch (3g per kg of seed) +Trichodermaviridae (6g/kg of seed),**T_{16}**= Control

RESULTS AND DISCUSSION

Influence of seed pelleted chemical treatment on seed quality of sunflower hybrid KBSH-53

A significant variation in test weight was observed among the treatments (Table no 1). Among the treatments the seed pelleted with zinc sulphate recorded highest test weight (5.38 g) over control (5.05 g). This could be attributed to the efficient metabolism and translocation of carbohydrate by zinc sulphate nutrition. Similar results were obtained by Devandrappa[3] (1989), Uppar and Kulakarni[13] (1989).

Significant variations in electrical conductivity were observed among the treatments (Table no 1). The seed pelleted with zinc sulphate recorded lowest electrical conductivity (374.74 dsm^{-1}) compared to other treatments. Control (un pelleted seeds) recorded highest electrical conductivity (399.04dsm^{-1}).This might be due direct influence of zinc on the quantity of auxin production, which in turn enabled to produce quality seed with better germination and vigour (Singh *et al*., 1996)[11] and similar results were observed in (Simon,1974)[10].

The resultant seeds of seed pelleting were significantly superior over control (un pelleted seeds) in terms of germination (Table no 1). The seed pelleted with zinc sulphate recorded highest germination (85.10 %) compared to other treatments. Control (un pelleted seeds) recorded lowest germination (81.67 %).These results are in agreement with the findings of Patil *et al.* (2006)[6] and Vasu devan et al. (1997)[14] in sunflower.

Seed pelleted with zinc sulphate were recorded significantly superior on root length (17.10 cm), shoot length (10.50 cm) and seedling length (27.15 cm) compared to other treatment (Table no 1). Control (un pelleted seeds) recorded lowest root length (14.23 cm), shoot length (9.20 cm) and seedling length (23.43 cm).This could be due to amount of stored food material, which reflects in higher test weight. This gives an indication that the seed had higher reserve food material as compared to control.

Seedling dry weight and seed density were significantly observed among the treatments (Table no 1,2). Seed pelleted with zinc sulphate recorded highest seedling dry weight and seed density (65.58 mg, 0.685 g/cc) over control (59.35 mg, 0.610 g/cc).These results are in agreement with the findings of Patil *et al.* (2006)[6] and Vasu devan et al. (1997)[14] in sunflower.

Field emergences percentages were significantly superior observed among the treatments (Table no 2). The seed pelleted with zinc sulphate recorded highest field emergence percentage (88.00%) compared to other treatments. Control (un pelleted seeds) recorded lowest field emergence (83.33 %) compared to other treatments. This could be due to activation of physiological and biochemical process in seed by zinc sulphate. Similar observations were made by Sarkar*et al.* (1998)[9] in sunflower.

Seed pelleted with zinc sulphate was recorded significantly superior on Tetrazolium dehydrogenase activity (0.901) compared to other treatments (Table no 2). Control (un pelleted seeds) recorded lowest (0.840) Tetrazolium dehydrogenase activity. Similar results were reported by Prabhuraj (1993)[7],

Vasudevan *et al.* (1997)[14] and Sarkar *et al.* (1998)[9] in sunflower.

Seedling vigour index-1(SVI-I) differed significantly among the treatments (Table no 1). The seed pelleted with zinc sulphate recorded highest seedling vigour index-I (2310) compared to other treatments. Control (un pelleted seeds) recorded lowest seedling vigour index-I (19.13).this may be due to increase in seedling length which in turn is attributed to the presence of higher amount of stored material, is reflected in higher test weight. This gives an indication that the seeds had higher reserve food material food material as compared to control.

Seedling vigour index-II (SVI-II) differed significantly among the treatments (table no 1). The seed pelleted with zinc sulphate recorded highest seedling vigour index-II (5580) compared to other treatments. Control (un pelleted) seeds recorded lowest (4847) seedling vigour index-II.this may due to increase in seedling dry weight. Similar results were observed in Patil *et al.* (2006)[6], Vasudevan *et al.* (1997)[14] in sunflower.

Table 1: Influence of seed pelleting on seed quality parameters of Sunflower F_1 hybrid-KBSH-53

Treatments	Germination (%)	Mean shoot length (cm)	Mean root length (cm)	Hundred seed weight (g)	Mean Seedling Length(cm)	Mean seedling dry weight (mg)	SVI-I	SVI-II	pH
Chemicals (T)									
T_1: Zinc sulphate (2%),	85.10	10.50	17.10	5.80	27.15	65.58	2310	5580	5.84
T_2: Boron (0.5%),	84.50	10.20	15.20	5.27	25.45	61.34	2150	5183	5.92
T_3: Gouch (5g per kg of seed)	84.40	9.98	15.01	5.16	24.95	62.80	2105	5300	6.21
S Em±	**0.63**	**0.08**	**0.14**	**0.04**	**0.25**	**0.46**	**28.52**	**49.13**	**0.09**
CD (P=0.05)	**1.83**	**0.23**	**0.42**	**0.12**	**0.72**	**1.35**	**82.38**	**142.28**	**0.26**
Botanicals and bio fertilizers (B)									
B_1: Without botanicals,	86.71	10.62	18.53	5.41	29.07	65.59	2520	5687	5.80
B_2: Ash (80 g per kg of seed),	85.33	10.32	17.00	5.20	27.37	63.79	2335	5443	5.96
B_3: Garlic paste (100 g per kg of seed)	86.11	10.14	17.34	5.25	27.49	63.85	2367	5498	6.06
B_4: Azotobacter (150 g per kg 0f seed)	85.00	9.67	16.06	5.23	25.74	62.99	2188	5354	6.14
B_5: Trichodermaviridae (6 g per kg of seed)	85.11	10.37	16.92	5.28	27.30	62.47	2323	5316	5.98
S Em±	**0.81**	**0.10**	**0.18**	**0.05**	**0.32**	**0.60**	**36.82**	**63.43**	**0.11**
CD (P=0.05)	**NS**	**0.30**	**0.54**	**NS**	**0.93**	**1.74**	**106.35**	**183.68**	**NS**
Interactions (TXB)									
T_1B_1	88.49	11.00	19.93	5.69	30.93	68.65	2736	6074	5.48
T_1B_2	88.00	10.80	17.93	5.21	28.76	66.60	2530	5860	5.94
T_1B_3	86.67	10.27	17.33	5.29	27.59	65.85	2391	5706	5.98
T_1B_4	86.67	9.90	16.76	5.38	26.66	64.40	2310	5580	5.88
T_1B_5	84.00	10.57	17.57	5.37	28.14	61.59	2363	5173	5.93
T_2B_1	87.33	10.70	17.80	5.47	28.50	66.42	2488	5800	5.64
T_2B_2	83.33	10.37	16.27	5.27	26.64	60.15	2219	5012	6.00
T_2B_3	86.00	9.90	17.84	5.28	27.74	62.13	2385	5343	6.10
T_2B_4	85.00	9.67	15.63	5.17	25.30	60.98	2150	5183	6.23
T_2B_5	86.33	10.37	16.63	5.20	27.00	64.50	2330	5568	5.63
T_3B_1	83.33	10.18	17.87	5.08	28.05	62.24	2337	5186	6.28
T_3B_2	84.67	9.80	16.80	5.13	26.65	64.45	2256	5457	5.95
T_3B_3	85.67	10.27	16.87	5.19	27.14	63.57	2325	5466	6.12
T_3B_4	83.33	9.47	15.80	5.15	25.27	63.61	2105	5300	6.33
T_3B_5	85.00	10.20	16.57	5.28	26.79	61.28	2277	5208	6.39
S Em±	**1.42**	**0.18**	**0.32**	**0.09**	**0.56**	**1.04**	**63.78**	**109.86**	**0.20**
CD (P=0.05)	**NS**	**NS**	**0.94**	**NS**	**NS**	**3.02**	**184.22**	**318.15**	**NS**
Control (un pelleted)	81.67	9.20	14.23	5.05	23.43	59.35	1913	4847	6.43
CV (%)	**2.88**	**3.10**	**3.32**	**3.24**	**3.57**	**2.85**	**4.76**	**3.49**	**5.94**

Table 2: Influence of seed pelleting on seed quality parameters of Sunflower F_1 hybrid-KBSH-53

Treatments	Electrical conductivity (dsm^{-1})	TDH Activity (A_{480})	Seed density (g/cc)	Moisture content (%)	Field emergence (%),	Oil content (%)
Chemicals (T)						
T_1: Zinc sulphate (2%),	374.74	0.901	0.685	8.50	88.00	37.11
T_2: Boron (0.5%),	385.52	0.878	0.668	8.75	87.26	36.93
T_3: Gouch (5g per kg of seed)	387.16	0.866	0.657	8.67	86.60	36.69
S Em±	**2.73**	**0.006**	**0.007**	**0.07**	**0.35**	**0.18**
CD (P=0.05)	**7.90**	**0.01**	**0.02**	**NS**	**1.01**	**NS**
Botanicals and bio fertilizers (B)						
B_1: Without botanicals,	373.21	0.914	0.681	8.50	87.88	37.22
B_2: Ash (80 g per kg of seed),	385.03	0.860	0.660	8.57	86.77	36.52
B_3: Garlic paste (100 g per kg of seed)	375.55	0.874	0.663	8.67	87.33	36.93
B_4: Azotobacter (150 g per kg 0f seed)	384.78	0.884	0.677	8.70	86.88	36.72
B_5: Trichodermaviridae (6 g per kg of seed)	393.80	0.876	0.669	8.75	87.55	37.06
S Em±	**3.53**	**0.008**	**0.01**	**0.09**	**0.45**	**0.24**
CD (P=0.05)	**10.21**	**0.02**	**NS**	**NS**	**NS**	**NS**
Interactions (TXB)						
T_1B_1	356.52	0.942	0.703	8.07	90.67	37.91
T_1B_2	366.60	0.871	0.685	8.25	88.33	36.81
T_1B_3	371.72	0.880	0.690	8.62	87.33	36.92
T_1B_4	387.71	0.925	0.682	8.89	86.33	37.38
T_1B_5	391.45	0.890	0.693	8.71	87.33	36.87
T_2B_1	367.12	0.911	0.671	8.69	88.00	37.15
T_2B_2	394.41	0.868	0.652	8.85	86.00	36.61
T_2B_3	383.15	0.880	0.681	8.90	87.33	37.06
T_2B_4	387.79	0.872	0.691	8.46	87.67	35.95
T_2B_5	395.16	0.860	0.652	8.85	87.33	37.88
T_3B_1	395.67	0.891	0.620	8.75	85.00	36.04
T_3B_2	394.09	0.853	0.653	8.64	86.00	36.15
T_3B_3	372.41	0.876	0.681	8.49	87.33	37.50
T_3B_4	378.86	0.861	0.663	8.78	86.67	36.83
T_3B_5	394.81	0.880	0.674	8.72	88.00	36.75
S Em±	**6.12**	**0.01**	**0.01**	**0.17**	**0.78**	**0.42**
CD (P=0.05)	**17.68**	**NS**	**Ns**	**NS**	**2.26**	**NS**
Control (un pelleted)	399.04	0.846	0.610	8.99	83.33	36.05
CV (%)	**2.76**	**3.04**	**4.50**	**3.44**	**1.56**	**1.99**

Oil content of seed were differed significantly among the treatments (Table no 2). The seed pelleted with zinc sulphate recorded highest oil content percentage (37.11 %) compared to other treatments. Control (un pelleted seeds) recorded lowest oil percentage (36.05 %).The role of boron and zinc application in improving oil content percentage was a well-established phenomenon, application of sulphur plus iron and zinc as foliar spray recorded highest oil content in safflower (Ravi et al., 2008)[8].zinc and iron are involved in the synthesis of oil plant in plant and also enzyme activity in plant cell. These findings are in agreement with Narsireddy and Madan Mohan Reddy (1993)[5].

Influence of chemicals, botanicals and bio fertilizers on seed quality of sunflower hybrid KBSH-53

Among Botanicals and bio fertilizers treatments, without botanicals and bio fertilizers ($B_{1)}$ shows significant effect on root length (18.53 cm). Shoot length(10.62 cm), seedling length(29.07 cm),

seedling dry weight(65.59mg),TDH(0.914),oil content(37.22 %), Electrical conductivity(373.21 dsm^{-1}), seedling vigour undex-1(2520) and vigour index-II(5687) over control, followed by ash pelleted seed, garlic paste pelleted seeds(Table no 1,2).

Among Botanicals and bio fertilizer treatments showed non-significant effect on germination percentage, moisture content, field emergence percentage, test weight, seed density, pH.

Among interaction effects, zinc sulphate without botanicals and bio fertilizers($T_1B_{1)}$ shows significant effect on field emergence percentage(90.67 %),root length(18.53 cm),),seedling length(30.93 cm),seedling dry weight (68.65mg), pH (5.48), EC (374.74dsm^{-1}), moisture content (8.07%), vigour index-I (2736), vigour index-II (6074) over control (83.33%, 14.23 cm, 9.20cm, 23.43cm, 59.35mg, 6.26, 399.04 dsm^{-1}, 8.99%, 1943, 4847) respectively obtained. Similar results were observed in Patil *et al.* (2006)[6], Vasudevan*et al.* (1997)[14] in sunflower. Interaction effects were non-significant in germination percentage, test weight, shoot length, seedling length, seed density, TDH(Table no1,2).

REFERENCES

1. Bharathi A, Nateshan P, Vanangamudi K, Sherin PS, Ramya,M. and Thangavel P, 2003,Conceptual and utility differences among seed enhancement technologies viz.,seed pelleting, seed coating and seed colouring.ICAR short course on Seed Hardening and Pelleting Technologies for Rainfed/Garden Land Ecosystems, May 27-june 5,Tamil Nadu Agricultural University,Coimbatore,p-131
2. Bilie TS. and Edward, M., 1980, Arial sowing of coated seeds. Agritrade, December, pp.45-46
3. Devendrappa KJ, 1989, Studied on seed filling and seed yield of sunflower varieties with growth regulator spray and hand pollination.M.Sc. (Agri) thesis, University of Agricultural sciences, Dharwad, Karnataka, India.
4. Krishnasamy V, 2003, Seed pelleting principles and practices. ICAR Short Courses On Seed Hardening And Pelleting Technologies For Rainfed/Garden Ecosystem, May 27-June 5 Tamil nadu agricultural university, Coimbatore, p.96
5. Narsi Reddy, C.H. and Madan Mohan Reddy, T. Response to phosphorus and sulphur fertilization in sulphur fertilization in sunflower. j.Res.APAU,1993; 21:235-236
6. Patil SB,Vyakarannahal BS, Deshpande VK. and Shekargouda M. Effect of boron and zinc application on seed yield and quality of sunflower restorer line, RHA-857.Karnataka J.Agric. Sci.,2006;19(3):708-710.
7. Prabhuraj DK, Badiger MK and Manure GR. Growth and yield of sunflower (Helianthus annus L.)as influenced by levels of phosphroussulphur and zinc. Indian J.Agron.1993;38(3):427-430.
8. Ravi S, Channal HT, Hebsur NS, Patil BN and Dharmatti PR. Effect of sulphur, zinc and iron nutrition on growth, yield nutrient uptake and quality of safflower (carthamustinctorius l.).Karnataka J.Agric., 2008;2(3):382-385
9. Sarkar RK, Sasmal TK, Chakraborty AA. and Bala B. Effect of micronutrient on physiological parameters in relation to yield of sunflower (Helianthus annus L.) in rice fallow gangetic alluvial soil. Indian Journal of Agricultural sciences, 1998;68:238-240.
10. Simon EW. Phospholipids and plant membrane permeability. News Physiol., (USSR), 1974;5(5):393-420
11. Singh Raghbir, Sharma RK and Singh Mohinder. Effect of P, Zn, Fe, Caco3 and farmyard manure application on yield and quality of sunflower (Helianthus annus L.).Annals of biology Ludhiana,1996;12(2):203-208
12. Taylor AG and Eckendrode CJ. Seed coating technologies to apply trigard for the control of onion maggot and to reduce pesticide application.in: Efforts Pertinent to the Integrated Pest Management at Cornell University.NYS IPM Publication, 1993;117:73-78
13. Uppar A and Kulakarni SS 1989. Effect of growth retardant on the growth physiology and yield potential in sunflower. MSc. (Agri) thesis, University of Agricultural Sciences, Dharwad, Karnataka, India.
14. Vasudevan SN, Virupakshppa K. and Bhaskar S. Yield and yield Effect of boron components of sunflower cultivars as influenced by seasons.J.Oilseeds Res1997;14:216-220.