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Influence of Organics on Quality Attributes of Safflower (*Carthamus tinctorius* L.) Seeds

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Abstract

Safflower (*Carthamus tinctorius* L.) is one of the oldest oilseed crops commercially grown for edible oil extracted from seeds.Seed priming is one of theuseful approach for improving seed germination and seedling growth in crop plants. The objective of this study was to evaluate the effect of different organics through seed priming on seed germination and quality of safflower.The experiment was laid out in Completely Randomized Design with sixteen organic treatments. Theresults revealed that, the seed primingwithBeejamrutha (100 %) for 12 h (T_6) recorded significantly highest seed quality parameters *viz*., seed germination per cent (96.97), shoot length (11.49 cm), root length (13.36 cm), seedling length (24.85 cm), seedling dry weight (230.30 mg), seedling vigour index I and II (24010 and 22334) compared to control (83.44 %, 8.64 cm, 8.86 cm, 17.50 cm, 109.97 mg, 1462 and 9184, respectively).

Keywords : *Safflower, seed priming, seed quality, beejamrutha and organics.*

Introduction

Safflower (*Carthamus tinctorius* L.) is a important oilseed crop. In India it is most commonly known as *karda*inmarathi and *kusum*in hindi and *kusube* in kannada. Among the 25 species of *Carthamus,* only *Carthamust inctorius* is the cultivated one. It is a highly branched, herbaceous, thistle like annual plant. These are 30 to 150 cm tall with globular flower heads having yellow, orange or red flowers (1). Traditionally, safflower has been grown for centuries from China to the Mediterranean region and all along the Nile valley up to Ethiopia (2). But, its area and production around the world have witnessed wide fluctuations in the past. It is a multipurpose crop and has been grown for centuries in India for high quality edible oil rich in linoleic (71-75%) or oleic (16-20%) acid which reduces the low-density lipoprotein (LDL; bad cholesterol) without affecting high-density lipoprotein (HDL; good cholesterol) in blood (3).

Organic agriculture has a greater scope of minimizing all forms of pollutants and brings sustainability. This practice gives a very low adverse effect to the economy; Sustainable agriculture can contribute significantly to rural vitality by increasing the area under such practices; double the income of the family compared to conventional practices (4). It is very cost effective and brings premium return on organic products. Under the present situation of available varieties, achievable yield potential and price structure it does not appear that safflower can be a very popular crop in India under high-input conditions. It can however, be grown profitably under rainfed conditions by applying selected low-value inputs like beejamrutha, jeevamrutha, *Pseudomonas fluorescenceetc* without application of insecticides or pesticides with little or no loss of seed yield and seed quality parameters (5).

Among the indigenous technologies used by farmers, use of Beejamrutha and jeevamrutha has been given importance sinceage old days. Beejamrutha, a mix of cow dung, cow urine,water, lime and a handful of soil and jeevamrutha, a mix of cow dung, cow urine, water, jaggery, pulse flour and handful of soil, a totally organic product helpful for the plant growth and protects the crop from harmful soil-borne and seed-borne pathogens. Smearing the seeds with beejamru the before sowing control manydiseases that attack the plant right from its seedling stage (6). Presence of naturally occurring beneficial micro organisms predominantly bacteria, yeast, actinomycetes, photosynthetic bacteria and certain fungiwere detected in cow dung which enhances the seed quality parameters which isone component of Beejamrutha (7).

Materials and Methods

The present investigation was carried out by using genetically pure seeds of safflower *cv*. PBNS-12 obtained from Krishi Vigyan Kendra, Bidar, Karnataka, India. The laboratory experiment was conducted at the Department of Seed science and Technology, College of Agriculture, UAS, Raichur during *Kharif* 2019-20. Thestudy aimed to

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Table-1 : Influence of soaking duration with different organics on seed germination, shoot length, root length, seedling length, Seedling dry weight (mg) and Seedling vigour index (I and II) in safflower.

Treatment	Seed germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index I	Seedling vigour index II
T_1 : Control (without soaking)	83.44	8.64	8.86	17.50	109.97	1,462	9,184
T_2 : Seeds soaking in water for 6 h	88.90	9.14	9.16	18.30	129.97	1,625	11,543
T_3 : Seeds soaking in water for 12 h	90.97	9.22	9.28	18.51	159.97	1,684	14,554
T_4 : Seeds soaking in water for 18 h	87.17	9.14	9.16	18.30	179.97	1,594	15,672
T_5 : Seeds soaking in beejamrutha for 6 h	94.96	11.09	13.12	24.20	223.30	2,297	21,211
T_6 : Seeds soaking in beejamrutha for 12 h	96.97	11.49	13.36	24.85	230.30	2,410	22,334
T_7 : Seeds soaking in beejamrutha for 18 h	94.03	11.08	12.85	23.94	200.03	2,252	18,810
T_8 : Seeds soaking in jeevamrutha for 6 h	91.83	10.41	12.16	22.58	179.98	2,074	16,531
T_9 : Seeds soaking in jeevamrutha for 12 h	92.60	10.70	12.46	23.16	189.97	2,145	17,595
T_{10} : Seeds soaking in jeevamrutha for 18 hrs	90.02	9.90	11.86	21.76	170.01	1,960	15,317
T_{11} : Seeds soaking in Pseudomonas fluorescence for 6 h	88.03	9.34	10.36	19.70	180.00	1,732	15,824
T_{12} : Seeds soaking in Pseudomonas fluorescence for 12 h	90.05	9.45	10.18	19.63	159.97	1,768	14,402
T_{13} : Seeds soaking in Pseudomonas fluorescence for 18 h	91.03	9.36	9.86	19.22	153.00	1,750	13,936
T_{14} : Seed treatment with waste decomposer for 30 min	88.97	9.05	9.54	18.59	147.00	1,652	13,069
T_{15} : Seed treatment with waste decomposer for 45 min	86.97	9.11	9.51	18.62	139.97	1,617	12,155
T_{16} : Seed treatment with waste decomposer for 60 min	86.00	9.06	9.37	18.43	129.97	1,586	11,186
Mean	90.12	9.76	10.69	20.46	167.71	1,850	15,208
S.Em±	1.42	0.24	0.28	0.50	4.09	45.99	410.01
C.D @ 1%	4.12	0.69	0.79	1.45	11.85	133.49	1,186.50

know the effect of different organic priming treatmentsat different duration in safflower to improve the seedquality. The experiment was laid out in Completely Randomized Design with sixteen organic treatments in different duration *viz*.,T_1-Control (without soaking), T_2-Seeds soaking in water for 6 h, T_3- Seeds soaking in water for 12 h, T_4-Seeds soaking in water for 18 h, T_5-Seeds soaking in beejamrutha for 6 h, T_6-Seeds soaking in beejamrutha for 12 h, T_7-Seeds soaking in beejamrutha for 18 h, T_8- Seeds soaking in jeevamrutha for 6 h, T_9- Seeds soaking in jeevamrutha for 12 h, T_{10}-Seeds soaking in jeevamrutha for 18 h, T_{11}-Seeds soaking in *Pseudomonas fluorescence* for 6 h, T_{12}-Seeds soaking in *Pseudomonas fluorescence* for 12 h, T_{13}-Seeds soaking in *Pseudomonas fluorescence* for 18 h, T_{14}-Seed treatment with waste decomposer for 30 min T_{15}-Seed treatment with waste decomposer for 45 min and T_{16}-Seed treatment with waste decomposer for 60 min. Seeds of safflower cv. PBNS-12 were soaked with organics with seed to solution ratio (w/v) of 1:1 under ambient condition at various temperature in which beejamrutha, jeevamrutha, waste decomposer solution are used (100%) except *Pseudomonas fluorescence* is (20%) and control.After pre-conditioning, the seeds were soaked in respective organic priming solutions at various durations, the seeds were removed from the solutions and shade dried at room temperature to bring back to original moisture content. The non primed seeds were used as control.

Results and Discussion

In this present study, seeds were evaluated for their physiological parameters. Results revealed that,the seed soaking in beejamrutha for 12 h (T_6) recorded significantly highest seed quality parameters *viz*., seed germination per cent (96.97), shoot length (11.49 cm), root length (13.36 cm), seedling length (24.85 cm), seedling dry weight (230.30 mg), seedling vigour index I and II (24010 and 22334) compared to control (83.44 %, 8.64 cm, 8.86 cm, 17.50 cm, 109.97 mg, 1462 and 9184, respectively).

The reasons for increased seed physiological parameters observed in the present study might be due to the fact that priming activate the physiologically active substances *viz*., growth regulators and nutrients. Germination is an enzymatic reaction and is strongly correlated with enzymatic activities present in the seed. The reason behind better performance of beejamrutha treatment may be the components and microorganisms associated with it. (7) showed that, naturally occurring beneficial microorganisms mainly bacteria, yeasts, actinomycetes, photosynthetic bacteria and certain fungi were detected in cow dung which is one of component of beejamrutha. Beejamrutha contain macro as well as micro nutrients, many vitamins, essential amino acids, growth promoting factors like, Indole Acetic Acid (IAA), gibberellic acid (GA) and beneficial microorganisms (6,8). The result of beejamrutha treatment showed significant effect on seed germination percentage, better morphological parameters such as epicotyl length, hypocotyls length and number of radical and increase in biochemical contents of *Zea mays* L. seed (9). Higher germination percentage with beejamrutha seed treatment might be due to the presence of useful bacteria in

beejamrutha, producing indole acetic acid (IAA) and gibberellic acid (GA) (6). Similar results were also recorded by (10) in paddy.

Seed germination and seedling development are well regulated process in plant physiology involving high metabolic activity (11). Seed germination requires an increase in general metabolic activity and development of a seedling from the embryo begins (9). Seeds and enzymes such as lipases, proteinases, phosphatases and hydrolases absorb water and act on the seed, thus helping to break down the storage materials (12) in to simpler ones.

Conclusions

Among the different organic treatments and durations, twelve hours of seeds soaking in Beejamrutha (100%) was found superior for all seed quality parameters *viz*., seed germination, shoot length, root length, seedling length, seedling dry weight and seed vigour index I and II compared to control in safflower.

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