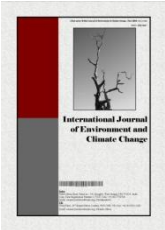

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Pre-sowing Seed Treatment with Botanicals and Organics on Plant Growth, Yield and Yield Attributing Traits of Okra (*Abelmoschus esculentus* L.) cv.VROH-12 Kashi Shristi

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present situation emphasizes the need to enhance eco-friendly agriculture practices for intensive farming. Chemical farming has made an unfavourable impact of the health care of not only soil but also the favourable soil microbial clique and the plants cultivated in these soil. This eventually has led the way to a high demand of botanical and organic produce by the present day health conscious society and repeated attempts are being made by farmers all over the world to make chemical free environment. Botanical and organics play vital role in increasing soil fertility and increase yield. The experimental study was conducted at crop research field during *Kharif* 2021-2022, in the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences. To find out the suitable pre-sowing seed treatment of okra with different concentration, definite period of pre-sowing seed treatments with control (without treated) were calculated by the experimental study. The field experiment was carried out in Randomized Block Design with 13 treatments including control were used to study under field conditions. the results indicates that field emergence percentage (%), plant height at (30, 60 and at harvest) (cm), days of 50% flowering, days to maturity, number of branches per plant, number of capsules per plant, number of seeds per capsule, length of capsule (cm), seed yield per plant (g),

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seed yield per plot (g),seed index (%), biological yield (g), harvest index (%) were significantly recorded highest in vermiwash @5% (12hours) followed by vermiwash (3%), beejamrutham (3%), panchagavya (3%) and neem leaf extract (5%) is used for improving growth, yield and yield attributing traits of okra .

Keywords: Okra, pre-sowing; botanicals; organics; seed treatment; traits; kashi shristi.

1. INTRODUCTION

Okra (*Abelmoschus esculentus L*.) commonly known as lady's finger or bhendi. Okra belongs to the family malvaceae. The genus Abelmoschus is Asiatic origin. Oka is often cross pollinated crop and having chromosome number 2n=130. The Panchgavya, Jeevamrutham and Beejamrutham are cheaper ecofriendly organic preparations made from cow products namely dung, urine, milk, curd and ghee. The Panchgavya is an well organized plant growth refresher that strengthen the biological efficiency of crops. It is used to activate soil and to protect the plants from diseases and also increase the nutritional quality of fruits and vegetables. It is used as a foliar spray, as soil application along with irrigation water, seed or seedling treatment *etc.* Jeevamruth encourage massive biological activity in soil and makes the nutrients available to crop. Beejamrutham protect the crop from soil borne and seed borne pathogens and it improves seed germination [1].

Pre-sowing treatments of Okra seeds for guarantee their earlier, successful germination. This will help people to decrease their production cost of seedlings on a wide scale. A significant body of confirmation suggests that pre-sowing treatments strongly increase the germination process [2]. Seed pre-sowing treatment will modify the physiological and biochemical nature of seeds, so as to get the characters that are favorable for drought tolerant through. Apart from using conventional farm-based products, there is an increasing demand for organic liquid formulations like panchagavya which help in quick increase of soil fertility through strengthen activity of soil microflora and fauna. Role of seed treatment application of panchagavya in production of many plantation crops had been well documented in India. Panchagavya plays the important role in promoting plant growth and provides immunity to plant system. Panchagavya is prepared by the products obtained from the cow viz; dung, urine, milk, curd, and ghee [3,4]. Panchagavya plays an important role in promoting growth of plants (75%) and act as immunity booster (25%) and increase the organic farming without any yield loss. It contains almost all the major nutrients llike Nitrogen, Phosphorous, and potassium and micronutrients which are necessary for plant growth and hormones like Indole acetic acid(IAA) and Gibberellic acid (GA)as required for crop growth as well as the predominance of fermentative microorganisms like yeast, azotobactor, phospobacteria and lactobacillus [5].

Neem (*Azadirachta indica, A. Juss*) is well known as village pharmacy as all parts of the plant are used for curing several types of diseases and infections. Extracts of leaves and seeds shows the property of antibacterial, antifungal, antiviral and anti malaria. Leaf extracts are also known to impede the growth of plant pathogens. The Essential oil obtained from neem leaf is used as a treating agent for fungal diseases in plants and it is used for seed treatment. The chemical substance or active principle present in this neem leaf extract prompt the protection against insect and pathogens hence the good viability and vigour of crop will be obtained.

1.1 Objectives

1. To determine the effect of selected pre-sowing seed treatment on growth, yield and yield attributing traits of okra.
2. To find out suitable pre-sowing seed treatment in okra.

2. MATERIALS AND METHODS

VROH-12 kashi shristi okra seeds (*Abelmoschus esculentus L*.) variety was collected from the department of genetics and plant breeding, Sam Higginbottom University of Agriculture Science and Technology, prayagraj were used to study under field conditions during Kharif, 2021-22. The climatic conditions recorded from the university meteorological station. The mean values of temperature, relative humidity, rainfall and wind speed were 33.85^{o}C, 83%, 20.22mm, 14km/h respectively. Botanical and organic treatments were prepared as follows.

Panchagavya was prepared from cow products viz. Cow urine (2.5L), Cow dung (2.5kg), Curd (1kg), Cow milk (2.5L), Ghee (500ml); these ingredients were mixed together along with 5 kg of jaggery in a circular container. The mixture was added with 5L of water and kept a side for 30 days. Fermentation take place by making the mixture to a fine concentrate giving out the sweet smell, the fermented liquid was filtered through cotton muslin cloth and the final volume of filtrate was made 500 ml. The solution was stored in refrigerator. 1, 3, 5% solution was used for seed treatment.

Jeevamrutham was prepared by taking 300 g fresh cow dung, 300 ml cow urine (old), 75 g black jaggery , 100 g pulse flour and 3.5 g live soil mixed with 7L of water. Solution was kept for 5-7 days in shade for fermentation. At the time of fermentation, the solution was mixed daily, the lid of the container should be kept loose. After the solution was used for seed treatments.

Beejamrutham (Protocol given by Palekar, 2006) was prepared by using desi cow dung (2.5kg) was taken in a cotton cloth, tie it by using thread and was submerged in 15liters of water in separate container and kept a side for overnight. After 12-16 hours, this bundle of cow dung was squeezed thrice by hand, 750grams of soil was dissolved in cow dung extract by mixing it well. To this 3liters of desi cow urine and lime water was added and stirred well. The seeds of okra were soaked in beejamrutham solutions of different concentrations (1%, 3% and 5%) for 12 hours then dried in shade and later used for field experiment.

Neem leaf extract was prepared by collecting fresh leaves of neem plant, washed, dried under shade. The dried leaves were crushed and powdered by using pestle and mortar, then 35grams of leaf powder was dissolved in 120ml of distilled water in the beaker to make 3 and 5% leaf extract. The leaf extract was filtered by using cotton muslin cloth to get rid of waste material and unwanted leaf matter. Seeds were soaked in the leaf extract at room temperature for 4hrs. the seeds were dried under shade and used for germination.

Vermiwash may be collected from the vermicompost units as a by product liquid extract. The coelomic fluid of earthworm is called as vermiwash.

2.1 Experimental Design

The experimental materials comprising was grown under randomized block design (RBD) with three replications. The experimental field was divided into 3 blocks of equal size.

2.2 Treatment Details

T_0: Control
T_1: Panchagavya 1%
T_2: Panchagavya 3%
T_3 : Panchagavya 5%
T_4: Beejamrutham 1%
T_5: Beejamrutham 3%
T_6: Jeevamrutham 1%
T_7: Jeevamrutham 3%
T_8: Jeevamrutham 5%
T_9: Neem leaf extract 3 %
T_{10}: Neem leaf extract 5 %
T_{11}: vermiwash 3%
T_{12}: Vermiwash 5%

2.3 Seed Soaking in the Solution

Okra seeds was soaked for the duration of 12hours in the above prepared solutions viz., panchagavya, jeevamrutham, beejamrutham, neem leaf extract, vermiwash, after soaking a period of time the solutions was drained out from the beaker and the presoaked seeds was air dried to its original weight and were sown in field to find out the suitable pre-sowing seed treatment for growth and yield. Untreated seeds are called as control.

2.4 Statistical Analysis

The analysis of data was worked out to test the signification tests. It was done according to the procedure of RBD for each character as per methodology suggested by Fisher (1936). The total variance and degree of freedom was partitioned into three components viz. Replication, treatment and error.

3. RESULTS AND DISCUSSION

According to the investigation, all the observations were analyzed and influenced by the treatments, the different between control and the treated seeds was mentioned in Table 1.

Table 1. Mean sum of square for 14 different characters in okra

S. no.	Characters	Replications (df=2)	Treatments (df=12)	Error (df=24)
1	Field Emergence %	7.16	0.09*	0.02
2	Plant Height@ 30 DAS	0.58	1.50*	0.47
3	Plant Height@ 60 DAS	10.13	19.05*	5.76
4	Plant Height at harvest	14.05	82.57*	26.49
5	Number of Branches per plant	0.85	2.84*	0.88
6	Number of capsules per plant	0.48	26.50*	1.75
7	Days to 50% flowering	1.00	23.56*	2.33
8	Number of seeds per plant	15.46	12.39*	3.81
9	Seed yield per plant	2.59	20.77*	6.82
10	Length of capsule	2.44	3.89*	1.20
11	Seed yield per plot	6339.56	9191.14*	1125.32
12	Seed index	0.19	2.59*	0.28
13	Biological yield	2639.53	10868.78*	1565.60
14	Harvest index	0.83	101.13*	10.32

Table 2. Mean performance of different treatments for pre-harvest characters in okra

Treatments	Field emergence%	Plant height at 30 Days (cm)	Plant height at 60Days (cm)	Plant height at harvest (cm)	No.of branches per plant	No. of capsules per plant	Days to 50% Flowering (days)
T0 – Control	69.4	18.92	74.66	121.43	4.6	15.4	50.66
T1 – Panchagavya 1%	88.86	19.13	77.00	122.59	6	18.93	46.33
T2 –Panchagavya 3%	86.88	19.24	77.39	126.80	5.8	16.66	43.33
T3 – Panchagavya 5%	86.11	19.78	78.16	125.32	5.9	17	44.0
T4 – Beejamrutham 1%	85.33	19.59	79.22	128.82	6.6	21.93	42.33
T5 – Beejamrutham 3%	75	19.66	78.28	122.46	6.73	17.66	46.66
T6 – Jeevamrutham 1%	77.77	19.19	76.52	124.60	5.26	16.8	46.33
T7 – Jeevamrutham 3%	83.33	20.31	79.33	123.14	5.4	21.26	42.33
T8 – Jeevamrutham 5%	85.66	19.02	78.80	123.53	6.2	16.4	47.66
T9- Neem leaf extract 3%	80.55	19.34	77.14	122.52	5.4	20.66	45.33
T10– Neem leaf extract 5%	86.11	20.27	76.68	132.11	6.6	23.2	46.66

Treatments	Field emergence%	Plant height at 30 Days (cm)	Plant height at 60Days (cm)	Plant height at harvest (cm)	No.of branches per plant	No. of capsules per plant	Days to 50% Flowering (days)
T11 – Vermiwash 3%	72.22	20.71	78.55	136.40	7.87	17.2	42.66
T12 – Vermiwash 5%	91.6	21.21	85.45	136.44	8.00	24.7	41.33
Mean	82.73	19.72	78.24	126.64	6.16	19.07	45.08
Coefficient of variation(CV)	4.19	3.49	3.07	4.06	15.24	6.95	3.39
Standard Error.M	0.08	0.40	1.39	2.97	0.54	0.76	0.88
Critical Difference 5%	0.25	1.16	4.04	8.67	1.58	2.23	2.57
Critical Difference 1%	0.33	1.57	5.48	11.75	2.15	3.02	3.49
Range Minimum	950	18.92	74.66	121.43	4.6	15.4	41.33
Range Maximum	1142	21.21	85.45	136.44	8.00	24.7	50.66

Table 3. Mean performance of different treatments for post-harvest characters in okra

Treatments	No.of seeds per capsule	Seed yield per plant (g)	Seed yield per plot (g)	Seed Index (%)	Biological yield	Harvest Index
T0 – Control	34.53	12.94	233.15	4.37	514.35	55.04
T1 – Panchagavya 1%	40.13	13.26	277.87	6.09	417.85	65.73
T2 – Panchagavya 3%	37	16.19	354.10	5.56	524.10	67.55
T3 – Panchagavya 5%	39.53	15.51	240.19	5.63	419.52	59.75
T4 – Beejamrutham 1%	36.6	15.68	239.52	5.07	400.19	56.89
T5 – Beejamrutham 3%	38.4	14.92	335.13	4.82	538.46	68.42
T6 – Jeevamrutham 1%	37	14.40	281.01	6.36	485.21	66.68
T7 –Jeevamrutham 3%	36.93	15.99	279.93	6.45	449.93	62.21
T8 – Jeevamrutham 5%	37.93	14.45	241.91	7.19	371.91	59.58
T9 - Neem leaf extract 3%	40.4	15.63	241.29	6.28	391.29	61.61
T10 – Neem leaf extract 5%	40.73	19.18	325.21	6.85	393.15	64.23
T11 – Vermiwash 3%	36.53	17.72	262.30	6.79	476.76	74.81
T12 – Vermiwash 5%	41.2	20.01	356.76	7.41	362.30	72.27
Mean	38.21	15.87	282.18	6.07	441.93	68.35
Coefficient of variation(CV)	5.11	12.67	14.47	8.68	8.95	5.00
Standard Error. M	1.13	1.16	23.58	0.30	22.84	1.85
Critical Difference. 5%	3.29	3.39	68.82	0.89	66.68	5.41

Treatments	No.of seeds per capsule	Seed yield per plant (g)	Seed yield per plot (g)	Seed Index (%)	Biological yield	Harvest Index
Critical Difference. 1%	4.46	4.59	93.26	1.20	90.36	7.34
Range Minimum	34.53	12.94	233.15	4.37	362.30	55.04
Range Maximum	41.2	20.01	356.76	7.41	538.46	74.81

3.1 Analysis of Variance

The analysis of variance showed in Table: 1 for growth, yield, and yield attributing traits of okra. It observed that the variations between 13 treatments were importance for characters that attribute growth and yield of okra, viz., field emergence percent, plant height (30, 60 and at harvest), days to 50% flowering, days to maturity, number of branches per plant, number of capsules per plant, number of seeds per capsule, seed yield per plant, length of capsule, seed yield per plot, seed index, biological yield, and harvest index.

3.2 Mean Performance

Mean value is defined by the ratio of the sum of the observations to the total number of observations. The data presented in the table shows the mean performance of 13 treatments for growth, yield and yield attributing traits of okra as follows. Pre sowing seed treatments with highest percentage of field emergence (91.6) was maximum in T_{12}-vermiwash @ 5% followed by T1 –Panchagavya @ 1% (88.86) and found to be minimum in T_0-control (69.4) the influence of pre-sowing seed treatment on the field emergence was found to be an important and comparable similar finding was observed by Gopal et al., [6] and Suchitra et al., [7].

Maximum days taken to 50% flowering with (41 days) was highest in T_{12}-vermiwash @5% followed by (47 days) by 8– Jeevamrutham @ 5% and found to be the lowest in T_0-control. The influence of pre-sowing seed treatment on days to 50% flowering rate was found to be important and similar results observed by Elumalai et al., [8] and Thangavel et al., [9].

Maximum plant height at (30, 60, and at harvest) was recorded highest by T_{12}-vermiwash @5% with values of (21.21cm, 85.45cm, 136.4cm) and found to be the lowest in T_0-control (18.92cm, 74.66cm, 121.43cm).

The influence of pre-sowing seed treatments on days to maturity was found to be significant and similar results was observed by Elumalai et al., [8]; Thangavel et al., [9]; Giraddi et al., [10].

Number of capsules per plant (24.7) was maximum in T_{12}-vermiwash@5% for 12hours and found to be the minimum in T_0-control(15.4) Similar results in the Number of capsules per plant were observed by Chattopadhyay et al., [11]; Kaur [12].

Maximum length of pods per capsule (20.14cm) was recorded by T12 – Vermiwash @ 5% and it was followed by T8– Jeevamrutham @ 5% (17.06cm) the minimum length of capsules was recorded by T0 – Control (15.73cm). Similar results in the length of capsules were observed by Keshav et al., [13]; Samadhiya et al., [14]; Maheswari et al., [15].

Number of seeds per capsule (41.2) was recorded by T12 – Vermiwash @ 5% and it was followed by T10– Neem leaf extract @ 5% (40.73).Lowest seeds per capsule was observed by (35.53) and Highest seed yield per plant (20.01g) was recorded by T12 – Vermiwash @ 5% and it was followed by T10– Neem leaf extract @ 5% (19.18g), T11– Vermiwash @ 3% (17.72g). The least seed yield per plant was recorded by T0 – Control (12.94g). highest seed yield per plot (356.76g) was recorded by T12 – Vermiwash @ 5% and it was followed by T2– Panchagavya @ 3% (354.10g), T5– Beejamrutham @ 3% (335.13g). The lowest seed yield per plot was recorded by T0 – Control (233.15g). Similar results in the seed yield per plot were observed by Ansari et al., [16]; Kulkarni et al., [17] Suchitra et al., [7].Seed index (7.41) was observed highest in T_{12}-vermiwash@5% and found to be the lowest in T_0-control (514.3g).

4. CONCLUSION

In present days use of hazardous chemical fertilizers and pesticides are used by the farmers to get high yield of various agricultural crops by these heavy doses of chemicals decrease the ability to grow crops as it reduce the soil fertility, and cause serious health problems to the consumers in order to overcome the present situation new approaches are made by the scientists to reduce the cost of cultivation and thereby increase the fertility of soil to improve the yield of the agricultural crops by using botanical and organic seed treatments which are easily prepared from the locally available ingredients. From the present investigation it is concluded that the seeds of okra (kashi-shristi) treated with vermiwash @ 5% for duration of 12hours significantly enhanced the yield and yield attributing traits followed by Vermiwash @ 3% for 12 hours as compared to Control (nontreated) seeds. These recommendations are based on six months of experimentation and therefore

further study is needed to arrive at valid recommendations.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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