



Standardization of Different Pre-sowing Seed Treatments with Jeevamrutha, Panchagavya, Neem Oil and Vermiwash on Plant Growth Yield and Yield Attributing Traits of Cowpea (*Vigna unguiculata* L.) Var. SSC-06

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i2331610

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/92534>

Original Research Article

Received 20 July 2022
Accepted 29 September 2022
Published 07 October 2022

ABSTRACT

The field experiment was carried out at Field Experimentation Center, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP.) during *Kharif*-2021. This experiment was laid out in a Randomized Block Design with 13 treatments and replicated thrice to determine the effect of Jeevamrutha, Panchagavya, Neem oil and Vermiwash on growth, yield and yield attributing traits. The seeds of Cowpea variety Var. SSC-06 was treated as T₀-control, T₁, T₂, T₃, (Jeevamrutha @ 1%, 3%, 5%), T₄, T₅, T₆, (Panchagavya @ 1%, 3%, 5%), T₇, T₈, T₉, (Neem oil @ 1%, 3%, 5%), T₁₀, T₁₁, T₁₂, (Vermiwash @ 1%, 3%, 5%) respectively for 12 hours. It was found that ANOVA showed significance difference among all the treatments with the control for all the characters under study. Among all the treatments of present study, T₅ (Panchagavya @ 3% for 12 hours) was found more effective for Rate of field emergence (24.89), Plant height at 30 DAS (38.66), Plant height at 60 DAS (55.81), Plant height at 90 DAS (94.96), Days to 50% flowering (40.66), Days to maturity (58.66), Number of branches per plant (7.93), Number of pods per plant (19.4), Pod length (42.97 cm), Number of seeds per pod (13.73),

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Seed yield per plant (39.78), Seed yield per plot (835.56), Biological Yield (1775), Seed index (14.3) and Harvest index (47.03). Thus, treatment T₅ (Panchagavya @ 3% for 12 hours) was found to be suitable pre-sowing seed treatment for growth, yield and yielding attributes of cowpea seeds.

Keywords: Cowpea seeds; jeevamrutha; panchagavya; neem oil; vermiwash.

1. INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is one of the most important vegetable crops grown as pulse, vegetable and fodder crop. It is a self-pollinated crop. It belongs to Fabaceae with the chromosome number $2n = 22$. Cowpea is often called "black eyed pea" due to its black- or brown-ringed hylum. It is an annual herbaceous legume. It is regarded as one of the oldest human food sources and is the protein source of the common man. It is a significant multifunctional grain legume that is widely farmed. It is an important source of nutrients and provides high quality, inexpensive protein to diet based on cereal grains and starchy foods [1].

In all pulses which are grown in the world, cowpea is grown all over the world is 12.76 million ha with a production of 7.56 million tones and the productivity is 750 kg per ha (FAO 2013). In india, the cowpea is grown in an area about of 3.9 million ha with a production of 2.21 million tones with a productivity of 265 kg per ha. During 2017-2018 the total coverage under cowpea in Uttar Pradesh is 23.61 lakh hectare with a production around 22.34 lakh tones.

Pre-sowing seed treatment is a straight forward method that can enhance seedling vigour and establishment, which in turn improves crop performance in the field [2]. Pre-sowing seed treatment that enables early DNA replication, boosts RNA and protein synthesis, fixes damaged seed parts, and reduces metabolite leakage improves embryo growth, seedling speed, and uniformity in the field, as well as the plants' ability to withstand drought, resist pest damage, and produce more crop [3].

Heavy use of chemicals in agriculture has damaged the ecological foundation, resulting in soil deterioration, water resource depletion and food quality degradation. At this stage, there is a growing awareness of the use of "organic farming" as a remedy. Organic farming is low-cost and uses chemical-free fertilizer. It is important to create a powerful, practical and suitable nutritional management solution. Keeping in point of above mentioned facts the

present study was carried out to determine the effect of Jeevamrutha, Panchagavya, Neem oil and Vermiwash on growth, yield and yield attributing traits of cowpea and to identify the suitable doses of pre-sowing seed treatments of Jeevamrutha, Panchagavya, Neem oil and Vermiwash for Cowpea.

2. MATERIALS AND METHODS

The present investigation was carried out to study the "Standardization of Different Pre-sowing Seed Treatments with Jeevamrutha, Panchagavya, Neem oil and Vermiwash on Plant growth, yield and yield attributing traits of Cowpea (*Vigna unguiculata* L.)" Var SSC-06 in the Field experimentation center of department of genetics and plant breeding, SHUATS, Prayagraj. The experimental plot was sandy loam in texture, (PH 7.1). The experiment was laid out in Randomized Block Design with 13 treatments including control which were replicated thrice in *kharif* 2021.

2.1 Treatment Details

T₀-control, T₁,T₂,T₃-Jeevamrutha@1%,3%,5%, T₄,T₅,T₆-Panchagavya@1%,3%,5%, T₇,T₈,T₉-Neemoil@1%,3%,5% and T₁₀,T₁₁,T₁₂-Vermiwash@1%,3%,5%. The treatments were diluted to 1,3 and 5% concentration using distilled water. The Cowpea (*Vigna unguiculata*) Var, SSC-06 seeds are treated with above different seed treatments with different concentrations for 12 hours, after that seeds are dried to initial moisture content at room temperature. After drying the seeds were sown in experimental research plot. Field experiment was laid out in Randomized Block Design with three replications during *kharif* 2021.

From the sowing till the physiological maturity and harvest the observations were recorded on different growth parameters viz. Rate of field emergence, plant height at 30,60 and 90days, 50% flowering, number of branches per plant, days to maturity, number of pods per plant, number of seeds per pod, pod length (cm), seed yield per plant (g), seed yield per plot(g), biological yield(g), harvest index (%) were

recorded and stastically analyzed using analysis of variance was carried out according to the procedure of Randomized Block Design (RBD) for each character as per methodology advocated by panse and Sukhatme [4].

2.2 Methodology

Preparation of Jeevamrutha: Jeevamrutha is prepared by mixing 10 kg local cow dung with 10 litres cow urine, add 2 kg local jaggery, 2 kg pulse flour and handful of garden soil and the volume made upto 200 litres. Keep the drum in shade covering with wet gunny bag and stir the mixture clockwise thrice a day and incubate. The fermented liquid was filtered through cotton and the final volume of filtrate was made 1000 ml. This jeevamrutham can be used for 2-3days [5].

Mode of action of Jeevamrutha: Jeevamruth consists of naturally occurring microbes which are beneficial for plant nutrient availability viz., Bacteria, fungi, Yeast, Actinomycetes, and some photosynthetic bacteria. Different microbial populations present in Jeevamruth are bacteria, fungi, actinomycetes, phosphate solubilizing organisms, free living nitrogen fixers. These microbes bring in mineralization process and make nutrients available to the plants.

Preparation of Panchagavya: Panchagavya was prepared from cow products viz. Cow milk (5 L), ghee (2 L), curd (2 kg), cow urine (5 L) and cow dung (5 kg); these ingredients were mixed together along with 15 kg of jaggery in a circular container. The mixture was added with 15 L of water and kept as such for 30 days. Fermentation took place by making the mixture to a fine concentrate giving out the sweet odour. The fermented liquid was filtered through cotton and the final volume of filtrate was made 1000 ml.

Mode of action of Panchagavya: Due to Presence of naturally occurring, beneficial, effective microorganism in panchagavya predominantly, It helps in improving soil quality, growth and yield of crop. Panchagavya an organic product is a potential source to play great role for promoting growth and providing immunity in plant system.

Preparation of Neem Oil: To obtain neem oil, the seeds are first broken open and the kernels separated. The kernels are then pressed in industrial expellers or in hand- or bullock-operated wooden presses (ghanis).

Mode of action of Neem oil: Neem seed extract performs the dual function of both fertilizer and pesticide of organic origin. It also acts as a soil enricher and provides essential nutrients for plant growth. It is bio-degradable, eco-friendly and excellent soil conditioner which help to increase the crop yield on long run [6].

Preparation of Vermiwash: a plastic container of 15 to 20 liters capacity is required and the base of the container is fitted with tap to collect the watery worm extract. The container is filled with different successive layers. First base layer, medium sized bricks or stones up to a height of 10-15 cm filled. Above the base layer a layer of coarse sand (up to 6 inches) and fine sand (5 inches) are spread. Introduction of locally available earthworms (*Eisenia foetida*) mixing with fertile soil applied. After that, a layer of partially decomposed cow dung (20-25 cm) and organic residues of 40-45 cm were poured. All the layers in the container is moistened by sprinkling water over it. Container is sprinkled with approx 2 L water per day. After 16 to 20 days preparation of vermiwash in the unit begins. Everyday about 1-2 L of vermiwash will be collected [7].

Mode of action of Vermiwash: Vermiwash is the spent wash collected at the passage of water through a column of earthworm culture. The spent wash collected through a drainage pipe provided at the bottom of the vermicompost pit. Vermiwash contains 0.50 per cent nitrogen, 0.39 per cent phosphorus and 0.46 per cent potassium [8]. It is coelomic fluid extraction which contains several enzymes, plant growth stimulating hormones like cytokinins, gibberlines and vitamins along with micro-nutrients and macro-nutrients as nitrogen in the form of mucus, nitrogenous excretory substances [9]. It also increases the disease resistant power of crop [10]. Vermiwash obtained from dissolution of organic matter by earthworm is also found as good liquid manure and affects significantly the growth and productivity of crop during foliar spray [11]. Apart from organic acids, it also contains a rich source of soluble plant nutrients stimulating crop growth.

3. RESULTS AND DISCUSSION

3.1 Growth and Yield Parameters

The maximum Rate of field emergence was recorded in T₅-Panchagavya @ 3% for 12hours (24.89) and followed by T₂-Jeevamrutha @ 3%

for 12 hours (23.66) which was significantly superior over all other treatments and whereas the T₀-control found to be lowest(16.95). Similar results was observed by Kumar et al., [12]. Found that increased seed quality parameters are mainly because of microbes in the panchagavya solution viz., rhizobium, azotobacter and azospirillum; which provided the essential macro nutrients to the seedling in the developmental stages.

Seed treatment with Panchagavya lead to extensive root system, mobilized nutrients and increased photosynthetic activity of the plant and enable highest plant height. The highest plant height in our experiment found on 30, 60 and 90DAS was recorded in treatment T₅-Panchagavya @ 3% for 12 hours. (38.66) on 30 days and (55.81) on 60 days and (94.96) on 90 days after sowing which was found significantly superior over all other treatments. Whereas lowest plant height was recorded in treatment T₀-control with (32.12) on 30 days, (48.87) on 60 days, (86.6) on 90 days. Similar results were confined by Kala et al.,[13] and Ali et al [14].

Days to 50% flowering and Days to maturity in cowpea was observed that significantly minimum days to 50% flowering and days to maturity found

in treatment T₅-Panchagavya @ 3% for 12 hours where seeds may be considered as the best treatment for early period in days to 50% flowering and days to maturity (40.66) and (58.66) followed by T₂- Jeevamrutha @ 3% for 12 hours and maximum days for 50% flowering was recorded by T₀- control (51) and (69) days. Similar results were confined by Panchel et al., [15], Yeshwanth Chandra et al., [16].

Seed treatment with Panchagavya was significantly influenced the number of branches per plant. The highest number was observed in T₅ with 7.93. followed by T₂-Jeevamrutha @ 3% for 12 hours (6.6). Whereas minimum number of branches were recorded in treatment T₀-control (3.73). This may be due to the higher amounts of available carbon, nitrogen, phosphorous and potassium that required for the crop. Similar findings were associated with Anuja et al.,[17].

The number of pods plant⁻¹ and number of seeds pod⁻¹ are significantly maximum in treatment T₅-Panchagavya @ 3% for 12 hours (19.4) and (13.73) respectively and minimum number of pods plant⁻¹ and seed pod⁻¹ were recorded in treatment T₀- control (12.13) and (10.66). Similar results were confined with the work of Ali et al. [14].

Table 1. Analysis of variance for different characters in Cowpea

S. No.	Characters/traits	Mean Sum of Squares		
		Replication (df =02)	Treatments (df =12)	Error (df = 24)
1	Field emergence at 4DAS	0.58	32.17*	6.88
2	Field emergence at 7DAS	7.57	99.71*	7.55
3	Field emergence at 10DAs	59.95	108.92*	3.82
4	Rate of Field emergence	0.77	12.43*	0.83
5	Plant height (cm) at 30DAS	1.06	9.57*	0.25
6	Plant height (cm) at 60DAS	1.541	8.827*	0.782
7	Plant height (cm) at 90DAS	0.48	16.178*	0.33
8	50% Flowering (DAS)	0.07	31.74*	0.99
10	Number of branches per plant	0.07	3.31*	0.126
11	Days to maturity	0.02	30.29*	1.16
12	Number of pods per plant	0.1145	10.34*	0.09
13	Number of seeds per pod	0.085	2.29*	0.027
14	Pod length(cm)	0.49	35.38*	0.78
15	Seed yield per plant(gm)	2.18	147.05*	1.8
16	Seed yield per plot(kg)	961.9	64852.8*	795.88
17	Biological yield(qn/ha)	267.11	52239.18*	846.77
18	Seed index(gm)	0.15	3.51*	0.26
19	Harvest index(%)	4.25	141.84*	2.45

* significant at 5% level of significance

Table 2. Effect of treatments on mean performance of cowpea on Field emergence, Plant height, Days to 50% flowering, Days to maturity

S. No	Treatments	Field emergence			Rate of Field emergence	Plant Height			Days to 50% flowering	Days to maturity
		4 days	7 days	10 days		30 days	60 days	90 Days		
1	T ₀ -Control	14.28	49.20	63.49	16.95	32.12	48.87	86.6	51	69
2	T ₁ -Jeevamrutha	17.46	55.55	74.60	19.76	34.14	51.63	87.93	45.66	63.66
3	T ₂ -Jeevamrutha	23.81	65.07	84.12	23.66	37.70	54.98	94.23	41.66	59.66
4	T ₃ -Jeevamrutha	17.46	60.31	69.84	19.96	34.71	52.48	90.76	44.66	63.33
5	T ₄ -Panchagavya	15.87	55.55	73.01	19.20	33.62	51.71	89.16	49.66	67.66
6	T ₅ -Panchagavya	25.39	69.84	85.71	24.89	38.66	55.81	94.96	40.66	58.66
7	T ₆ -Panchagavya	17.46	63.49	73.01	20.73	35.02	51.68	90.2	43	61.33
8	T ₇ -Neem oil	14.28	53.96	74.60	18.74	36.30	52.37	92.1	47.33	65.33
9	T ₈ -Neem oil	17.46	63.49	77.77	21.21	36.33	52.34	90.93	44	62.
10	T ₉ -Neem oil	15.87	63.49	74.6	20.49	34.91	51.53	90.33	47.33	65.33
11	T ₁₀ -Vermiwash	19.04	53.96	71.42	19.61	34.77	52.22	89.83	46.66	64.66
12	T ₁₁ -Vermiwash	17.46	58.73	77.77	20.53	36.74	53.40	92.53	43.33	62.0
13	T ₁₂ -Vermiwash	19.04	55.55	68.25	19.52	36.93	48.87	91.80	50	68
	G 00mean	18.06	59.09	74.47	20.48	35.53	52.50	90.87	45.76	63.55
	F test	S	S	S	S	S	S	S	S	S
	SE(m)	1.51	1.58	1.12	0.52	0.28	0.51	0.33	0.57	0.62
	CD at 5%	4.44	4.66	3.31	1.54	0.85	1.49	0.98	1.69	1.82
	CV	14.51	4.65	2.62	4.47	1.41	1.68	0.64	2.17	1.68

Table 3. Effect of treatments on mean performance of cowpea on No. of Branches, No. of Pods/Plant, pod Length, No. of seeds/Pod, Seed yield/plot, Biological yield, Seed index, Harvest index

S. No	Treatments	No. of Branches	No. of pods/plant	Pod length	No. of seeds/pod	Seed yield/plant	Seed yield/plot	Biological yield(m ²)	Seed index	Harvest index
1	T ₀ -Control	3.73	12.13	29.83	10.66	13.07	274.48	1277.33	10.5	21.48
2	T ₁ -Jeevamrutha	4.53	14.5	32.34	12.0	20.05	421.16	1466.33	11.9	28.72
3	T ₂ -Jeevamrutha	6.6	18.4	40.33	13.46	34.37	721.9	1713.66	13.53	42.11
4	T ₃ -Jeevamrutha	4.86	15.33	34.93	11.66	19.58	411.34	1457.4	11.07	28.22
5	T ₄ -Panchagavya	4.86	17.2	37.34	12.93	29.08	610.78	1527.33	13	39.99
6	T ₅ -Panchagavya	7.93	19.4	42.97	13.73	39.78	835.56	1775	14.3	47.03
7	T ₆ -Panchagavya	4.53	16	34.56	12.33	22.57	473.98	1572.66	11.5	30.13
8	T ₇ -Neem oil	5.26	17.53	33.7	12.53	30.36	637.63	1636.67	13.45	38.97
9	T ₈ -Neem oil	4.73	17.26	37.76	12.73	29.4	617.54	1614.67	13.1	38.24
10	T ₉ -Neem oil	5.4	15.6	33.68	12.66	24.82	521.21	1471.66	12.83	35.41
11	T ₁₀ -Vermiwash	4.73	15.86	36.36	11.33	23.88	501.67	1591.66	12.9	31.58
12	T ₁₁ -Vermiwash	5.13	17.53	36.37	13.13	30.08	631.83	1688.66	13	37.41
13	T ₁₂ -Vermiwash	4.93	17.13	37.91	13.13	30.03	630.65	1639	12.96	38.47
	G mean	5.17	16.45	36	12.48	26.69	560.74	1571.69	12.61	35.21
	F test	S	S	S	S	S	S	S	S	S
	SE(m)	0.2	0.17	0.51	0.09	0.77	16.28	16.8	0.29	0.9
	CD at 5%	0.6	0.52	1.5	0.28	2.27	47.82	49.32	0.86	2.65
	CV	6.86	1.88	2.45	1.32	5.03	5.03	1.85	4.05	4.45

Significantly maximum pod length was recorded in treatment T₅-Panchagavya @3% for 12 hours (42.97) followed by T₂-Jeevamrutha @ 3% for 12 hours (6.6). Whereas minimum pod length were recorded in treatment T₀-control (29.83). Similar results were observed by Ali et al.,[14] and Sutar et al., [18].

As number of pods increases the yield increases, significantly maximum seed yield plant⁻¹ and seed yield plot⁻¹ was found in treatment T₅-Panchagavya @3% for 12 hours (39.78) and (835.56). followed by T₂-Jeevamrutha @ 3% for 12 hours. Minimum seed yield in cowpea was recorded in untreated control seeds in treatment T₀. It is agreeable with Patel et al., [19] and Usman et al., [20].

In case of biological yield the maximum was recorded in treatment T₅-Panchagavya @3% for 12 hours (1775) this is due to Panchagavya enhanced the plant metabolic activities, resistance against to the diseases and pests increased the physiological content of crop. followed by T₂-Jeevamrutha @ 3% for 12 hours (1713.66). whereas minimum biological yield were recorded in treatment T₀-control (1277.33). Moosavi et al.,[21].

The seed index (weight of 100 seeds) was found maximum in treatment T₅-Panchagavya @3% for 12 hours (14.3). this is due to increased mobilization of nutrients in panchagavya treated seeds. Minimum seed index was found in T₀-control (10.5). Usman et al., [20].

Significantly maximum percent of harvest index was observed in the treatment T₅-Panchagavya @ 3% for 12 hours with grand mean (35.21). The minimum percent of harvest index per plot is found in untreated seed treatment T₀-(21.48). Similar results were observed by Raja et al., [22].

4. CONCLUSION

On the basis of this study it can be concluded that different pre sowing seed treatments showed that significant effect on growth and yield parameters, treated with panchagavya @ 3%(T₅) for 12 hours recorded higher and followed by jeevamrutha @ 3%(T₂) for 12 hours, for growth, yield and yield attributing traits of cowpea. Thus, Panchagavya @ 3% and Jeevamrutha @ 3% for 12 hours was found to be suitable pre sowing seed treatments for cowpea seeds. The present study result was based on 6 months trial so, further investigation is required.

ACKNOWLEDGEMENT

I express my thankfulness to my advisor Dr. Prashant Kumar Rai and all the faculty members of the Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj-211007, Uttar Pradesh for providing essential facilities to undertake the studies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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