Original Research Article

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

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, Panchgavya, Neem oil and Vermiwash on growth, yield and yield attributing traits. The seeds of Cowpea variety Var. SSC-06 was treated as T_0-control, T_1, T_2, T_3, (Jeevamrutha @ 1%, 3%, 5%), T_4, T_5, T_6, (Panchagavya @ 1%, 3%, 5%), T_7, T_8, T_9, (Neem oil @ 1%, 3%, 5%), T_{10}, T_{11}, T_{12}, (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, T_5 (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), 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 T_5 (Panchagavya @ 3% for 12 hours) was found to be suitable pre-sowing seed treatment for growth, yield and yielding attributes of cowpea seeds.

Key words: Cowpea seeds, Jeevamrutha, Panchagavya , Neem oil, Vermiwash.

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 (Timko *et al*., 2007).

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**.** Compared to the worldwide the productivity of the cowpea.

Comment [M1]: incomplete

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 (Basra *et al*., 2006). 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 (Sen and Osborne, 1974).

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.

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.

3.1 Treatment Details.

T_0-control, T_1,T_2,T_3-Jeevamrutha@1%,3%,5% for 12 hours T_4,T_5,T_6-Panchagavya@1%,3%,5% for 12 hours, T_7,T_8,T_9-Neemoil@1%,3%,5% for 12 hours, T_{10},T_{11},T_{12}-Vermiwash@1%,3%,5% for 12 hours. 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.

Comment [M2]: instead of repeating 12 hours, it could have been used as common one.

Comment [M3]:

3.2 Methodology

Mode of action of Jeevamrutha: Jeevamruth consists of naturally occuring 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.

Mode of action of Panchagavya: Panchagavya is the blend of 5 products obtained from fresh cow dung, cow urine, cow's milk, cow's ghee, and jiggery. Presence of naturally occuring, beneficial, effective microorganisams in panchagavya predominantly, 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.

Mode of acton of Neem oil: Neem oil is a plant product used as a liquid fertilizer and natural pesticide. It is extracted from the neem seeds and leaves. Neem (*Azadiracta indica*) plant parts shows antimicrobial growth potentiality of cell wall breakdown. It has synergitic effect on early and uniform seed germination and enhances tolerances to pest and diseases during early crop stage.

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. The wash is a collection of excretory products and excess secretions of earthworms along with micronutrients from soil organic molecules. 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. It also increases the disease resistant power of crop. 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. Vermiwash contains 0.50 per cent nitrogen, 0.39 per cent phosphorus and 0.46 per cent potassium. Apart from organic acids, it also contains a rich source of soluble plant nutrients stimulating crop growth.

RESULTS AND DISCUSSIONS

Growth and Yield Parameters:

The maximum Rate of field emergence was recorded in T_5-Panchagavya @ 3% for 12hours (24.89) and followed by T_2-Jeevamrutha @ 3% for 12 hours (23.66) which was significantly superior over all other treatments and whereas the T_0-control found to be lowest(16.95). Similar results was observed by Kumar *et al*., (2020). Found that increased seed quality parameters are mainly because of microbes in the panchagavya solution *viz.,* rhizobium, azotobacter and azospirillium; which provided the essential macro nutrients to the seedling in the developmental stages.

The highest plant height in our experiment found on 30, 60 and 90DAS was recorded in treatment T_5- 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 T_0-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.,* (2019) and Ali *et al* (2011).

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 T_5-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 T_2- Jeevamrutha @ 3% for 12 hours and maximum days for 50% flowering was recorded by T_0- control (51) and (69) days. Similar results were confined by Panchel *et al.,* (2017).

In case of branches maximum number of branches was recorded in treatment T_5-Panchagavya @ 3% for 12 hours (7.93) followed by T_2-Jeevamrutha @ 3% for 12 hours (6.6). Whereas minimum number of branches were recorded in treatment T_0-control (3.73). Similar results were observed by Anuja *et al.*,(2014).

The number of pods plant^{-1}and number of seeds pod^{-1} are significantly maximum in treatment T_5-Panchagavya @ 3% for 12 hours (19.4) and (13.73) respectively and minuimum number of pods plant^{-1} and seed pod^{-1} were recorded in treatment T_0- control (12.13) and (10.66). Similar results were confined with the work of Ali *et al.*,(2011).

Significantly maximum pod length was recorded in treatment T_5-Panchagavya @3% for 12 hours (42.97) followed by T_2-Jeevamrutha @ 3% for 12 hours (6.6). Whereas

minimum pod length were recorded in treatment T_0-control (29.83). Similar results were observed by Ali *et al.*,(2011) and Sutar *et al.,* (2018).

As number of pods increases the yield increases, significantly maximum seed yield plant^{-1} and seed yield plot^{-1} was found in treatment T_5-Panchagavya @3% for 12 hours (39.78) and (835.56). followed by T_2-Jeevamrutha @ 3% for 12 hours. Minimum seed yield in cowpea was recorded in untreated control seeds in treatment T_0 . It is agreeable with Patel *et al.,* (2013).

In case of biological yield the maximum was recorded in treatment T_5-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 T_2-Jeevamrutha @ 3% for 12 hours (1713.66). whereas minimum biological yield were recorded in treatment T_0-control (1277.33).

The seed index (weight of 100 seeds) was found maximum in treatment T_5-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 T_0- control (10.5).

Significantly maximum percent of harvest index was observed in the treatment T_5-Panchagavya @ 3% for 12 hours with grand mean (35.21). The minimum percent of harvest index per plot is found in untreated seed treatment T_0-(21.48). Similar results were observed by Raja *et al.,* (2022)

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	T0-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	T0-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

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%(T_5) for 12 hours recorded higher and followed by jeevamrutha @ 3%(T_2) 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.

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