Influence of Cow Based Liquid Manures and Spacing on Growth and Yield of Cowpea (*Vigna Unguiculata* L.) under Natural Farming

Abstract

A field experiment was conducted at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) during *Kharif*, 2022. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), organic carbon (0.75%), available N (269.96 kg/ha), available P (33.10 kg/ha), and available K (336 kg/ha). The treatments applied Combination of liquid organic manures Panchgavya and jeevamrut and three level of spacing were of Panchgavya (3% and 5%) and Jeevamrut (5% and 10%). The experiment was laid out in Randomized Block Design with twelve treatments each replicated thrice. Based on the objectives taken maximum plant height (78.34 cm), number of total branches (4.76), plant dry weight (17.91 g/plant), seed yield (1.73 t/ha) and stover yield (3.45 t/ha) were recorded significantly higher in treatment combination of Panchagavya (5%) + Spacing 40 × 15 cm. number of pods per plant (22.99), number of seeds per pods (10.81) were recorded significantly higher in treatment combination of Panchagavya (3%) + Spacing 45 × 10 cm.

Keywords: *Panchgavya, Jeevamrutha, Cow urine, Cowpea, Growth, and Yield*.

INTRODUCTION

"Cow pea (*Vigna unguiculata* L.) is most important among pulse crops. It is popularly called as vegetable meat as it plays an important role in Indian diet on account of high per cent of protein (23.14%) which is double than that of cereals. The amino acid profile reveals that lysine, leucine and phenylanine content are relatively higher in cowpea. In India vegetable cowpea is grown over an area of 23,012 ha with production of 1,33,587 tons of green pod and productivity of 5800 kg/ha. The leading states are UP, Bihar, Jharkhand, West Bengal, Odisha etc. Beside its use as vegetable, pulse and fodder it can also be used as green manure, N fixer, cover crop, leafy vegetable. Above all it is a drought tolerant and hardy crop and well adapted to relatively dry environment. Cowpea contributes to the improvement of soil fertility by the atmospheric nitrogen fixation in the soil (56 kg N/ha to the subsequent crop) in association with symbiotic bacteria

under favorable conditions". (**Kalegore *et al.* 2018**).

"There are various options for the use of organic inputs in organic cultivation of wheat and use of liquid organic input preparations or formulations is one of them" (Sharma *et al.*, 2015). "Liquid organic formulations have largely remained in the background of mainstream scientific literature and what little knowledge exists about them is mainly confined to biodynamic farming literature" (Divers, 1999). "In India, the traditional liquid fertilizer called Panchgavya, has been shown to have a modest NPK content of 0.03-0.02-0.04 but a high iron content of 0.84 per cent. Other Indian liquid manures such as jeevamrut and beejamrut are reportedly used not as sources of nutrients but as plant growth enhancers" (**Palekar, 2006 and Vasanthkumar, 2006**). "They are rich sources of beneficial micro-flora who stimulate the plant growth and help in getting better vegetative growth and good quality yield. Formulations prepared from agricultural by- products *viz*., bran of grains, oil cakes, farmyard manure etc., are excellent growth carriers and storage media" (Devakumar et al., 2011). "Jeevamrut, a newly introduced liquid manure prepared from cow dung, cow urine, pulses flour, jaggary and soil collected from virgin land or below the canopy of banyan tree, helps to enhance microbial population in soil, soil fertility and productivity. Few research studies have been done on this aspect and indicated that use of jeevamrut promote growth and productivity of crops" (**Boraiah, 2013**).

MATERIALS AND METHODS:

A field experiment was conducted at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) during *Kharif*, 2022. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), organic carbon (0.75%), available N (269.96 kg/ha), available P (33.10 kg/ha) and available K (336 kg/ha). Two liquid organic manures Panchagavya O1-3% and O2-5% and jeevamrutha O3-5% and O4-10% l/ha. and second variable was spacing: S1- Spacing 35 × 20 cm, S2 - Spacing 40 × 15 cm and S3 - Spacing 45 × 10 cm. The experiment was laid out in Randomized Block Design with 12 treatments T1- Panchagavya (3%) + Spacing 35 × 20 cm, T2- Panchagavya (3%) + Spacing 40 × 15 cm, T3- Panchagavya (3%) + Spacing 45 × 10 cm, T4- Panchagavya (5%) + Spacing 35 × 20 cm, T5- Panchagavya (5%) + Spacing 40 × 15 cm, T6- Panchagavya (5%) + Spacing 45 × 10 cm, T7- Jeevamrutha (5%) + Spacing 35 × 20 cm, T8- Jeevamrutha (5%) + Spacing 40 × 15 cm, T9- Jeevamrutha (5%) + Spacing 45 × 10 cm, T10- Jeevamrutha (10%) + Spacing 35 × 20 cm, T11- Jeevamrutha (10%) + Spacing 40 × 15 cm and T12- Jeevamrutha (10%) + Spacing 45 × 10 cm. each replicated thrice. The observations were recorded on different growth and yield parameters were analyzed statistically to test their significance.

RESULTS AND DISCUSSION

A. Growth Attributes:

At 80 DAS, significantly higher plant height (78.34 cm) was recorded with application of Panchagavya (5%) + Spacing 40 × 15 cm. However, Panchagavya (3%) + Spacing 40 × 15 cm (77.96 cm), Panchagavya (3%) + Spacing 45 × 10 cm (76.65 cm) and Jeevamrutha (5%) + Spacing 40 × 15 cm (81.41 cm) were statistically at par with Panchagavya (5%) + Spacing 40 × 15 cm. The IAA and GA present in Panchgavya when applied as foliar spray could have created stimuli in the plant system and increased the production of growth regulators in cell system and the action of growth regulators in plant system ultimately stimulated the necessary growth and development. Similar findings were also reported by Patel (2012). At 80 DAS significantly maximum number of branches (4.76) was recorded with application of Panchagavya (5%) + Spacing 40 × 15 cm. However, Panchagavya (3%) + Spacing 40 × 15 cm (4.10), Panchagavya (5%) + Spacing 45 × 10 cm (4.10) and Jeevamrutha (5%) + Spacing 40 × 15 cm (4.69) were statistically at par with Panchagavya (5%) + Spacing 40 × 15 cm. The auxin content in Panchagavya upon its application leads to the activation of cell division and cell elongation in the auxiliary buds which had a promoting effect in increased number of branches, leaves and leaf area. The application of panchagavya would have induced the endogenous synthesis of native auxins resulting in an early active growth (**Sutar *et al*., 2019).** At 80 DAS, the maximum dry matter accumulation (17.91 g/plant) was recorded with application of Panchgavya (5%) + Spacing 40 × 15 cm. However, Panchgavya (3%) + Spacing 40 × 15 cm (15.78 g/plant), Panchgavya (5%) + Spacing 45 × 10 cm (16.13 g/plant), Jeevamrutha (5%) + Spacing 40 × 15 cm (16.91 g/plant) and Jeevamrutha (10%) + Spacing 35 × 20 cm (15.87 g/plant) were statistically at par with Panchgavya (5%) + Spacing 40 × 15 cm.

B. Yield Attributes

At harvest, the significantly higher number of pods/plant were observed in the treatment combination of Panchgavya (3%) + Spacing 45 × 10 cm recording 22.99 pods/plant. Treatment Panchgavya (3%) + Spacing 40 × 15 cm (20.05 pods/plant), Panchgavya (5%) + Spacing 40 × 15 cm (20.99 pods/plant), Panchgavya (5%) + Spacing 45 × 10 cm (21.67 pods/plant), Jeevamrutha (5%) + Spacing 35 × 20 cm (20.76 pods/plant) and Jeevamrutha (5%) + Spacing 40 × 15 cm (22.32 pods/plant) were statistically at par with Panchgavya (3%) + Spacing 45 × 10 cm. At harvest, significantly maximum number of seeds/pod (10.81) was observed in the treatment combination of Panchgavya (3%) + Spacing 45 × 10 cm. However, Panchgavya (3%) + Spacing 40 × 15 cm (10.03 seeds/pod), Jeevamrutha (5%) + Spacing 40 × 15 cm (9.36 pods/plant) and Jeevamrutha (10%) + Spacing 35 × 20 cm (9.28 seeds/pod) were statistically at par with Panchgavya (3%) + Spacing 45 × 10 cm. The effect of Panchgavya on vegetative growth (plant height, number of leaves and branches per plant) and reproductive growth (pods per plant, pod length, seeds per pod, test weight and seed yield per plant) were considered as the important yield attributes having a significant positive correlation with seed and haulm yield. These findings are in

line with the findings of **Kumar (2014)**.

The significantly maximum seed yield of cowpea (1.73 t/ha) was observed in the treatment combination of Panchgavya (5%) + Spacing 40 × 15 cm. However, Panchgavya (5%) + Spacing 35 × 20 cm (1.64 t/ha) and Panchgavya (5%) + Spacing 45 × 10 cm (1.50) were statistically at par Panchgavya (5%) + Spacing 40 × 15 cm. It was observed that crop yield is the complex function of physiological processesand biochemical activities, which modify plant anatomy and morphology of the growing plants. Seed and stover yield of chickpea were significantly influenced by different treatments of Panchgavya application. The significantly maximum stover yield of cowpea (3.45 t/ha) was observed in the treatment combination of Panchgavya (5%) + Spacing 40 × 15 cm. However, Panchgavya (3%) + Spacing 35 × 20 cm (3.18 t/ha), Panchgavya (5%) + Spacing 35 × 20 cm (3.32 t/ha), Panchgavya (5%) + Spacing 45 × 10 cm (3.40 t/ha) and Jeevamrutha (10%) + Spacing 40 × 15 cm (3.22) were statistically at par Panchgavya (5%) + Spacing 40 × 15 cm.

CONCLUSION

As per research trial, the treatment combination of Panchagavya (5%) at a spacing of 40 × 15 cm was found to be more productive.

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Table.1 Influence of Cow Based Liquid Manures and Spacing on Growth parameters of Cowpea.

Treatments	Plant height (cm)	Number of branches	Dry weight (g/plant)
Panchagavya (3%) + Spacing 35 × 20 cm	67.45	2.98	12.22
Panchagavya (3%) + Spacing 40 × 15 cm	77.96	4.10	15.78
Panchagavya (3%) + Spacing 45 × 10 cm	76.65	4.03	14.42
Panchagavya (5%) + Spacing 35 × 20 cm	68.89	3.05	14.19
Panchagavya (5%) + Spacing 40 × 15 cm	78.34	4.76	17.91
Panchagavya (5%) + Spacing 45 × 10 cm	74.67	4.10	16.13
Jeevamrutha (5%) + Spacing 35 × 20 cm	67.87	4.06	14.43
Jeevamrutha (5%) + Spacing 40 × 15 cm	75.45	4.69	16.91
Jeevamrutha (5%) + Spacing 45 × 10 cm	72.62	3.75	13.02
Jeevamrutha (10%) + Spacing 35 × 20 cm	72.54	3.44	15.87
Jeevamrutha (10%) + Spacing 40 × 15 cm	71.34	3.90	14.13
Jeevamrutha (10%) + Spacing 45 × 10 cm	72.59	4.02	12.65
F-test	S	S	S
SEm±	1.30	0.22	0.88
CD (P=0.05)	6.26	0.68	2.65

Table.2 Influence of Cow Based Liquid Manures and Spacing on yield attributes of Cowpea.

Treatments	Pods/plant	Seeds/pods	Seed yield (t/ha)	Stover yield(t/ha)
Panchagavya (3%) + Spacing 35 × 20 cm	19.17	8.05	1.32	3.18
Panchagavya (3%) + Spacing 40 × 15 cm	20.05	10.03	1.26	2.99
Panchagavya (3%) + Spacing 45 × 10 cm	22.99	10.81	1.18	2.87
Panchagavya (5%) + Spacing 35 × 20 cm	19.50	9.05	1.64	3.32
Panchagavya (5%) + Spacing 40 × 15 cm	20.99	9.15	1.73	3.45
Panchagavya (5%) + Spacing 45 × 10 cm	21.67	8.49	1.50	3.40
Jeevamrutha (5%) + Spacing 35 × 20 cm	20.76	8.34	1.02	3.02
Jeevamrutha (5%) + Spacing 40 × 15 cm	22.32	9.36	1.09	2.76
Jeevamrutha (5%) + Spacing 45 × 10 cm	19.08	7.43	1.31	3.12
Jeevamrutha (10%) + Spacing 35 × 20 cm	17.18	9.28	1.19	2.79
Jeevamrutha (10%) + Spacing 40 × 15 cm	15.97	6.39	1.22	3.22
Jeevamrutha (10%) + Spacing 45 × 10 cm	16.17	7.41	1.21	2.83
F-test	S	S	S	S
SEm±	0.97	0.53	0.11	0.10
CD (P=0.05)	2.99	1.61	0.33	0.27

Note: S means Significant