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Pratik Panchal

M.Sc (Agri.) Students,
Department of Agronomy,
Chimanbhai Patel College of
Agriculture Sardarkrushinagar
Dantiwada Agricultural
University, Sardarkrushinagar,
Dist. Banaskantha, Gujarat,
India

PH Patel

Assistant professor, Department
of Agronomy, Chimanbhai Patel
College of Agriculture
Sardarkrushinagar Dantiwada
Agricultural University,
Sardarkrushinagar, Dist.
Banaskantha, Gujarat, India

AG Patel

Assistant Research Scientist,
Department of Agronomy,
Chimanbhai Patel College of
Agriculture
Sardarkrushinagar Dantiwada
Agricultural University,
Sardarkrushinagar, Dist.
Banaskantha, Gujarat, India

Ajit Desai

M.Sc (Agri.) Students,
Department of Agronomy,
Chimanbhai Patel College of
Agriculture
Sardarkrushinagar Dantiwada
Agricultural University,
Sardarkrushinagar, Dist.
Banaskantha, Gujarat, India

Correspondence**PH Patel**

Assistant professor, Department
of Agronomy, Chimanbhai Patel
College of Agriculture
Sardarkrushinagar Dantiwada
Agricultural University,
Sardarkrushinagar, Dist.
Banaskantha, Gujarat, India

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Effect of *Panchagavya* on growth, yield and economics of chickpea (*Cicer arietinum*)

Pratik Panchal, PH Patel, AG Patel and Ajit Desai

Abstract

A field experiment was conducted during *rabi*, 2014-15 at Agronomy Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the "Effect of *panchagavya* on growth, yield and economics of chickpea (*Cicer arietinum*). The result reported that among different treatments, foliar spray of *panchagavya* @ 4% at branching and flowering stage showed its superiority by producing the highest plant (54.9 cm), number of nodules/plant (15.67), fresh (157.57 mg) and dry (52.67 mg) weight of nodules/plant, seed (2054 kg/ha) and stover (2483 kg/ha) yield of chickpea along with maximum net return of ₹ 50008 and B:C ratio of 3.05.

Keywords: Chickpea, Panchagavya, Economics

1. Introduction

Chickpea (*Cicer arietinum*) is the largest produced food legume of south Asia and third largest produced food legume globally, after common bean (*Phaseolus vulgaris*) and field pea (*Pisum sativum*). Chickpea plays a significant role in improving soil fertility by fixing the atmospheric nitrogen. Chickpea meets 80 percent of its nitrogen requirement from symbiotic nitrogen fixation and can fix nitrogen up to 140 kg/ha from air. It leaves substantial amount of residual nitrogen for subsequent crops and adds plenty of organic matter to maintain and improve soil health and fertility. Because of its deep tap root system, chickpea can withstand under drought conditions by extracting water from deeper layers in the soil profile. (Gaur *et al.* 2010) [3].

Panchagavya, an organic product is the potential source to play the role for promoting growth and providing immunity in plant system. *Panchagavya* is a bio promoter with a combination of five products obtained from the cow *viz*: dung, urine, milk, curd and ghee. *Panchagavya* acts as growth promoter (75%) and immunity booster (25%) and exactly fills the missing link to sustain the organic farming without any yield loss (Vedivel, 2007) [11]. Biochemical properties of *panchagavya* revealed that it contains almost all the major nutrients like N, P, K and micronutrients necessary for plant and growth hormones like Indole acetic acid (IAA) and Gibberalic acid (GA) required for crop growth as well as the predominance of fermentative microorganisms like yeast, azotobacter, phoshobacteria and lactobacillus (Selvaraj, 2003) [8].

2. Material and methods

A field experiment was conducted during *rabi* season of 2014-15 at Agronomy Instructional Farm, Department of Agronomy, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the "Effect of *panchagavya* on growth, yield and economics of chickpea". The soil of the experimental field was loamy sand in texture, low in organic carbon (0.17%) and available nitrogen (196 kg/ha), medium in available phosphorus (42 kg/ha) and available potash (254 kg/ha) with 7.2 soil pH. Ten treatments *viz.*, foliar spray of *panchagavya* @ 2% at branching, flowering and branching + flowering stage; @ 4% at branching, flowering and branching + flowering stage; @ 6% at branching, flowering and branching + flowering stage along with 20:40:00 NPK kg/ha as RDF were tested in randomized block design replicating thrice. Chickpea (cv. Gujarat Gram 1) was used as a test crop. All other cultural practices were performed uniformly for all treatments. The crop was sown on 6th November, 2014 using recommended agronomical practices and plant protection measures were undertaken as per the need and the required plant population was maintained.

The observations were recorded on different growth attributing characters such as plant height, number of nodules per plant, fresh and dry weight of nodules per plant, yield (seed as well as stover yield) and economics.

3. Results and discussion

Effect on growth and growth attributes

Plant height measured at 90 days after sowing (DAS) was significantly influenced due to different treatments. Among the treatments, foliar spray of *panchagavya* @ 4% at branching + flowering stage recorded significantly the highest plant height of 54.9 cm over rest of the treatments at 90 DAS. The increase in plant height might be due to the application of nutrients through foliar spray of *panchagavya* which enhanced the growth rate of plant since it contains the favorable macro and micro nutrients, growth hormones and biofertilizers in liquid formulation. Moreover the presence of growth enzymes in *panchagavya* might have favoured rapid cell division and elongation. Similar findings have been reported by Venkatlakshmi *et al.* (2009)^[12], Balakumbahan *et al.* (2010)^[2] and Kumar *et al.* (2011)^[4].

Significant differences were observed in number of nodules per plant due to the application of *panchagavya*. A foliar spray of *panchagavya* @ 4% at branching + flowering stage recorded maximum values of number of root nodules per plant (15.67) and fresh and dry weight of root nodules (157.67 mg and 52.67 mg, respectively) per plant (Table 1). The increase in number of root nodules per plant, fresh and dry weight of nodules per plant might be due to the better availability of nutrients. The IAA and GA present in *panchagavya* 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)^[6].

Effect on yield

Crop yield is the complex function of physiological processes and biochemical activities, which modify plant anatomy and morphology of the growing plants. Seed and stover yield of chickpea was significantly influenced by different treatments of *panchagavya* application. Foliar spray of *panchagavya* @ 4% at branching + flowering stage recorded the maximum seed yield (2054 kg/ha) and stover yield (2483 kg/ha) (Table 1). This might be attributed to the favorable effect on vegetative growth, i.e. plant height and reproductive growth parameters. These findings are in the line with those reported by Kumawat *et al.* (2009)^[5], Avudaithai *et al.* (2010)^[1], and Suresh *et al.* (2011)^[9].

Effect on economics

The highest gross realization (74373 ₹/ha), net realization (50008 ₹/ha) was incurred under the treatment of foliar spray of *panchagavya* @ 4% at branching + flowering stage with the BCR value of 3.05. The next better treatment in view of gross realization was treatment of RDF (20:40:00 NPK kg/ha) which recorded the net realization of 46553 ₹/ha and BCR value of 2.87 (Table 1). The results are in confirmation with those reported by Swaminathan *et al.* (2007) and Prabhu *et al.* (2010).

Table 1:

Treatments	Plant height (cm) at 90 DAS	Number of nodules/plant	Weight of nodules/plant (mg)		Seed yield (kg/ha)	Stover yield (kg/ha)	Gross return (□/ha)	Net return (□/ha)	B:C Ratio
			Fresh weight	Dry weight					
T ₁ = Foliar spray of <i>panchagavya</i> @ 2% at branching stage	47.4	7.90	115.67	23.67	1609	2016	58331	35366	2.54
T ₂ = Foliar spray of <i>panchagavya</i> @ 2% at flowering stage	45.6	5.87	109.00	23.33	1582	1863	57233	34268	2.49
T ₃ = Foliar spray of <i>panchagavya</i> @ 2% at branching + flowering stage	47.7	8.83	128.00	35.67	1664	2107	60347	36782	2.56
T ₄ = Foliar spray of <i>panchagavya</i> @ 4% at branching stage	51.6	12.73	147.67	49.00	1934	2364	70054	46689	3.00
T ₅ = Foliar spray of <i>panchagavya</i> @ 4% at flowering stage	50.7	11.20	146.00	48.00	1880	2323	68123	44758	2.92
T ₆ = Foliar spray of <i>panchagavya</i> @ 4% at branching + flowering stage	54.9	15.67	157.67	52.67	2054	2483	74373	50008	3.05
T ₇ = Foliar spray of <i>panchagavya</i> @ 6% at branching stage	49.6	10.60	139.33	42.33	1721	2121	62356	38591	2.62
T ₈ = Foliar spray of <i>panchagavya</i> @ 6% at flowering stage	48.6	10.07	134.67	39.67	1677	2110	60805	37040	2.56
T ₉ = Foliar spray of <i>panchagavya</i> @ 6% at branching + flowering stage	50.7	11.33	139.00	44.33	1760	2175	63775	38610	2.53
T ₁₀ = RDF (20-40-0 NPK kg/ha)	52.7	13.90	152.33	50.00	1973	2397	71452	46553	2.87
S.Em. ±	1.8	0.57	3.77	2.07	104	111	--	--	--
C.D. at 5%	5.2	1.68	11.18	6.15	308	331	--	--	--

4. Conclusion

Based on the results of experiment, it is concluded that higher seed yield, net return and B:C ratio of chickpea (cv. Gujarat Gram 1) can be secured by foliar spray of *panchagavya* @ 4% at branching + flowering stage.

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