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**Moomal Bharadwaj**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**SS Lakhawat**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**B Upadhaya**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**Shalini Pilania**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**Devendra Jain**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**RN Bunker**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

**Corresponding Author:**

**Moomal Bharadwaj**

Rajasthan College of Agriculture,  
MPUAT, Udaipur, Rajasthan,  
India

## Effect of organic liquid manures on vegetative growth and yield of pea (*Pisum sativum* L.)

**Moomal Bharadwaj, SS Lakhawat, B Upadhaya, Shalini Pilania, Devendra Jain and RN Bunker**

### Abstract

A field experiment entitled “Effect of organic liquid manures on Growth and Yield of Pea (*Pisum sativum* L.)” was conducted at Horticulture farm, Department of Horticulture, Rajasthan College of Agriculture, Udaipur during *rabi* season during 2020- 21. The experiment was made up of the eight treatments of different combination of organic liquid inputs and those were replicated four times before applied randomly in 32 plots under Randomized Block Design (RBD). The crop's recommended nitrogen dose (RDN) was NPK @ 25:40:50 kg/ha. Results showed that among organic liquid manures practises application of T<sub>8</sub>: T<sub>1</sub> was recorded with significantly highest plant height (30, 60 DAS and at harvest), number of leaves (30, 60 DAS and at harvest), leaf length (cm), leaf area (cm<sup>2</sup>), leaf width(cm), days taken to first flowering, days taken to first picking, was recorded under T<sub>8</sub> treatment (*i.e.*, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% sprays at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS).

**Keywords:** Manures, pea, Horticulture, *rabi*, *Pisum sativum* L.

### Introduction

India is the second largest producer of pea in the world. Pea occupies about 433.00 thousand hectares area which gives a total production of 39.61 lakh tonnes with 9.14t /ha productivity. In Rajasthan, total area under vegetable crop production is 197.90 thousand hectares with a production of 1928.6 thousand MT. (Anonymous, 2019). Pea (*Pisum sativum* L.) is an important vegetable crop grown throughout the world. In India, it is grown as an herbaceous winter annual in the plains of North India and as summer vegetable in the hills. Pea belongs to family Leguminosae and it is considered to be native of South West Asia. It is a self - pollinated crop which thrives best in the cool climate with cardinal temperature range between 10°C to 30°C. Garden peas can be grown on a wide range of soils; however, they thrive best on well drained, loose and friable loamy soils. Peas are utilized mainly as a vegetable. Besides, it is also consumed as a pulse. There are two types of peas are generally cultivated - field pea (*Pisum sativum* L. var. *arvense*) generally used for ‘dal’ making and garden pea (*Pisum sativum* L. var. *hortense*) is a green coloured, wrinkled seeded, sweet in taste used as green vegetable. (Joshi *et al.*, 2020) <sup>[17]</sup>

Organic farming has gained popularity in recent years owing to the awareness of the inherent benefits it provides in terms of crop productivity as well as preserving dynamic soil nutrient status and a safe environment (Lokanath and Parameshwarappa, 2006) <sup>[20]</sup>.

Panchagavya has played a significant role in providing resistance to pests and diseases, resulting in increased overall yields (Tharmaraj *et al.*, 2011). Spraying of panchgavya induces early flowering, high seed setting percentage and also it increases the growth and yield components with growth promoting activity and it is a lowcost technology. It possess the properties of fertilizers and bio pesticides (Siresha, 2013) <sup>[27]</sup>. It has resulted in positive effect on growth and productivity of crops (Somasundaram *et al.*, 2003) <sup>[28]</sup>. Panchagavya plays an important role in the quality of fruits and vegetables. It is used as a foliar spray, soil application along with irrigation, as well as seed treatment (Natarajan, 2002). Vermiwash is nutrient rich liquid manure, extracted from vermicomposts riches with a greater number of earthworms feeding on organic waste material and plant residues. It is non-toxic and eco-friendly, which arrests bacterial growth and forms as a protective layer for their survival and growth. Vermiwash contains N, P, K, Ca & hormones such as auxin, cytokinin, some other secretions and many useful microbes like heterotrophic bacteria, fungi etc.). Jeevamruth promotes immense biological activity in soil and provides the nutrients for the crop stand.

Mixing cow urine, cow dung, pulse flour and jaggary (gur), it is prepared and allowed to ferment for a week. The filtered extract is used for soil application, and numerous beneficial microorganisms are believed to microbiologically enrich soil. Jeevamruth is reported to have a very large population of nitrogen fixers, phosphate solubilizers and siderophore producers (Pathak and Ram, 2013).

## Materials and Methods

### Description of the study area

The experiment was carried out at the Horticulture Farm, Rajasthan College of Agriculture, MPUAT, Udaipur. Geographically, Udaipur is located at 24°35' N latitude, 73°42' E longitude, and an altitude of 582.17 meters above sea level in the south-eastern part of Rajasthan. The region falls under Rajasthan's Agro-climatic zone IV.a. (Sub-Humid Southern Plain and Aravalli Hills). Mean weekly maximum and minimum relative humidity ranged between 90.6% and 22.7%, respectively, and the total rainfall received during the crop period is 12.6 mm. The soil analysis confirmed that soil of experimental field was clay loam belongs to *Typic Haplustepts*, which was slightly alkaline in reaction, low in available nitrogen, medium in available phosphorus, and high in available potassium.

### Experimental design and procedure

The field experiment was laid out in Randomized Block Design with four replications eight treatments as per recommended dose of fertilizer (NPK @ 25:40:50 kg/ha) involving levels of Panchgavya, Jeevamruth, and Vermiwash spray at different growth stages of the crop.

Water spray were applied as per the: T1, Panchagavya @4% spray at 30 and 45 days after sowing; T2, Vermi-wash @10% spray at 30 and 45 days after sowing; T3, Jeevamruth @500 liters/ha at the time of sowing and 30 DAS; T4, Panchagavya @ 4% sprays at 30 and 45 days + vermiwash @ 10 spray at 35 and 50 days; T5, Jeevamruth @ 500 liters /ha at the time of sowing and 30 DAS+ Panchagavya @ 4% spray at 30 and 45 DAS; T6, Jeevamruth @ 500 liters/ ha at the time of sowing and 30 DAS+ Vermiwash @ 10% spray at 30 and 45 DAS; T7, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS+ Panchagavya @ 4% spray at 30 and 45 DAS+ Vermiwash @ 10% spray at 35 and 50 DAS or spray both at 30 and 45 DAS were accommodated in the field.

**Table 1:** Nutrient content (NPK) of inputs used

S. No.	Inputs	N (%)	P <sub>2</sub> O <sub>5</sub> (%)	K <sub>2</sub> O (%)
1.	Vermicompost	1.11	0.27	0.31
2.	Neem cake	5.09	1.10	1.19

## Result and Discussion

### Growth parameter

The results of the investigation presented in (Table 1 to 2). Significantly the plant height (*i.e.*, 25.08, 65.47 and 77.15 cm at 30, 60 DAS and at harvest, respectively) number of leaves (*i.e.*, 47.71, 101.21 and 71.21 at 30, 60 DAS and at harvest, respectively), leaf length and leaf width (*i.e.*, 4.47 and 2.47 cm, respectively), leaf area at harvest (*i.e.*, 11.03 cm<sup>2</sup>), with minimum number of taken to first flowering (*i.e.*, 42.85 days) and, minimum days taken to first pod picking (*i.e.*, 56.45 days) along with maximum number of pod pickings (*i.e.*, 5.9) was recorded under T<sub>8</sub> treatment (*i.e.*, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% sprays at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS) however, significantly minimum plant height (*i.e.*, 12.79, 38.20 and 32.81 cm at 30, 60 DAS and at harvest, respectively), number of leaves (*i.e.*, 23.48, 71.22 and 51.63 at 30, 60 DAS and at final harvest, respectively), leaf length and leaf width (*i.e.*, 2.58 and 1.50 cm, respectively), leaf area at harvest (*i.e.*, 5.75 cm<sup>2</sup>) with highest days taken to first flowering (*i.e.*, 50.34 days) and days taken to first pod picking (*i.e.*, 68.58 days) along with number of pickings (*i.e.*, 3.22) was recorded in T<sub>1</sub> treatment (*i.e.*, control). In the present study the higher growth attributes in T<sub>8</sub> treatment can be accounted for the fact that vermiwash contains higher amount of organic carbon, N, P, K, Ca & Mg nutrients and plant growth hormones which was responsible for rapid growth and development of plants as reported by Maya *et al.*, (2015).

### Yield attributes and Yield

The results of the investigation presented in (Table 3 and 4). The yield parameters of pea were significantly affected by liquid organic manures application. Significantly highest number of pods per plant (*i.e.*, 4.82), pod weight (*i.e.*, 10.24 g), pod length (*i.e.*, 8.85 cm), number of seeds per pod (*i.e.*, 10.95), pod yield per plant (*i.e.*, 49.31 g), pod yield per plot (*i.e.*, 7.396 kg) and pod yield per hectare (*i.e.*, 109.46 t/ha) was observed under T<sub>8</sub> treatment (*i.e.*, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% sprays at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS) however, lowest number of pods per plant (*i.e.*, 2.99), pod weight (*i.e.*, 8.19 g), pod length (*i.e.*, 7.42 cm), number of seeds per pod (*i.e.*, 5.99), pod yield per plant (*i.e.*, 49.31 g), pod yield per plot (*i.e.*, 3.667 kg) and pod yield per hectare (*i.e.*, 109.46 t/ha) was noted in T<sub>1</sub> treatment (*i.e.*, control). Similar findings were also reported by Kumar *et al.* (2011) <sup>[18]</sup> in groundnut, Kumar *et al.* (2012) in blackgram, Choudhary *et al.* (2013) in groundnut and Shinde *et al.* (2015).

**Table 2:** Effect of liquid organic manures on plant height of pea

Treatments	30DAS	60DAS	At last harvest
T <sub>1</sub> Control (water spray)	12.79	38.20	32.81
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	14.41	42.20	39.24
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	16.12	45.99	45.21
T <sub>4</sub> Jeevamruth @500l/ha at the time of sowing and 30 DAS	19.48	53.73	58.02
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	17.89	49.76	51.69
T <sub>6</sub> Jeevamruth @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	21.08	57.58	64.31
T <sub>7</sub> Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	23.50	61.65	70.76
T <sub>8</sub> Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	25.08	65.47	77.15
S.Em±	0.527	1.238	0.747
CD at 5%	1.551	3.642	2.197

**Table 3:** Effect of liquid organic manures on number of leaves of pea

Treatments	30DAS	60DAS	At last harvest
T <sub>1</sub> Control (water spray)	23.48	71.22	51.63
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	26.99	75.58	54.54
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	30.36	79.84	57.81
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	37.44	88.30	63.25
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	33.99	84.14	60.60
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	40.79	92.76	65.84
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	44.20	97.33	68.40
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% spray at 35 and 50 DAS	47.71	101.21	71.21
S.Em±	0.459	0.147	0.736
CD at 5%	1.350	0.432	2.164

**Table 4:** Effect of liquid organic manures on leaf length, leaf width and leaf area of pea

Treatments	Leaf length (cm)	Leaf width(cm)	Leaf area(cm <sup>2</sup> )
T <sub>1</sub> Control (water spray)	2.58	1.50	5.75
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	2.79	1.63	6.50
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	3.02	1.75	7.30
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	3.43	2.03	8.74
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	3.26	1.89	8.09
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	3.64	2.23	9.57
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	4.00	2.35	10.33
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	4.47	2.47	11.03
S.Em±	0.078	0.025	0.168
CD at 5%	0.228	0.075	0.494

**Table 5:** Effect of liquid organic manures on days taken to first flowering, days taken to first pod pickings and total number of pod pickings

Treatments	Days taken to first flowering	Days taken to first pod	Total number of pod pickings
T <sub>1</sub> Control (water spray)	50.34	65.58	3.22
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	49.29	66.93	3.60
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	48.22	65.28	3.99
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	46.12	61.87	4.77
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	47.17	63.61	4.37
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	45.06	60.07	5.15
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	43.98	58.26	5.53
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	42.85	56.45	5.90
S.Em±	0.123	0.287	0.025
CD at 5%	0.362	0.843	0.075

**Table 6:** Effect of liquid organic manures on number of pods per plant and number of seeds per pod of pea

Treatments	Number of pods per plant	Number of seeds per pod of pea
T <sub>1</sub> Control (water spray)	2.99	5.99
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	3.18	6.58
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	3.52	7.27
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	4.04	8.66
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	3.78	7.95
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	4.30	9.30
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	4.56	9.95
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	4.82	10.95
S.Em±	0.038	0.063
CD at 5%	0.113	0.185

**Table 7:** Effect of liquid organic manures on pod weight, pod length and pod diameter of pea

Treatments	Pod weight (g)	Pod length (cm)	Pod diameter (cm)
T <sub>1</sub> Control (water spray)	8.19	7.42	1.29
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	8.46	7.62	1.35
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	8.74	7.82	1.41
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	9.28	8.25	1.55
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	9.01	8.02	1.48
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	9.54	8.45	1.62
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	9.80	8.65	1.69
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	10.24	8.85	1.76
S.Em±	0.048	0.062	0.016
CD at 5%	0.140	0.183	0.048

**Table 8:** Effect of liquid organic manures on pod yield per plant(g), pod yield per plot (kg) and pod yield per hectare (t/ha) of pea

Treatments	Pod yield per plant (g)	Pod yield per plot (kg)	Pod yield per hectare (t/ha)
T <sub>1</sub> Control (water spray)	24.45	3.667	5.43
T <sub>2</sub> Panchagavya @4% spray at 30 and 45 days after sowing	26.85	4.027	5.96
T <sub>3</sub> Vermi- wash @10% spray at 30 and 45 days after sowing	30.77	4.616	6.83
T <sub>4</sub> Jeevamrut @500l/ha at the time of sowing and 30 DAS	37.49	5.624	8.32
T <sub>5</sub> Panchagavya @4% sprays at 30 and 45 days+ vermi- wash@10% spray at 35 and 50 days	34.07	5.110	7.56
T <sub>6</sub> Jeevamrut @ 500 liters /ha at the time of sowing and 30 DAS + Panchagavya@ 4% sprays at 30 and 45 DAS	40.97	6.146	9.10
T <sub>7</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Vermiwash@ 10% sprays at 30 and 45 DAS	44.62	6.693	9.91
T <sub>8</sub> Jeevamrut @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% spray at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS	49.31	7.396	10.95
S.Em±	0.302	0.045	0.067
CD at 5%	0.889	0.133	0.197

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### References

- Abira S, Joseph R, Padmaja CK. Influence of vermicomposted fruit waste and biofertilizers on leaf chlorophyll content of soybean (*Glycine max* (L.) Merrill). *Research on Crops* 2007;3:737-739.
- Ali MN, Ghatak S, Ragul T. Biochemical analysis of panchagavya and sanjibini and their effect in crop yield and soil health. *Journal of crop and Weeds* 2011;2:84-86.
- Amalraj DL, Kumar PG, Ahmed HSK, Abdul R, Kishore N. Microbiological analysis of panchagavya, vermicompost, and FYM and their effect on plant growth promotion of pigeon pea (*Cajanus cajan* L.) in India. *Organic Agriculture* 2013;3:23-29.
- Anonymous. Indian Horticulture database. [www.nhb.gov.in](http://www.nhb.gov.in) 2018a, visited on-19 Dec. 2020
- Anonymous. Vital Statistics, 2018. [www.agriculture.rajasthan.gov.in](http://www.agriculture.rajasthan.gov.in) 2018b, visited on- 19 Dec. 2020
- Bhargavi K, Sumathi V, Krishna Reddy G, Umamahesh V, Bhargav H. Productivity and economics of summer greengram as influenced by different organic manures and organic sprays. *Bulletin of Environment, Pharmacology and Life Sciences* 2018;1:147-157.
- Chandrakala M, Hebsur NS, Bidari BI, Radder BM. Effect of FYM and fermented liquid manures on nutrients uptake by chilli (*Capsicum annum* L.) and soil nutrient status at harvest. *Asian Journal of Horticulture* 2007;4:19-24.
- Chongre S, Mondal R, Biswas S, Munshi A, Mondal R, Pramanic M. Effect of liquid manure on growth and yield of summer green gram (*Vigna radiata* L. Wilczek). *Current Journal of Applied Science and Technology* 2020;38:1-7.
- Choudhary GL, Sharma SK, Choudhary S, Singh KP, Kaushik MK, Bazaya BR. Effect of panchagavya on quality, nutrient content and nutrient uptake of an organic black gram [*Vigna mungo* (L.) Hepper]. *Journal of Pharmacognosy and Phytochemistry* 2017;5:1572-1575.
- Devakumar N, Shubha S, Gouder SB, Rao GGE. Microbial analytical studies of traditional organic preparations beejamruth and jeevamruth, Proc. Building Organic Bridges. 4th ISOFAR Scientific Conference, Istanbul, Turkey 2014,639.
- Dutta AK, Majee SK, Das R. Effect of BD-501 and panchagavya on yield and quality of garden pea cv. Arkel. *International Journal of Latest Engineering and Management Research* 2018;3:50-53.
- Ghugre TD, Gore AK, Jadhav SB. Effect of organic and inorganic nutrient sources on growth, yield and quality of cabbage (*Brassica oleracea*). *J. Soils and Crops* 2007;1:89-92.
- Gopakkali P, Sharanappa. Effect of organic production techniques on the growth, yield, quality and economics of chilli (*Capsicum annum*) and soil quality in dry zone of Karnataka. *Indian Journal of Agronomy* 2014;1:155-156.
- Gopalkrishnan TR. Vegetable crops. New India publishing agency, New Delhi 2007;4:170.



15. Jadhav RL, Kulkarni S. Effect of foliar spray of nutrients on productivity of greengram (*Vigna radiata*) in North Eastern transitional zone of Karnataka. *Legume Research* 2016;5:817-819.
16. Joshi H, Varma LR. Influences of organic nutrients in combination with bio-fertilizers on yield and quality of garden pea (*Pisum sativum* L.) cv. Bonneville. *International Journal of Agricultural Sciences* 2018;10:6063-6066.
17. Joshi HN, Varma LR. Effects of organic nutrients in combination with biofertilizers on uptake N, P, K and yield of garden pea (*Pisum sativum* L.). *The Pharma Innovation Journal* 2020;9:385-389.
18. Kumar RHS, Venkete G, Vanangamudi K. Effect of integrated organic sources of nutrients on quality and economics of groundnut (*Arachis hypogaea* L.). *Advance Research Journal of Crop Improvement* 2011;1:81-85.
19. Lalani SR, Bhalu VB, Chavda MR. Effect of Various Cow-based Solution on Growth and Quality Parameters on Summer Groundnut (*Arachis Hypogaea* L.) *Journal of Agricultural Engineering and Food Technology* 2020;1:16-19.
20. Lokanath HM, Paramesh warappa KG. Effect of organics on the productivity of Spanish bunch groundnut under the rainfed farming situation. *Congress of soil science* 2006,62-63.
21. Lunagariya DD, Zinzala VJ, Barvaliya MM, Dubey PK. Effect of organics on growth, yield, quality, and economics of fenugreek (*Trigonella foenum-graecum* L.) grown under the organic farming system. *Journal of Pharmacognosy and Phytochemistry* 2018;7:2420-2424.
22. Patel DM, Patel IM, Patel BT, Singh NK, Patel CK. Effect of Panchgavya and jivamrut on yield, chemical and biological properties of soil and nutrients uptake by kharif groundnut (*Arachis hypogaea* L.). *International Journal of Chemical Studies* 2018;3:804-809.
23. Patil HM, Udmale KB. Response of different organic inputs on growth and yield of soybean on inceptisol. *Scholarly Journal of Agricultural Sciences* 2016;6:139-144.
24. Rekha GS, Valivittan K, Kaleena PK. Studies on the influence of vermicompost and vermiwash on the growth and productivity of black gram (*Vigna mungo*). *Advances in Biological Research* 2013;4:114-121.
25. Safiullah K, Durani A, Durrani H, Ansari MA. Effect of solid and liquid organic manures on growth, yield and economics of sweet corn (*Zea mays* L. *Var.* Saccharata Sturt) under south Gujarat condition. *International Journal of Pure Applied Bioscience* 2018;2:567-574.
26. Singh NK, Patel DM, Patel IM. Effect of Panchgavya and jeevamrut on yield, chemical and biological properties of soil and nutrients uptake by kharif groundnut (*Arachis hypogaea* L.). *International Journal of Chemical Studies* 2018;3:804-809.
27. Sireesha O. Effect of plant products, panchagavya, and bio-control agents on rice blast disease of paddy and yield parameters. *International Journal of Research in Biological Sciences* 2013;3:48-50.
28. Somasundaram E, Sankaran N, Meena S, Thiyagarajan TM, Chandragiri KK, Panneerselvam S. Response of green gram to varied concentrations of Panchakavya (organic nutrition) foliar application. *Madras Agricultural Journal* 2003;90:169-172.
29. Subrata C, Ramyajit M, Soumik B, Ammaruddin M, Riasen M, Mahadev P. Effect of Liquid Manure on Growth and Yield of Summer Green Gram (*Vigna radiata* L. Wilczek). *Current Journal of Applied Science and Technology* 2020;6:1-7.
30. Sutar R, Sujith GM, Devakumar N. Growth and yield of Cowpea [*Vigna unguiculata* (L.) Walp] as influenced by jeevamrutha and panchagavya application. *Legume Research* 2018;42:824-828.
31. Swaminathan C, Swaminathan V, Richard KR. Panchgavya, *Kisan World* 2007;1:57-58.
32. Tolanur SI, Badanur UP. Effect of integrated use of organic manures, green manure, and fertilizer nitrogen on sustaining productivity of rabi sorghum-chickpea system and fertility of a vertisol. *The journal of the Indian Society of Soil Science* 2003;51:41-44.
33. Verma S. Bio-efficacy of organic formulations along with fertilizers on growth, yield and quality of pigeonpea (*Cajanus cajan* L.). Doctoral dissertation, Institute of Agricultural Sciences, Banaras Hindu University 2016.
34. Vijayakumar B, Yadav RH, Gowri P, Kandari LS. Effect of panchagavya humid and micro herbal fertilizer on the yield and post-harvest soil of Soybean (*Glycine max* L.). *Asian Journal of Plant Sciences* 2012;11:83.