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Effect of liquid organic substances, spray frequency and levels of fertilizer on growth and flowering of okra (*Abelmoschus esculentus* (L.) Moench)

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Abstract
An investigation was carried out on "Effect of liquid organic substances, spray frequency and levels of fertilizer on okra (*Abelmoschus esculentus* (L.) Moench)" at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during *Kharif*, 2021. The experiment was laid out in Factorial Randomized Block Design with eighteen treatment combinations involving two levels of liquid organic substances *i.e.* o_1 (Panchagavya 3%) and o_2 (Jeevamruta 5%), three levels of spray frequency *i.e.* s_1 (Two spray at 20 & 40 DAS), s_2 (Three spray at 20, 40 & 60 DAS) and s_3 (Four spray at 20, 40, 60 & 80 DAS) and levels of fertilizer in three levels *i.e.* f_1 (100% RDF), f_2 (80% RDF) and f_3 (60% RDF) in Gujarat Anand Okra 5 variety. T_7 (Panchagavya 3% + Four spray at 20, 40, 60 & 80 DAS + 100% RDF) produced superior results on growth and flowering parameters *viz*., [stem diameter at 45 DAS and last picking (mm), plant height at 45 DAS and last picking (cm), number of leaves per plant at 45 DAS and last picking and number of nodes at last picking] and [days taken for initiation of first flower after sowing, days taken for flower initiation to edible maturity and days taken for first picking], respectively, as compared to the other treatments.

Keywords: Jeevamruta, *Kharif*, Panchagavya, RDF

Introduction
Okra is one of the important *kharif* and summer vegetable grown widely in sub-tropical region of the world for its tender pods due to its high adaptability over a wide range of environmental conditions. It is commonly known as lady's finger or Bhindi (*Abelmoschus esculentus* (L.) Moench) belongs to the Malvaceae family (NIHORT, 1986) [8]. The okra plant is erect, herbaceous annual green, stem with radish tinge. Okra is most popular in India, Nigeria, Pakistan, Cameroon, Iraq and Ghana. India ranks first in the area and production of okra in the world. In India, okra covers an area of 521 thousand hectare with the production of 6355 thousand MT with an average productivity of 12.20 MT ha^{-1} (Annon. 2019-20) [2]. In Gujarat, it is grown either as sole or inter crop. The main districts of Gujarat where okra is produced in a bulk are Navsari, Surat and Tapi.

Liquid organic formulations like panchagavya and jeevamruta are the fermented products which are used as plant growth enhancing substances prepared with material derived from plants and animals. They are rich sources of beneficial micro flora which support, stimulate the plant growth and help in getting better vegetative growth and also good quality and yield (Devakumar *et al*. 2011) [3]. These liquid organic substances, when applied to the plants, found to influence metabolic processes of plants such as respiration, photosynthesis, nucleic acid synthesis and ion uptake. They are also rich source of macro and micro nutrients, naturally occurring plant growth promoters like GA_3, cytokinin, NAA *etc.* that are required in different concentrations for better growth of plant {Xu and Xu. (2000) [14] and Selvaraj *et al*. (2007) [11]}.

Materials and Methods
A field experiment on okra var. GAO 5 was conducted at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during *kharif* 2021. The experiment was laid out in Factorial Randomized Block Design with total eighteen treatments comprising of three factors *viz*., liquid organic substances (O) *viz*., o_1 (Panchagavya 3%) and o_2 (Jeevamruta 5%); spray frequency (S) *viz*., s_1 (Two spray at 20 & 40 DAS), s_2 (Three spray at 20, 40 & 60 DAS) and s_3 (Four spray at 20, 40, 60 & 80 DAS) and levels of fertilizer *viz*., f_1 (100% RDF), f_2 (80% RDF) and f_3 (60% RDF).

The combination of treatments comprised of Panchagavya 3% + Two spray at 20 & 40 DAS + 100% RDF (T_1), Panchagavya 3% + Two spray at 20 & 40 DAS + 80% RDF (T_2), Panchagavya 3% + Two spray at 20 & 40 DAS + 60% RDF (T_3), Panchagavya 3% + Three spray at 20, 40 & 60 DAS + 100% RDF (T_4), Panchagavya 3% + Three spray at 20, 40 & 60 DAS + 80% RDF (T_5), Panchagavya 3% + Three spray at 20, 40 & 60 DAS + 60% RDF (T_6), Panchagavya 3% + Four spray at 20, 40, 60 & 80 DAS + 100% RDF (T_7), Panchagavya 3% + Four spray at 20, 40, 60 & 80 DAS + 80% RDF (T_8), Panchagavya 3% + Four spray at 20, 40, 60 & 80 DAS + 60% RDF (T_9), Jeevamruta 5% + Two spray at 20 & 40 DAS + 100% RDF (T_{10}), Jeevamruta 5% + Two spray at 20 & 40 DAS + 80% RDF (T_{11}), Jeevamruta 5% + Two spray at 20 & 40 DAS + 60% RDF (T_{12}), Jeevamruta 5% + Three spray at 20, 40 & 60 DAS + 100% RDF (T_{13}), Jeevamruta 5% + Three spray at 20, 40 & 60 DAS + 80% RDF (T_{14}), Jeevamruta 5% + Three spray at 20, 40 & 60 DAS + 60% RDF (T_{15}), Jeevamruta 5% + Four spray at 20, 40, 60 & 80 DAS + 100% RDF (T_{16}), Jeevamruta 5% + Four spray at 20, 40, 60 & 80 DAS + 80% RDF (T_{17}) and Jeevamruta 5% + Four spray at 20, 40, 60 & 80 DAS + 60% RDF (T_{18}) replicated thrice.

The experimental soil was loamy sand, with good drainage condition. As per recommended dose, whole quantity of well decomposed FYM (20 t ha^{-1}) applied to the experiment field before sowing and mixed thoroughly with the soil and dose of N:P:K (100:50:50 kg ha^{-1}) out of which half dose of the nitrogen (N) and full dose of phosphorus (P_2O_5) and potassium (K_2O) were applied as basal dose in the form of urea, single super phosphate (SSP) and muriate of potash (MOP), respectively as per the treatments. The remaining half dose of nitrogen was applied as top dressing in the form of urea at thirty days after sowing. The planting was done at the spacing of 60 cm × 30 cm with gross plot size 3.6 m × 1.8 m and net plot size 2.4 m × 1.2 m. Foliar application of liquid organic substances was performed at 20, 40, 60 and 80 DAS as per the treatments. The stem diameter in milimeter was measured at 45 DAS and at last picking with the help of digital vernier caliper (Absolute digematic caliper mitu Toyo Co. Japan) near ground level of plant. The plant height in centimeter was measured at 45 DAS and at last picking with the help of scale from ground level to the tip of the main shoot. The number of leaves at 45 DAS and at last picking and the number of nodes at last picking were recorded by hand counting method. All the flowering parameters were noted from the date of sowing from each tagged plants. Statistical analysis of the data pertaining to growth and flowering parameters were analysed as per the methods described by Panse and Sukhatme (1985) [9].

Results and Discussion

Growth paramaters

The data on growth attributing characters such as stem diameter at 45 DAS and last picking (mm); plant height at 45 DAS and last picking (cm); number of leaves per plant at 45 DAS and last picking and number of nodes at last picking are depicted in Table 1.

Stem diameter at 45 DAS and last picking (mm)

Various liquid organic substances, spray frequency and levels of fertilizer produced non significant effect on stem diameter at 45 DAS and at last picking. Maximum stem diameter at 45 DAS and at last picking (11.61 and 15.58 mm) was recorded with the treatment o_1 (Panchagavya 3%) among various liquid organic substances. The application of s_3 (Four spray at 20, 40, 60 & 80 DAS) registered with maximum stem diameter at 45 DAS and at last picking (11.72 and 15.75 mm) and the treatment f_1 (100% RDF) gave maximum stem diameter at 45 DAS and at last picking (12.06 and 15.91 mm).

Plant height at 45 DAS and at last picking (cm)

A perusal of the data reveals that the plant height at DAS and at last picking (cm) was significantly influenced. Significantly maximum plant height *i.e.* (45.88 cm and 127.20 cm) was recorded with the treatment o_1 (Panchagavya 3%) at 45 DAS and at last picking, respectively. The influence of spray frequency on plant height at 45 DAS was found non significant. Whereas, significantly maximum plant height (128.72 cm) at last picking was recorded with the treatment s_3 (Four spray at 20, 40, 60 & 80 DAS) which was statistically remained at par (123.85 cm) with s_2 treatment (Three spray at 20, 40 & 60 DAS). Significantly maximum plant height (47.98 cm and 130.39 cm) was recorded with the treatment f_1 (100% RDF) at 45 DAS and at last picking, respectively. The interaction of S × F produced significantly maximum plant height (144.60 cm) at last picking was recorded with the treatment combination of s_3f_1 and the data are depicted in Table 2. The data on interaction effect between O × S × F at last picking revealed that significantly maximum plant height (159.49 cm) at last picking was recorded with the treatment combination of $o_1s_3f_1$ and are presented in Table 3. Though, the interaction of O × S and O × F were not able to produce significant variation.

Table 1: Effect of liquid organic substances, spray frequency and levels of fertilizer on various growth parameters of okra (*Abelmoschus esculentus* (L.) Moench)

Treatment	Stem diameter (mm)		Plant height (cm)		Number of leaves per plant		Number of nodes at last picking
	At 45 DAS	At last picking	At 45 DAS	At last picking	At 45 DAS	At last picking	
Liquid organic substances (O)							
o_1	11.61	15.58	45.88	127.20	17.92	15.21	13.85
o_2	11.27	15.18	43.68	119.87	17.33	14.21	13.07
S.Em. ±	0.28	0.23	0.73	1.85	0.30	0.26	0.27
C.D. at 5%	NS	NS	2.11	5.32	NS	0.74	0.78
Spray frequency (S)							
s_1	11.12	14.95	43.51	118.04	17.08	13.82	13.04
s_2	11.48	15.44	44.97	123.85	17.67	14.83	13.51
s_3	11.72	15.75	45.86	128.72	18.13	15.48	13.83
S.Em. ±	0.34	0.29	0.90	2.27	0.36	0.32	0.33
C.D. at 5%	NS	NS	NS	6.52	NS	0.91	NS
Levels of fertilizer (F)							

f_1	12.06		15.91		47.98		130.39		18.93		16.76		14.07	
f_2	11.44		15.37		44.59		123.02		17.59		14.67		13.44	
f_3	10.82		14.87		41.77		117.21		16.36		12.71		12.86	
S.Em. ±	0.34		0.29		0.90		2.27		0.36		0.32		0.33	
C.D. at 5%	NS		NS		2.58		6.52		1.05		0.91		NS	
Interaction effect	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**
O × S	0.48	NS	0.41	NS	1.27	NS	3.20	NS	0.51	NS	0.45	NS	0.47	NS
O × F	0.48	NS	0.41	NS	1.27	NS	3.20	NS	0.51	NS	0.45	NS	0.47	NS
S × F	0.59	NS	0.50	NS	1.55	NS	3.92	11.29	0.63	NS	0.55	NS	0.58	NS
O × S × F	0.84	NS	0.70	NS	2.20	NS	5.55	15.96	0.89	NS	0.77	NS	0.82	NS
C.V.%	12.72		7.91		8.50		7.78		8.76		9.09		10.53	

Application of 3% panchagavaya showed better results on plant height because panchagavya contains macronutrients such as N, P, K and micronutrients needed for various vitamins, amino acids, growth regulators such as auxins and gibberellins which are required for proper growth and development of plants. Similar results were recorded by Gopakkali and Sharanappa (2014) [5] in chilli and Mishra *et al*. (2015) [7] in capsicum. The result also showed that the application of organic substances with the combination of inorganic fertilizers was found more beneficial for increasing the height of okra plants. This might be due to the fact that the organic substances would have provided congenial of soil physical condition and the micronutrients in an optimum range to the plant. Application of organic substances helped to promote the metabolic activities through the supply of such important micronutrients in the early growth phase which in turn must have encouraged the overall growth. Similar findings were also reported by Swain *et al*. (2015) [13] in Chilli and Amiry *et al*. (2017) [1] in okra.

Table 2: Interaction effect of spray frequency and levels of fertilizer on plant height at last picking (cm) of okra (*Abelmoschus esculentus* (L.) Moench)

Treatment	**Plant height at last picking (cm)**			
	f_1	**f_2**	**f_3**	**Mean S**
s_1	117.44	120.02	116.66	118.04
s_2	129.13	124.65	117.79	123.85
s_3	144.60	124.38	117.17	128.72
Mean F	130.39	123.02	117.21	
S.Em. ±		3.923		
C.D. at 5%		11.285		
C.V.%		7.78		

Table 3: Interaction effect of liquid organic substances, spray frequency and levels of fertilizer on plant height at last picking (cm) of okra (*Abelmoschus esculentus* (L.) Moench)

Treatment	**Plant height at last picking (cm)**					
	o_1			**o_2**		
	s_1	**s_2**	**s_3**	**s_1**	**s_2**	**s_3**
f_1	116.96	129.76	159.49	117.91	128.50	129.71
f_2	123.43	130.14	124.73	116.62	119.16	124.02
f_3	122.85	120.14	117.31	110.47	115.44	117.03
S.Em. ±			5.55			
C.D. at 5%			15.96			
C.V. %			7.78			

Number of leaves per plant at 45 DAS and last picking

Various liquid organic substances has significant impact on the number of leaves per plant at last picking. Effect of organic substances and spray frequency on number of leaves at 45 DAS was found non significant. Significantly maximum number of leaves per plant at last picking (15.21) was recorded with treatment o_1 (Panchagavya 3%). Influence of spray frequency on number of leaves per plant at last picking (15.48) was significantly maximum recorded in s_3 treatment (Four spray at 20, 40, 60 & 80 DAS), which was at par (14.83) with s_2 treatment (Three spray at 20, 40 & 60 DAS). Amongst the different levels of fertilizer, treatment f_1 (100% RDF) was able to produce significantly maximum number of leaves per plant (18.93 and 16.76) at 45 DAS and at last picking, respectively. The interaction effect of different liquid organic substances, spray frequency and levels of fertilizer on number of leaves per plant at 45 DAS and at last picking was found non significant.

This increase in number of leaves per plant might be due to the proper nutrition to okra crop through the foliar application of organic products which contributed to enhance source-sink relationship in the plant. The results were in the similar line with Suchitra *et al*. (2017) [12] in okra.

Number of nodes at last picking

The data on number of nodes at last picking revealed that effect of liquid organic substance on number of nodes at last picking was found significant. The treatment o_1 (Panchagavya 3%) recorded higher number of nodes (13.85) which was at par (13.07) with treatment o_2 (Jeevamruta 5%). While, the influence of spray frequency and levels of fertilizer on number of nodes at last picking were unable to produce significant variation.

The number of nodes at last picking was considerably increased due to the application of panchagavya. This foliar spray of panchagavya on the plants may have accelerated the metabolic process and resulted in to maximum branches which ultimately increased the number of nodes. Similar findings were reported by Amiry *et al*. (2017) [1] in okra.

Flowering parameters

The observation on flowering parameters attributing characters such as days taken for initiation of first flower after sowing, days taken for flower initiation to edible maturity and days taken for first picking were significantly influenced by different liquid organic substances, spray frequency and levels of fertilizer. The mean data are depicted in Table 4.

Days taken for initiation of first flower after sowing

It is explicit from the data that the days taken for initiation of first flower after sowing significantly influenced by the different liquid organic substances, spray frequency and levels of fertilizer during the period of investigation. An inquisition of the data revealed that of liquid organic sources revealed that significantly minimum days to first flowering (37.81 and 36.53) were recorded with treatment o_1 (Panchagavya 3%)

and treatment f_1 (100% RDF), respectively. The application of s_3 treatment (Four spray at 20, 40, 60 & 80 DAS) registered significantly minimum days to first flowering (37.93) which was at par with s_2 treatment (38.95). Examination of the interaction effect was found non significant among various liquid organic substances, spray frequency and levels of fertilizer on days taken for initiation of first flower after sowing.

The application of panchagavya has growth regulating effect along its insecticidal properties which must have triggered the formation of florigen resulting in early flowering. The present finding is in consonance with the observations of Mathews *et al*. (2017) [6] in tomato, brinjal and okra as well. The better nutrient availability and nutrient uptake increased the growth and yield of crop. The possible reason for earliness in flowering might be due to the accelerated photosynthesis and rapid translocation of photosynthates towards the initiating flower buds resulting in early flowering. Ramesh *et al*. (2015) [10] reported similar result from combination of vermicompost, liquid organic substances and RDF in tomato.

Table 4: Effect of liquid organic substances, spray frequency and levels of fertilizer on various flowering parameters of okra (*Abelmoschus esculentus* (L.) Moench)

Treatment	Days taken for initiation of first flower after sowing		Days taken for flower initiation to edible maturity		Days taken for first picking	
Liquid organic substances (O)						
o_1	37.81		7.06		45.03	
o_2	40.76		7.36		47.71	
S.Em. ±	0.57		0.08		0.79	
C.D. at 5%	1.64		0.24		2.28	
Spray frequency (S)						
s_1	40.97		7.41		47.84	
s_2	38.95		7.11		46.09	
s_3	37.93		7.10		45.18	
S.Em. ±	0.70		0.10		0.97	
C.D. at 5%	2.01		NS		NS	
Levels of fertilizer (F)						
f_1	36.53		6.71		43.20	
f_2	39.08		7.03		46.15	
f_3	42.24		7.88		49.75	
S.Em. ±	0.70		0.10		0.97	
C.D. at 5%	2.01		0.29		2.79	
Interaction effect	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**	**S.Em. ±**	**C.D. at 5%**
O × S	0.99	NS	0.14	NS	1.37	NS
O × F	0.99	NS	0.14	NS	1.37	3.94
S × F	1.21	NS	0.18	NS	1.68	NS
O × S × F	1.71	NS	0.25	NS	2.37	NS
C.V. %	7.56		5.99		8.87	

Days taken for flower initiation to edible maturity

Inspection of data revealed that the effect of various liquid organic substances on days taken for flower initiation to edible maturity was found significant. Significantly the minimum days taken from flowering to edible maturity (7.06 and 6.71) were recorded with the treatment o1 (Panchagavya 3%) and treatment f_1 (100% RDF), respectively. The data showed non significant difference for days taken for flower initiation to edible maturity among spray frequency. The interaction effect of different liquid organic substances, spray frequency and levels of fertilizer was unable to produce significant effect on days taken for flower initiation to edible maturity. The application of liquid organic substance may have attributed to the faster enhancement of vegetative growth and storing sufficient reserved food materials for enhanced growth. It might also be due to huge amount of beneficial microbes present in panchagavya which may have helped in decomposition of organic matter and releasing of available nutrients for easy uptake and utilization by plants from the soil treated with them resulting in better growth and development. These findings are in agreement with Ramesh *et al*. (2015) [10] in tomato.

Days taken for first picking

An elaborate study of data showed that the significantly minimum days to first picking (45.03 and 43.20) were recorded with the treatment o_1 (Panchagavya 3%) and treatment f_1 (100% RDF), respectively. While, inspection of data showed non significant difference for days to first picking among spray frequency. The data on interaction effect between liquid organic substances (O) and levels of fertilizer (F) on days to first picking was able to create significant variation and presented in Table 5. The significantly minimum days to first picking (42.99) was recorded with the treatment combination of o_1f_1 which was at par with o_1f_2 (45.72), o_1f_3 (46.38), o_2f_1 (43.41) and o_2f_2 (46.59) treatment. Further view of data revealed that interaction effect between O × S, S × F and O × S × F on days to first picking was found non significant.

Minimum time taken for days to first picking with three sprays of panchagavya may be due to proper nutrient content in panchagavya leads to early maturity. Similar observation was recorded earlier by Devanda *et al*. (2021) [4] in okra. The application of panchagavya may have attributed to the faster enhancement of vegetative growth and storing sufficient reserved food materials for differentiation of buds into flower buds and consequently fruit growth and development ultimately resulted in early harvest. This was might be due to more vegetative growth from transplanting to floral bud caused nutrient stress and it resulted to early flower. The

flowering period extend for long time due to supply of nutrient through top dress of fertilizer and higher cytokinin and auxin in the tissue by spray of organic substances on plant. These findings are in agreement with Ramesh *et al*. (2015) [10] in tomato.

Table 5: Interaction effect of liquid organic substances and levels of fertilizer on days taken for first picking of okra (*Abelmoschus esculentus* (L.) Moench)

Treatment	Days taken for first picking			
	f_1	f_2	f_3	Mean O
o_1	42.99	45.72	46.38	45.03
o_2	43.41	46.59	53.12	47.71
Mean F	43.20	46.15	49.75	
S.Em. ±	1.37			
C.D. at 5%	3.94			
C.V. %	8.87			

From the above results, it was found that the flowering characters were also significantly enhanced with application of o_1 (Panchagavya 3%) and recorded minimum days taken for initiation of first flower after sowing, days taken for flower initiation to edible maturity and days taken for first picking. Panchagavya is liquid organic solution, prepared from cow dung, cow urine, cow milk, curd, cow deshi ghee, sugarcane juice, tender coconut water, banana paste and toddy or grape juice. It source to play great role for promoting growth and providing immunity in plant system. Bio-chemical properties of panchagavya revealed that it possesses almost all the major nutrients like N, P, K and micro nutrients essential for plant and growth hormones like IAA and GA required for crop growth (Mathews *et al*. 2017) [6].

Conclusions

On the basis of results obtained from the present investigation, it can be concluded that the foliar spray of 3% panchagavya at 20, 40, 60 & 80 DAS along with 100% RDF is the best in terms of growth and flowering parameters in okra.

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References

1. Amiry MN, Anjanappa M, Ibaad MH. Influence of integrated nutrient management on growth, yield and yield attributes of Okra (*Abelmoschus esculentus* (L). Moench) cv. Arka Anamika under drip irrigation. International Journal of Pure and Applied Bioscience 2017;5(6):703-707.
2. Anonymous. Indian Horticulture Database. National Horticulture Board, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi, 2019.
3. Devakumar N, Rao GGE, Reddy VC, Pradeep S. Developing organic package of practices for yield maximization of irrigated field bean. Developing organic package of practices for yield maximization of irrigated field bean. Annual report. Research Institute on Organic Farming, UAS, Bengaluru, (2011-2012).
4. Devanda P, Lakhawat SS, Pilania S, Sharma SK, Mordia A, Dudi DPS *et al*. Effect of organic manures and liquid formulations on growth, yield and quality of okra (*Abelmoschus esculentus* (L.) Moench) cv. Arka Anamika. International Journal of Current Microbiology and Applied Sciences. 2021;10(6):426-433.
5. Gopakkali, Sharanappa. Effect of organic production technology on the growth, yield, quality and economics of chilli (*Capsicum annuum* L.) and soil quality in dry zone of Karnataka. Indian Journal of Agronomy. 2014;59(1):151-156.
6. Mathews NS, Bharani A, Nandhini DU. Influence of organic inputs on growth parameters of vegetable crops under terrace farming. International Journal of Chemical Studies. 2017;5(5):763-765.
7. Mishra N, Sahu GS, Mishra PP, Ray M. Effect of panchagavya on growth and yield of capsicum. International Journal of Tropical Agriculture. 2015, 33(4).
8. NIHORT- National Horticultural Research Institute. Advances in fruit and vegetable research at NIHORT, 1978-1986, p. 62.
9. Panse VG, Sukhatme PV. In Statistical methods for Agricultural workers. Edn 4, Indian Council of Agricultural Research Publication, New Delhi, 1985, pp. 87-89.
10. Ramesh G, Ajithkumar K, Savitha AS, Patil SG. Integrated influence of organic manures in addition to inorganic fertilizers on growth, yield parameters and early blight disease of tomato (*Lycopersicon esculentum* L.). International Journal of Biological and Pharmaceutical Research. 2015;6(6):478-483.
11. Selvaraj J, Ramaraj B, Devarajan K, Seenivasan N, Senthikumar S, Sakthi E. Effect of organic farming on growth and yield of thyme. In articles and abstracts of national seminar on production and utilization of medicinal plants, 13-14, March, 2007 held at Annamalaie University, Tamil Nadu, 63.
12. Suchitra R, Poonguzhali S, Saranya B, Suguna S, Jothibasu K. Effect of panchagavya on growth and yield of okra. International Journal of Current Microbiology and Applied Sciences. 2017;6(9):3090-3097.
13. Swain SS, Sahu GS, Mishra N. Effect of panchagavya on growth and yield of chilli (*Capsicum annuum* L. cv. Kuchinda Local). Green Farming. 2015;6(2):338-340.
14. Xu HL, Xu HL. Effect of a microbial inoculants and organic fertilizer on growth, photosynthesis and yield of sweet corn. Journal of Crop Production. 2000;3(1):183-214.