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## Effect of nutrient management through organic sources on yield and quality of garlic (*Allium sativum* L.) under organic farming

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### Abstract

An experiment was conducted on medium black calcareous soil at Junagadh (Gujarat) to evaluate FYM, biofertilizers and botanicals for organic cultivation of garlic (var. Gujarat Garlic 4) during *Rabi* season of 2017-18 and 2018-19. The results revealed that the growth parameters, yield attributes and yield were significantly influenced by the various organic treatments in both years and pooled results. The experimental results revealed that the application of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS (T<sub>1</sub>) produced significant effect on growth parameters, yield attributes and yield obtained significantly higher bulb yield (68.04, 71.28 and 68.99 q/ha) and straw yield (8.63, 9.47 and 8.87 q/ha) in 2018, 2019 and pooled results, respectively.

**Keywords:** Organic, *rabi*, *Panchgavya*, FYM

### Introduction

Garlic (*Allium sativum* L.) belongs to family "Alliaceae". Garlic is the second most important bulb crop grown in India for spices and condiments. It has a compound bulb, containing 10-16 cloves enclosed by a thin membranous sheath. It is considered as a valuable, nutritive, medicinal and condimental crop produce used throughout the world. It comprises of more than 600 species (Davies, 1992).

Garlic is the second most widely used cultivated *Allium* after onion in spices. It is grown throughout the plains of India. In India, major garlic growing states are Madhya Pradesh, Rajasthan, Gujarat, Orissa, Assam and Himachal Pradesh. Among states Gujarat rank 3<sup>rd</sup> in production after Madhya Pradesh and Rajasthan. Garlic is grown in 3.03 lakh hectares in India with the production of 17.21 lakh tones and productivity of 5.68 t ha<sup>-1</sup> during 2018-19. In Gujarat, it is grown on 9823 hectares with production of 1.51 lakh tones and the productivity of 6.24 t ha<sup>-1</sup>, which is higher than national productivity of 5.0 t ha<sup>-1</sup> (Anonymous, 2018).

With increased awareness on organic farming among the farming community, they are using of many organic formulations in crop production. During the last few years there has been increasing interest in the use of *Panchagavya*, *Jivamrut* and other liquid organic formulations. *Panchagavya* and *Jivamrut* are two organic products which have received wide spread attention and acceptability among organic farming practitioners. Application of cow-based bio-enhancers, botanicals, organic manures and biofertilizers such as *Panchagavya*, *Jivamrut*, banana sap, seaweed extract, cattle manure, vermicompost and *Azotobacter*, Phosphorus solubilizing bacteria (PSB), Potassium solubilising bacteria (KSB) and Sulphur oxidizing bacteria (SOB) has led to a decrease in the use of chemical fertilizers and has provided high quality products free from harmful agro-chemicals for human safety. Cattle manure is the source of N and other nutrients (such as phosphorus, potassium, calcium, iron, zinc and copper) for plants that can make valuable contributions to soil's organic matter, can improve physical properties, and is a centre for biological activities. Free-living nitrogen fixing bacteria such as *Azotobacter chroococcum* and *Azospirillum lipoferum*, are found to have not only the ability to fix nitrogen but also the ability to release phytohormones similar to gibberellic acid and indole acetic acid. Organic matter promotes formation of soil crumb, thus makes the soil friable and thereby, facilitates the proper movement of air and water as well as absorption of rain water.

They also add plant nutrients to the soil and organic acid during decomposition which act on the insoluble nutrients reserve in the soil and make them available.

## Materials and Methods

The experiment was conducted at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *rabi* season of 2017-18 and 2018-19. The soil of the experimental plot was clayey in texture, medium in organic carbon (0.55 and 0.61% in 2017-18 and 2018-19, respectively) and slightly alkaline in reaction with  $\text{pH}_{2.5}$  8.0 to 7.8 and  $\text{EC}_{2.5}$  0.55 to 0.50  $\text{dSm}^{-1}$ . The soil was low in available nitrogen (210 and 216  $\text{kg ha}^{-1}$  in 2017-18 and 2018-19, respectively), low in available phosphorus (21.56 and 17.68  $\text{kg ha}^{-1}$  in 2017-18 and 2018-19, respectively) and medium in available potassium (229 and 215  $\text{kg ha}^{-1}$  in 2017-18 and 2018-19, respectively). The values of sulphur, available micronutrients (Fe, Zn, Mn, Cu and B) and  $\text{CaCO}_3$  for the year 2017-18 and 2018-19. Twelve treatments comprising of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_1$ ), FYM @ 10 t/ha + *Jivamrut* @ 500 l/ha at sowing, 30 and 60 DAS ( $T_2$ ), FYM @ 10 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS ( $T_3$ ), FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS ( $T_4$ ), FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS ( $T_5$ ), Vermicompost @ 5 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_6$ ), Vermicompost @ 5 t/ha + *Jivamrut* @ 500 l/ha at sowing, 30 and 60 DAS ( $T_7$ ), Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS ( $T_8$ ), Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS ( $T_9$ ), Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS ( $T_{10}$ ), FYM @ 5 t/ha + Vermicompost 2.5 t/ha ( $T_{11}$ ) and Control (Absolute) ( $T_{12}$ ) in randomized block design with three replications. Additionally, *Azotobacter*, PSB, KSB and SOB were applied each @ 1 l/ha through drenching at time of sowing to the all plots except control.

The crop was raised with all the standard package of practices and protection measures also timely carried out as they required. The experimental data recorded for growth parameters, yield attributes and yield parameters were statistically analyzed for level of significance.

## Results and Discussion

### Growth, yield attributes and yields

The data revealed that The treatment  $T_1$  i.e. FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS was found superior by producing significantly higher plant height (41.58, 42.64 and 42.11 cm) during 2017-18 and 2018-19 and in pooled results at harvest of garlic crop. The increase in plant height might be due to application of nutrients through foliar spray of *Panchgavya* enhanced the growth rate of plant since it contains the favourable macro and micro nutrients, growth hormones and biofertilizers in liquid formulation. Moreover the presence of growth enzymes in *Panchgavya* might have favoured rapid cell division and elongation and increased the activities of beneficial microorganisms in soil by application of FYM which ultimately resulted into production of growth promoting substances and improved nutrient availability for longer period and thus, beneficial effects on growth parameters of garlic. Similar findings have been reported by Kumar *et al.* (2011)<sup>[6]</sup>, Sahare (2015)<sup>[4]</sup> and Javiya (2019)<sup>[5]</sup>. Significantly the highest diameter of bulb (3.65, 3.71 and 3.68 cm during the year 2018, 2019 and in pooled results, respectively) was

registered with an application of FYM @ 5 t/ha + Vermicompost @ 2.5 t/ha ( $T_{11}$ ).

The results revealed that significantly the dry weight of bulb (15.06, 15.90 and 15.48 g), highest number of cloves (22.60 and 21.35 during 2019 and in pooled results, respectively), 100 cloves weight (77.53, 80.41 and 78.97 g during the year 2018, 2019 and in pooled results, respectively) were noted with an application of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_1$ ) during the year 2018, 2019 and in pooled results, respectively,

The result data indicated that the application of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_1$ ) gave significantly highest bulb yield in values of 71.28 and 68.99 q/ha during 2019 and pooled results, it was remain at par with  $T_{11}$  and  $T_6$  during 2019 and pooled results respectively, while, it was registered highest value (68.04 q/ha) with treatment of Vermicompost @ 5 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_6$ ) which was remain at par with  $T_1$  and  $T_{11}$  during 2018. Whereas, the treatment  $T_{12}$  (Control) registered significantly the lowest bulb yield (40.26, 41.27 and 40.77 q/ha) in 2018, 2019 and pooled results, respectively.

The result data indicated that the application of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_1$ ) gave significantly highest straw yield in values of 8.63 and 8.87 q/ha during 2018 and pooled results, it was remain at par with  $T_3, T_4, T_5, T_6, T_8, T_9$  and  $T_{11}$  in 2018, and  $T_3, T_4, T_5, T_6$  and  $T_{11}$  in pooled results respectively, while, it was noted higher value (9.47 q/ha) with treatment of Vermicompost @ 5 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS ( $T_6$ ) which was remain at par with  $T_1, T_3, T_4, T_5, T_6, T_8, T_9$  and  $T_{11}$  during 2019. Whereas, the treatment  $T_{12}$  (Control) registered significantly the lowest straw yield (3.12, 4.94 and 4.03) q/ha in 2018, 2019 and pooled results, respectively.

The increase in diameter of bulb, dry weight of bulb, number of cloves, 100 cloves weight, dry bulb yield, bulb yield and straw yield due to the better availability of nutrients which enabled the increased yield. FYM might have improved the physical and biochemical properties of the soil and increased the activities of beneficial microorganisms which resulted in to production of growth promoting substances and improved nutrient availability for longer period and thus, beneficial effects on growth and yield parameters of garlic. Inoculation of various biofertilizers (*Azotobacter*, PSB, KSB and SOB) might be due to increase in nutrient availability through solubilization of insoluble inorganic fertilizers, decomposition of organic compounds, production of plant growth promoting substances which favors the growth and development of crop and in possess anti-pathogenic activity aided in soils and ultimately resulted higher garlic yield (Darzi *et al.*, 2009 and Adel *et al.*, 2012)<sup>[10, 11]</sup>. Crop yield is the complex function of physiological processes and biochemical activities which modify plant anatomy and morphology of the growing plants. Organic point of view, bulb and straw yields of garlic were significantly increased with *Panchgavya* as foliar spray @ 3% at 30, 45 and 60 DAS + FYM 10 t/ha ( $T_1$ ), which might due to an enhanced release of nitrogen from the growth promoting substances produced by the microbes present in *Panchgavya*. Adequate quantity of enzymes present in the cells might be have favoured rapid growth which turned out to be yield. Similar findings were also reported by Mavarkar *et al.* (2016)<sup>[1]</sup> in groundnut, Sahare (2015)<sup>[4]</sup> in rice, Rao *et al.* (2015)<sup>[3]</sup> in chilli, Mishra *et al.* (2015)<sup>[2]</sup> in capsicum, Subha *et al.* (2014)<sup>[9]</sup> in maize, Anuja and Vijayalakshmi (2014)<sup>[8]</sup> in Cowpea, Javiya (2019)<sup>[5]</sup> in wheat and Bhalodia (2018)<sup>[7]</sup> in garlic.

**Table 1:** Effect of different treatments on plant height of garlic at harvest

	Treatments	Plant height (cm)		
		2017-18	2018-19	Pooled
T <sub>1</sub>	FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	41.58	42.64	42.11
T <sub>2</sub>	FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	38.20	40.30	39.25
T <sub>3</sub>	FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	36.72	38.63	37.68
T <sub>4</sub>	FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	38.30	40.47	39.39
T <sub>5</sub>	FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	40.77	42.35	41.56
T <sub>6</sub>	Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	39.34	40.98	40.16
T <sub>7</sub>	Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	36.38	38.39	37.39
T <sub>8</sub>	Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	37.14	39.20	38.17
T <sub>9</sub>	Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	37.14	39.47	38.31
T <sub>10</sub>	Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	39.56	41.76	40.66
T <sub>11</sub>	FYM @ 5t/ha + Vermicompost 2.5 t/ha	40.19	41.41	40.80
T <sub>12</sub>	Control (Absolute)	31.74	32.85	32.30
	S.Em.±	1.71	1.66	1.19
	C.D. at 5%	5.02	4.88	3.40
	C.V.%	7.79	7.23	7.50
	Y			
	S.Em.±			0.49
	C.D. at 5%			1.38
	Y x T			
	S.Em.±			1.69
	C.D. at 5%			NS

**Table 2:** Effect of different treatments on diameter of bulb of garlic at harvest

	Treatments	Diameter of bulb (cm)		
		2017-18	2018-19	Pooled
T <sub>1</sub>	FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	3.49	3.59	3.54
T <sub>2</sub>	FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	3.47	3.53	3.50
T <sub>3</sub>	:FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	3.07	3.07	3.07
T <sub>4</sub>	FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	2.95	3.08	3.02
T <sub>5</sub>	FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	3.08	3.48	3.28
T <sub>6</sub>	Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	3.06	3.16	3.11
T <sub>7</sub>	Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	3.56	3.55	3.55
T <sub>8</sub>	Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	3.14	3.37	3.26
T <sub>9</sub>	Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	2.93	3.11	3.02
T <sub>10</sub>	Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	2.81	2.96	2.88
T <sub>11</sub>	FYM @ 5 t/ha + Vermicompost @ 2.5 t/ha	3.65	3.71	3.68
T <sub>12</sub>	Control (Absolute)	2.30	2.63	2.46
	S.Em.±	0.17	0.17	0.12
	C.D. at 5%	0.51	0.51	0.35
	C.V.%	9.68	9.19	9.43
	Y			
	S.Em.±			0.05
	C.D. at 5%			0.14
	Y x T			
	S.Em.±			0.17
	C.D. at 5%			NS

**Table 3:** Effect of different treatments on dry weight of bulb of garlic at harvest

	Treatments	Dry weight of bulb (g)		
		2017-18	2018-19	Pooled
T <sub>1</sub>	FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	15.06	15.90	15.48
T <sub>2</sub>	FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	9.16	10.09	9.63
T <sub>3</sub>	FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	10.84	11.83	11.34
T <sub>4</sub>	FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	13.33	13.93	13.63
T <sub>5</sub>	FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	14.76	15.70	15.24
T <sub>6</sub>	Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	14.89	15.87	15.39
T <sub>7</sub>	Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	9.13	10.13	9.64
T <sub>8</sub>	Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	10.72	13.52	12.12
T <sub>9</sub>	Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	13.52	14.32	13.92
T <sub>10</sub>	Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	13.60	14.53	14.07
T <sub>11</sub>	FYM @ 5t/ha + Vermicompost @ 2.5 t/ha	14.71	15.65	15.19
T <sub>12</sub>	Control (Absolute)	6.13	6.99	6.57
	S.Em.±	1.17	1.21	0.84
	C.D. at 5%	3.43	3.55	2.40

C.V.%	10.65	9.88	10.25
Y			
S.Em.±			
C.D. at 5%			
Y x T			
S.Em.±			
C.D. at 5%			
			1.19
			NS

**Table 4:** Effect of different treatments on number of cloves of garlic at harvest

Treatments	Number of cloves		
	2017-18	2018-19	Pooled
T <sub>1</sub> FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	20.10	22.60	21.35
T <sub>2</sub> FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	16.31	17.27	16.79
T <sub>3</sub> FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	18.27	19.27	18.77
T <sub>4</sub> FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	19.45	20.54	19.99
T <sub>5</sub> FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	20.76	21.48	21.12
T <sub>6</sub> Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	20.63	21.48	21.05
T <sub>7</sub> Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	16.27	17.42	16.85
T <sub>8</sub> Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	16.85	17.70	17.28
T <sub>9</sub> Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	19.58	20.49	20.04
T <sub>10</sub> Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	19.82	20.80	20.31
T <sub>11</sub> FYM @ 5t/ha + Vermicompost @ 2.5 t/ha	20.59	21.64	21.12
T <sub>12</sub> Control (Absolute)	12.68	13.76	13.22
S.Em.±	1.34	1.19	0.89
C.D. at 5%	3.92	3.49	2.55
C.V.%	12.56	10.55	11.54
Y			
S.Em.±			
C.D. at 5%			
Y x T			
S.Em.±			
C.D. at 5%			
			1.27
			NS

**Table 5:** Effect of different treatments on 100 cloves weight of garlic at harvest

Treatments	100 cloves weight (g)		
	2017-18	2018-19	Pooled
T <sub>1</sub> FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	77.53	80.41	78.97
T <sub>2</sub> FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	54.38	58.22	56.30
T <sub>3</sub> FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	62.58	64.38	63.48
T <sub>4</sub> FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	58.20	60.51	59.35
T <sub>5</sub> FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	73.53	75.73	74.63
T <sub>6</sub> Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	72.57	74.59	73.58
T <sub>7</sub> Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	53.24	55.71	54.48
T <sub>8</sub> Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	66.19	68.60	67.40
T <sub>9</sub> Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	57.34	59.57	58.46
T <sub>10</sub> Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	73.18	75.52	74.35
T <sub>11</sub> FYM @ 5t/ha + Vermicompost @ 2.5 t/ha	77.10	79.28	78.19
T <sub>12</sub> Control (Absolute)	42.04	43.51	42.77
S.Em.±	2.37	2.34	1.66
C.D. at 5%	6.94	6.86	4.74
C.V.%	6.40	6.11	6.25
Y			
S.Em.±			
C.D. at 5%			
Y x T			
S.Em.±			
C.D. at 5%			
			2.35
			NS

**Table 6:** Effect of different treatments on bulb yield of garlic at harvest

Treatments	Bulb yield (g/ha)		
	2017-18	2018-19	Pooled
T <sub>1</sub> FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	66.70	71.28	68.99
T <sub>2</sub> FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	48.61	51.11	49.86
T <sub>3</sub> FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	58.52	63.65	61.09
T <sub>4</sub> FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	60.50	64.69	62.60
T <sub>5</sub> FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	61.27	64.32	62.80
T <sub>6</sub> Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	68.04	69.59	68.81

T <sub>7</sub>	Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	45.40	50.59	48.00
T <sub>8</sub>	Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	58.40	60.23	59.31
T <sub>9</sub>	Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	55.33	59.30	57.32
T <sub>10</sub>	Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	54.44	58.51	56.48
T <sub>11</sub>	FYM @ 5t/ha + Vermicompost @ 2.5 t/ha	67.61	70.22	68.92
T <sub>12</sub>	Control (Absolute)	40.26	41.27	40.77
	S.Em.±	1.62	1.49	1.10
	C.D. at 5%	4.76	4.36	3.14
	C.V.%	6.92	7.88	8.96
	Y			
	S.Em.±			0.47
	C.D. at 5%			1.33
	Y x T			
	S.Em.±			1.63
	C.D. at 5%			NS

**Table 7:** Effect of different treatments on straw yield of garlic at harvest

Treatments	Straw yield (q/ha)			
	2017-18	2018-19	Pooled	
T <sub>1</sub>	FYM @ 10 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	8.63	9.11	8.87
T <sub>2</sub>	FYM @ 10 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	5.84	7.04	6.44
T <sub>3</sub>	FYM @ 10 t/ha + Banana Pseudostemsap as foliar spray @ 1% at 30 and 60 DAS	7.64	8.46	8.05
T <sub>4</sub>	FYM @ 10 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	7.68	8.51	8.10
T <sub>5</sub>	FYM @ 10 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	7.49	8.81	8.15
T <sub>6</sub>	Vermicompost @ 5 t/ha + <i>Panchgavya</i> as foliar spray @ 3% at 30 and 60 DAS	8.22	9.47	8.85
T <sub>7</sub>	Vermicompost @ 5 t/ha + <i>Jivamrut</i> @ 500 l/ha at sowing, 30 and 60 DAS	5.65	6.82	6.23
T <sub>8</sub>	Vermicompost @ 5 t/ha + Banana Pseudostem sap as foliar spray @ 1% at 30 and 60 DAS	7.26	8.03	7.64
T <sub>9</sub>	Vermicompost @ 5 t/ha + Seaweed extract as foliar spray @ 3.5% at 30 and 60 DAS	7.21	7.82	7.52
T <sub>10</sub>	Vermicompost @ 5 t/ha + Cow urine as foliar spray @ 5% at 30 and 60 DAS	6.78	7.32	7.05
T <sub>11</sub>	FYM @ 5t/ha + Vermicompost @ 2.5 t/ha	8.25	9.42	8.84
T <sub>12</sub>	Control (Absolute)	3.12	4.94	4.03
	S.Em.±	0.31	0.40	0.26
	C.D. at 5%	0.92	1.19	0.73
	C.V.%	7.79	8.79	8.39
	Y			
	S.Em.±			0.10
	C.D. at 5%			0.29
	Y x T			
	S.Em.±			0.36
	C.D. at 5%			NS

## Conclusion

It can be concluded that for obtaining higher yield components with better quality of garlic (*cv.* GG-4) should be obtained with application of FYM @ 10 t/ha + *Panchgavya* as foliar spray @ 3% at 30 and 60 DAS in medium black calcareous soils of South Saurashtra region of Gujarat.

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