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Effect of INM on gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty under Navsari and Tansa Conditions

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ABSTRACT

Field investigations were carried out to know the "Response of INM on gladiolus (Gladiolus grandiflorus L.) cv. American Beauty under Navsari and Tansa conditions" was carried out at Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) and ASPEE Research Farm, Tansa, Mumbai (Maharastra) during 2015-16. An application of bio-fertilizers, FYM along with chemical fertilizers and foliar spray of Nauroji Novel Organic Liquid Fertilizer have shown significant result in the treatments at both locations viz., Navsari and Tansa. Significantly maximum plant height, number of leaves per plant and minimum days taken to spike initiation, days to harvesting of spike from initiation and maximum spike length, rachis length, florets per spike, floret diameter, vase life, spikes yield, number of corms per plant, weight of corms per plant, weight of cormels per plant, size of the corm, NPK contents in leaf, organic carbon, available N, P and K in soil was found best in the combination of 100% RDF + FYM @ 7.5 t/ha + Azotobacter + PSB + KMB + 1% foliar spray of Nauroji Novel Organic Liquid Fertilizer (T_{10}) followed by T_7 i.e. 100% RDF + FYM @ 7.5 t/ha + Azotobacter + PSB + KMB and T_6 i.e. 75% RDF + FYM @ 7.5 t/ha + Azotobacter + PSB + KMB at both Navsari and Tansa conditions.

Key words: *INM, Gladiolus, Bio-fertilizers, Growth, Yield*

INTRODUCTION

Gladiolus is commonly known as sword lily, corn flag and gladioli. It is also known as "Queen of bulbous flowers". Botanically gladiolus is known as *Gladiolus grandiflorus* L. and belongs to family Iridaceae. The flower is popular for its majestic spikes which contain attractive, elegant, dazzling and delicate florets. These florets open in sequence over longer duration and hence, have a good keeping quality of cut spikes. The colour range in gladiolus is fantastic and almost any colour from near to black to white, pink, violet, lilac or mauve, greenish, smoky and combinations of these colours are also available. The spikes of gladiolus are mainly used for garden, interior decoration and for making bouquets. It has been great market value on the festival like of Diwali, Holi, New Year, Christmas and also on marriage ceremony.

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Today, the production of crops is constant or moving toward reduction while, nitrogen, phosphorous and potash are using as per requirement of plants through inorganic fertilizers. Generally, farmers apply nitrogen, phosphorous and potash for increasing production of crops. Often, they do not apply micronutrients which can be easily available through application of organic manures. Some progressive farmers use both organic manures and inorganic fertilizers but unfortunately they are applying these fertilizers in inadequate combinations. Therefore, the soils remain deficient in micronutrients. Use of inorganic fertilizers under intensive agriculture has been associated with reduced crop yield, soil acidity and nutrient imbalance. Constant use of inorganic fertilizers in highly weathered soil create poor physical structure and nutrient retention characteristics hence, adversely affect crop growth and yield[10]. Therefore, the application of plant nutrients through organic sources like compost, FYM and bio-fertilizers remains the alternative choice of growers for maintaining its sustainable production[14]. Plants require both organic manures and inorganic fertilizers in an adequate combination to produce better production. Gladiolus also requires macro and micro nutrients in an adequate combination. Therefore, the present study was carried out to study the Integrated Nutrient Management (INM) in gladiolus to study the effect of integrated nutrient management on growth, floral and corms parameters on gladiolus in agro climatic conditions of South Gujarat and Tansa farm, Mumbai, India.

MATERIAL AND METHODS

The present study was carried out at two different locations viz., Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) and ASPEE Research Farm, Tansa, Mumbai during 2015-16. The field experiment consisted ten treatments *viz.*, T_1 : 100% recommended dose of fertilizers (200: 200: 200 kg/ha NPK), T_2 : 50% RDF + FYM @ 15 t/ha, T_3 : 75% RDF + FYM @ 7.5 t/ha, T_4 : 100% RDF + FYM @ 7.5 t/ha, T_5 : 50% RDF + FYM @ 15 t/ha + *Azotobacter* + PSB + KMB, T_6 : 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB, T_7 : 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB, T_8 : T_1 + *Azotobacter* + PSB + KMB, T_9 : T_1 + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer and T_{10} : T_7 + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer and was laid out in Randomized Block Design with three replications. The crop was raised in open field condition by adopting the recommended package of practices with integrated nutrient management with varied doses of RDF with common levels of bio-fertilizers, farm yard manure and foliar spray of *Nauroji* Novel Organic Liquid Fertilizer. The investigations were carried out during *Rabi* season at both locations. The entire plot was thoroughly ploughed to a depth of 45 cm and brought to a fine tilt after removing the weeds and stubbles prior to planting. Farm yard manure (FYM), basal dose of recommended dose of fertilizer, bio-fertilizers and 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer were applied and mixed well with the soil as per the treatment specification. Observations were recorded on vegetative, flowering, yield, nutrient levels in plant and soil parameters and data were statistically analysed as suggested by Panse and Sukhatme[11].

RESULTS AND DISCUSSION

Growth parameters

It is apparent from the data presented in Table 1 that the significant differences were observed among the treatments with respect to plant height at 60, 120 DAP and number of leaves per plant in Navsari and Tansa conditions. The maximum plant height of 59.73cm & 57.67 cm at 60 DAP, 84.00 cm & 81.67 cm at 120 DAP and number of leaves per plant (19.87 and 18.47) was observed with treatment T_{10} (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) at Navsari and Tansa conditions, respectively. However, minimum plant height at 60 DAP (48.33 cm & 46.33 cm), 120 DAP (64.67 cm

& 62.67 cm) and number of leaves per plant (14.73 & 13.55) was recorded under treatment of T_1 (100% RDF 200:200:200 NPK kg/ha) in both conditions, respectively. The results obtained are in confirmation with findings of Godse *et al.*[7] in gladiolus. This might be due to significant increase in growth attributes would be the favourable effect of bio-fertilizers which are microbial inoculants of selective microorganisms that help in improving soil fertility by the way of accelerating biological nitrogen fixation from atmosphere, solubalization of the insoluble nutrients already present in soil, decomposing plant residues, stimulating plant growth and production. The process consumes less energy and provides more nutrients to plants without polluting the nature. Phosphorus solubilizing bacteria encourages early root development and it also helps in rapid cell development in the plants and consequently increases the growth of the plant. These findings are corroborated by Barman *et al*.[3] in tuberose, Srivastava and Govil[15] and Rajhansa *et al*.[13] in gladiolus.

Flowering parameters

The data presented in Table 2 & 3 clearly indicated that the minimum number of days to spike initiation (48.10 and 50.33), days to harvesting of spike from initiation of spike (16.57 and 18.17) and maximum spike length (66.63 cm and 64.33 cm), rachis length (39.53 cm and 37.33 cm), number of florets per spike (11.30 and 10.97), diameter of 2nd floret (8.50 cm and 8.27 cm) and vase life of spike (14.93 days and 14.40 days) were recorded under the treatment T_{10} (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) at Navsari and Tansa conditions, respectively. Whereas minimum values of theses parameters was found in treatment T_1 (100% RDF 200:200:200 NPK kg/ha). These results are in close conformity with findings of Dubey and Misra[6] in gladiolus and Sunitha *et al.*[16] in marigold.

Significantly positive improvement in flowering parameters was might be due to more vegetative growth of gladiolus plants which favourably reflected with increased level of fertilizer along with manures and bio-fertilizers application as concluded by Pansuriya and Chauhan[12] in gladiolus. This is due to the fact that nitrogen is a starting material for biological synthesis and it also plays an important role in plant metabolism by virtue of being an essential constituent of diverse types of metabolically active compounds like amino acids, proteins, nucleic acids, porphyrins, flavins, purine and phyrimidine, nucleotides, flavin, nucleotides, enzymes, co-enzymes and alkaloids. Thus, the increased availability of photosynthates finally results into large storage of these compounds, which promoted faster vegetative growth and ultimately induced early flower bud initiation and prolonged flowering span. *Nouroji* novel organic liquid fertilizer contains growth promoting substances *viz*., GA, cytokinin and different micronutrients like Fe, Zn, Mn and Cu. These nutrients play a vital role in the growth and development of gladiolus plants because of its stimulatory and catalytic effects on flower characters and metabolic processes. Similar observations had been reported by Basoli *et al.*[4], Ali *et al*.[1] in gladiolus and Sunitha *et al*.[16] in marigold.

Yield parameters

The data presented in Table 3 clearly revealed that significantly maximum number of spikes per plant (2.50 and 2.37) and number of spikes per hectare (401234.57 and 376543.21) at both Navsari and Tansa conditions, respectively with the application of 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer (T_{10}) followed by T_7 *i.e*. 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB and T_6 *i.e.* 75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB. However, minimum number of flowers per plant (1.77 and 1.70), number of flowers per plot (61.33 and 58.67) and number of flower per hectare (283950.62 and 271604.94) in both conditions, respectively with the treatment of T_1 (100% RDF *i.e.* 200:200:200 NPK kg/ha). These results are in the line with the findings of Kumar *et al*.[8] and Kumari Vasantha[9] in gladiolus whereas Sunitha *et al.*[16] reported similar results in marigold.

Flower yield attributes were positively affected by bio-fertilizers like *Azotobacter* which is an associative living diazotroph and has been certified as potential microbial inoculants for increasing the productivity of various crops. These organisms play role in fixation, synthesize and secrete many amino acids, which influence plant growth that ultimately affects the various flower parameters. Phosphorus solubilizing bacteria plays an important role in converting insoluble phosphatic compound such as rock phospohate, bone meal and basic slag particularly the chemically fixed soil phosphorus into available form. It also produces organic acids like malic, succinic, fumaric, citric, tartaric, alpha ketoglutaric acid and presence of growth promoting substances such as auxins, gibberellins and cytokinin which influence plant growth that ultimately affects the maturity and thereby increases the flower yield. These results are in harmony with those obtained by Chaudhary *et al*[5].

Corm and Cormels parameters

Among different treatment combinations, application of 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* novel organic liquid fertilizer (T_{10}) had positive influence on corms parameters (Table 4). This treatment recorded maximum number of corms per plant (2.43 and 2.27), weight of corms per plant (76.00 g and 73.67 g), weight of cormels per plant (12.67 g and 11.83 g) and size of the corm (5.67 cm and 5.30 cm) in Navsari and Tansa conditions, respectively which was at par with the treatment T_7 (100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB) and T_6 (75% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB). Whereas, minimum number of corms per plant (1.73 and 1.57), weight of corms per plant (53.33 g and 52.20 g), weight of cormels per plant (8.37 g and 7.80 g) and size of the corm (4.20 cm and 3.93 cm) was recorded in treatment T_1 (100% RDF 200:200:200 NPK kg/ha). Similar results were reported by Kumari Vasantha[9] and Basoli *et al.*[4] in gladiolus. This may be attributed to better availability of phosphorous, which is required particularly for corm growth. Better cormels production might be due to corms inoculated with bio-fertilizers have stored more carbohydrates through effective photosynthesis. The increase in corms weight might be due to storage of carbohydrates and nitrogen compounds in the corms. The carbohydrates and soluble nitrogen compounds translocates from leaves to corms. Similar findings have been reported by Baboo and Singh[2] in gladiolus.

Leaf tissue analysis

From the data (Table 5), it is revealed that the maximum nitrogen (1.37% and1.30%), phosphorus (1.07% and 0.97%) and potash (1.93% and 1.77%) content in leaf at Navsari and Tansa conditions, respectively was observed with the treatment T_{10} (T_7 + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer). The minimum nitrogen (0.91% and 0.77%), phosphorus (0.63% and 0.60%) and potash (0.93% and 0.90%) content in leaf at both conditions, respectively recorded under the treatment of T_1 (100% RDF 200:200:200 NPK kg/ha). The results obtained by Kumar *et al.*[8] and Ali *et al.*[1] in gladiolus showed positive impact of bio-fertilizers on nutrient uptake (NPK) by leaves. The combined application of organic, inorganic and bio-fertilizers significantly increased nitrogen content, which could be attributed to the rapid absorption of these elements by the plant surface and their translocation in the plant as reported by Baboo and Singh[2] in gladiolus.

Organic carbon and N, P and K status of soil

Different combination of FYM, inorganic and bio-fertilizers had significantly affected the available nutrient contents in soil (Table 6). It is clearly observed that the treatment combination of 100% RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1% foliar spray of *Nauroji* novel organic liquid fertilizer (T_{10}) resulted in maximum organic carbon (0.80% and 0.77%), available nitrogen (178.73 kg/ha and 175.67 kg/ha), phosphorus (19.48 kg/ha and 18.47 kg/ha) and potash (314.13 kg/ha and 282.67 kg/ha) in soil of Navsari and

Tansa, respectively. Whereas, minimum values was observed in treatment T_1 (100% RDF 200:200:200 NPK kg/ha) for both conditions. Similar results were found by Sonmez *et al.*[14] and Kumar *et al*.[8] in gladiolus.

They agreed with the fact that *Azotobacter* is free-living non-symbiotic aerobic nitrogen fixing bacteria that ultimately increased available nitrogen content in soil through biological nitrogen fixation. Moreover, the build-up of available phosphorus and potash in soil could be due to the organic acids which were released by increased microbial population in soil due to application of phosphorus solubilizing bacteria and potassium mobilizing bacteria were reported by Ali *et al.*[1] in marigold. Application of chemical fertilizers also enhanced the nutrient availability in soil but lower amount as compared to combined use of bio-fertilizers and chemical fertilizers. Foliar spray of *Nouroji* novel liquid organic fertilizer contains N: P: K- 119: 50.4: 1289 in ppm, these increases the N, P, K content in the soil. The bio-fertilizers improve the physical, chemical and biological properties of soil and also provide nutrients *viz.* N, P, K which is essential for plant growth. These results are in harmony with those obtained by Srivastava and Govil[15] in gladiolus. Organic carbon content of the soil was increased through inorganic and organic sources caused a marked improvement in organic carbon content and thus on decomposition increased organic carbon in the soil. These findings are in conformity to Sonmez *et al.*[14].

Table1: Effect of INM on growth parameters of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

Treatments	Plant height (cm)						Number of leaves/plant		
	60 DAP			120 DAP					
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	48.33	46.33	47.33	64.67	62.67	63.67	14.73	13.55	14.14
T_2	50.00	46.30	48.15	72.67	66.33	69.50	17.30	14.54	15.92
T_3	50.70	49.33	50.02	68.33	67.33	67.83	16.47	15.23	15.85
T_4	50.73	49.67	50.20	72.33	70.33	71.33	17.40	15.97	16.69
T_5	51.00	50.67	50.83	74.33	71.33	72.50	17.43	16.10	16.77
T_6	51.67	51.33	51.50	74.33	71.67	73.00	18.53	17.43	17.98
T_7	57.67	55.33	56.50	76.33	74.00	75.17	17.47	16.03	16.75
T_8	51.63	51.00	51.32	73.00	71.00	72.00	17.00	15.70	16.35
T_9	50.97	50.33	50.65	72.33	71.33	71.83	17.33	15.57	16.45
T_{10}	59.73	57.67	58.70	84.00	81.67	82.83	19.87	18.47	19.17
S.Em±	2.26	2.06	-	3.19	2.95	-	0.79	0.68	-
C.D. at 5%	6.70	6.13	-	9.47	8.77	-	2.36	2.02	-
C.V.%	7.48	7.03	-	7.54	7.22	-	7.93	7.41	-

Table 2: Effect of INM on flowering parameters of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

Treatments	Days to spike initiation			Days to harvesting of spike from initiation			Spike length (cm)			Rachis length (cm)			Number of florets/spike		
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	61.10	63.67	62.38	22.00	23.67	22.83	52.67	50.33	51.50	30.93	28.53	29.73	9.37	9.00	9.18
T_2	57.30	59.33	58.32	20.63	22.16	21.39	55.00	52.67	53.83	31.53	30.33	30.93	9.43	9.17	9.30
T_3	55.87	58.43	57.15	21.43	21.57	21.50	56.43	54.97	55.70	32.47	30.73	31.60	9.43	9.33	9.38
T_4	56.90	58.00	57.45	20.20	21.00	20.60	56.87	55.67	56.27	34.00	32.47	33.23	9.53	9.10	9.32
T_5	56.53	57.10	56.82	19.77	20.67	20.22	57.37	56.03	56.70	34.20	32.67	33.43	9.87	9.63	9.75
T_6	52.63	54.67	53.65	19.20	20.17	19.68	60.23	58.67	59.45	36.47	35.03	35.75	10.77	10.57	10.67
T_7	51.67	53.33	52.50	18.60	19.13	18.87	65.83	63.27	64.55	38.43	36.87	37.65	10.30	9.77	10.03
T_8	55.83	57.13	56.48	19.59	20.60	20.10	56.30	54.57	55.43	34.37	32.93	33.65	9.93	9.57	9.75
T_9	56.97	58.27	57.62	20.53	21.33	20.93	54.00	53.33	53.67	34.20	33.07	33.63	9.90	9.60	9.75
T_{10}	48.10	50.33	49.22	16.57	18.17	17.37	66.63	64.33	65.48	39.53	37.33	38.43	11.30	10.97	11.13
S.Em±	2.28	2.31	-	0.91	0.91	-	2.95	2.72	-	1.70	1.71	-	0.41	0.40	-
C.D. at 5%	6.77	6.85	-	2.70	2.72	-	8.77	8.09	-	5.04	5.08	-	1.20	1.18	-
C.V.%	7.14	7.01	-	7.93	7.59	-	8.80	8.36	-	8.48	8.97	-	7.03	7.14	-

Table 3: Effect of INM on flower yield parameters of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

Treatments	Diameter of 2nd floret (cm) from base			Vase life (days)			Number of spikes/plant			Number of spikes/ha		
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	6.87	6.60	6.73	12.10	11.03	11.57	1.77	1.70	1.73	283950.62	271604.94	277777.78
T_2	7.07	6.73	6.90	12.17	11.43	11.80	1.83	1.77	1.80	296296.30	287037.04	291666.67
T_3	7.20	7.07	7.13	12.53	11.83	12.18	1.97	1.83	1.90	308641.98	298611.11	303626.54
T_4	7.30	7.14	7.22	12.73	12.20	12.47	2.07	1.97	2.02	324074.07	310956.79	317515.43
T_5	7.40	7.20	7.30	12.80	12.53	12.67	2.13	2.03	2.08	341049.38	320987.65	331018.52
T_6	7.93	7.70	7.82	13.37	12.60	12.98	2.27	2.10	2.18	364197.53	339506.17	351851.85
T_7	7.63	7.33	7.48	13.53	12.90	13.22	2.40	2.20	2.30	370370.37	354938.27	362654.32
T_8	7.07	6.97	7.02	12.20	12.03	12.12	2.10	1.97	2.03	333333.33	312500.00	322916.67
T_9	7.23	7.10	7.17	12.63	12.23	12.43	2.07	2.07	2.07	327160.49	320987.65	324074.07
T_{10}	8.50	8.27	8.38	14.93	14.40	14.67	2.50	2.37	2.43	401234.57	376543.21	388888.89
S.Em±	0.30	0.30	-	0.54	0.59	-	0.09	0.10	-	14326.85	13240.02	-
C.D. at 5%	0.90	0.90	-	1.59	1.74	-	0.27	0.31	-	42567.25	39338.10	-
C.V.%	7.07	7.28	-	7.21	8.23	-	7.43	8.92	-	7.41	7.18	-

Table 4: Effect of INM on corm and cormel parameters of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

Treatments	Number of corms/plant			Weight of corms/plant (g)			Weight of cormels/plant (g)			Size of the corm (cm)		
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	1.73	1.57	1.65	53.33	52.20	52.77	8.37	7.80	8.08	4.20	3.93	4.07
T_2	1.80	1.70	1.75	54.67	53.67	54.17	8.40	8.13	8.27	4.40	4.17	4.28
T_3	1.90	1.77	1.83	55.33	54.53	54.93	9.83	8.67	9.25	4.51	4.30	4.40
T_4	1.97	1.80	1.88	59.00	57.67	58.33	9.87	9.07	9.47	4.63	4.37	4.50
T_5	2.03	1.90	1.97	62.67	60.67	61.67	10.00	9.60	9.80	4.70	4.40	4.55
T_6	2.17	2.10	2.13	65.33	63.03	64.18	10.77	10.07	10.60	5.00	4.50	4.75
T_7	2.27	2.17	2.22	67.33	65.47	66.40	11.80	11.00	11.40	5.30	5.07	5.18
T_8	2.07	1.93	2.00	62.00	59.53	60.77	10.33	9.80	10.07	4.60	4.43	4.52
T_9	2.00	1.87	1.93	61.33	59.10	60.22	9.87	9.40	9.63	4.40	4.57	4.48
T_{10}	2.43	2.27	2.35	76.00	73.67	74.83	12.67	11.83	12.25	5.67	5.30	5.48
S.Em±	0.10	0.09	-	4.24	4.01	-	0.68	0.48	-	0.27	0.20	-
C.D. at 5%	0.31	0.28	-	12.59	11.91	-	2.01	1.41	-	0.79	0.60	-
C.V.%	8.80	8.56	-	11.90	11.58	-	11.49	8.64	-	9.76	7.71	-

Table 5: Effect of INM on N, P, K content in leaf in gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

Treatments	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	0.91	0.77	0.84	0.63	0.60	0.62	0.93	0.90	0.92
T_2	0.87	0.85	0.94	0.67	0.63	0.65	0.83	0.93	0.80
T_3	0.84	0.80	0.95	0.70	0.67	0.68	1.00	0.97	0.98
T_4	0.97	0.93	1.03	0.73	0.70	0.72	1.43	1.27	1.35
T_5	1.13	1.07	1.14	0.77	0.75	0.76	1.40	1.30	1.35
T_6	1.23	1.17	1.22	0.83	0.77	0.80	1.67	1.60	1.64
T_7	1.27	1.20	1.27	0.87	0.80	0.83	1.83	1.67	1.75
T_8	1.17	1.00	1.03	0.72	0.71	0.72	1.63	1.43	1.53
T_9	1.13	1.03	1.10	0.75	0.73	0.74	1.57	1.47	1.52
T_{10}	1.37	1.30	1.42	1.07	0.97	1.02	1.93	1.77	1.85
S.Em±	0.09	0.04	-	0.05	0.04	-	0.08	0.09	-
C.D. at 5%	0.27	0.13	-	0.15	0.12	-	0.23	0.27	-
C.V.%	14.63	7.51	-	11.26	9.29	-	9.24	11.79	-

Table 6: Effect of INM on organic carbon and available N, P, K (kg/ha) of soil

Treatments	Organic carbon (%)			Available Nitrogen (kg/ha)			Available Phosphorus (kg/ha)			Available Potassium (kg/ha)		
	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean	Navsari	Tansa	Mean
T_1	0.50	0.57	0.53	138.27	135.33	136.80	15.60	15.20	15.40	256.77	237.67	247.22
T_2	0.60	0.60	0.60	151.00	149.50	150.25	16.77	16.33	16.55	259.00	225.00	242.00
T_3	0.63	0.63	0.63	152.27	150.33	151.30	16.73	16.03	16.38	260.33	235.00	247.67
T_4	0.67	0.67	0.67	152.83	151.00	151.92	15.07	15.87	15.47	268.00	244.67	256.33
T_5	0.70	0.68	0.69	157.00	154.33	155.67	16.70	16.47	16.58	270.90	247.33	259.12
T_6	0.63	0.70	0.67	165.70	161.33	163.52	17.27	16.57	16.92	304.67	266.67	285.67
T_7	0.73	0.72	0.73	167.85	163.00	165.42	18.94	18.10	18.52	307.00	273.33	290.17
T_8	0.60	0.59	0.59	155.53	152.67	154.10	17.00	16.27	16.63	272.33	241.33	256.83
T_9	0.57	0.55	0.56	155.10	153.33	154.22	17.06	16.60	16.83	266.67	246.00	256.33
T_{10}	0.80	0.77	0.79	178.73	175.67	177.20	19.48	18.47	18.97	314.13	282.67	298.40
S.Em±	0.03	0.03	-	6.26	6.59	-	0.79	0.61	-	11.56	11.66	-
C.D. at 5%	0.09	0.08	-	18.61	19.57	-	2.34	1.82	-	34.34	34.65	-
C.V.%	8.34	6.91	-	6.89	7.38	-	7.99	6.41	-	7.20	8.08	-

CONCLUSION

On the basis of present study, it may be concluded that by different sources of nutrients practices, we can minimize the cost of inorganic fertilizers, reduces soil pollution, which is beneficial for the present problems of high cost of inorganic fertilizers and environmental pollution which also can help to get good vegetative growth, flowering and corms parameters in gladiolus under agro-climatic conditions of Navsari and Tansa, India.

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