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EFFECT OF BORON AND ZINC FERTILIZATION ON FLOWER YIELD AND QUALITY OF GLADIOLUS IN GREY TERRACE SOILS OF BANGLADESH

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ABSTRACT

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A field experiment of Boron (B) and Zinc (Zn) on Gladiolus in Grey Terrace Soils was carried out at Floriculture Research field of Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur during Rabi seasons of 2005-2006 and 2006-2007 respectively. The objective was to evaluate the response of Gladiolus to B and Zn fertilizer and to find out the optimum dose of B and Zn for maximizing flower field of Gladiolus. Treatments comprising four levels of B (0, 1, 2 and 3 kg/ha) and four levels of Zn (0, 1.5, 3.0 and 4.5 kg/ha) along with combined blanket dose of $N_{375}P_{150}K_{250}S_{20}$ and cowdung 5 t/ha were used in the study. BARI Gladiolus-1 was taken as a test flower crop. However, it felt in the field data that B and Zn in their integration made a significant influence on flower yield and floral characters of Gladiolus. It was also inferred in Tables that integrated use of B and Zn was appeared to be more pronounced as compared to their single applications. All the studied flower characters like length and weights of rachis and spike and number and weight of florets per spike and stick weights and size of the florets greater influenced with the increase of B and Zn but subsequent addition of B and Zn beyond that level ($B_{2.0}Zn_{3.0}$ kg/ha) depressed the flower yield. Besides, the highest mean stick weight (55.19g) and the highest flower yield (14.70 t/ha) were recorded with the combined application of $B_{2.0}Zn_{3.0}$ kg/ha and 122% increase of flower yield was found to be contributed by afore said T_{11} ($B_{2.0}Zn_{3.0}$ kg/ha). This was significantly higher over other treatment combinations and B_0Zn_0. Similar result was also noticed in single applications of B and Zn but their effect was narrowed.

Key Words: Flower yield and quality, boron, zinc

INTRODUCTION

Gladiolus (*Gladiolus* sp.) is an important flower found everywhere in the world. It is a popular cut flower owing to its versatile colours and varieties having larger keeping quality of flower. It has great economic value for cut flower trade and much valued by the aesthetic world for beauty and loving people because its prettiness and unparallel elegance. They are widely used as artistic garlands, floral ornaments, bouquets etc. The long flower spikes are excellent as cut flower for table decoration when arranged in vases. For its attractiveness and assortment of colours, gladiolus captured the domestic and world market economy. Due to its aesthetic value for mankind and economic importance, the area and production of gladiolus flower crop increases substantially day by day like tuberose. But unfortunately the producers even do not have any recommended dose of integrated fertilizer package. Resulting, they are not getting desired and expected yield of flower. Flower crops are very much responsive to fertilizers. It is highly capable of exhausting huge nutrients from native soil. So, it requires higher amount of chemical fertilizers in balance proportion for ensuring maximizing flower production.

Fertilizer requirements of gladiolus like other crops, has vital role in growth, quality, corm and cormel production. There are some reports on the requirement of nitrogen (N), Phosphorus (P), Potassium (K) and other fertilization in some countries (Potti *et al*. 1986 and Afify, 1983). Major nutrients like nitrogen, phosphorus, potassium along with micronutrients noticeably increase the number of flowers, florets/spike, the longest spike and flowering stem of gladiolus (Afify, 1983). Increasing N fertilization substantially augmented plant growth, number of leaves/plant, spike length and number of florets/spike (Shah *et al*. 1984). It was also reported that hardness of the stick, flower colour and post-harvest life can be prolonged to some extent by applying micro-nutrients along with blanket dose of NPK and Mg. However, information regarding nutritional requirement and appropriate soil management practices are lacking for gladiolus cultivation in Bangladesh. Hence, such an investigation was undertaken to evaluate the response of gladiolus to B and Zn and their optimum dose for maximizing flower yield of gladiolus in Grey Terrace Soils of region.

MATERIALS AND METHODS

The field trial of B and Zn on gladiolus was conducted at Floriculture field of Horticulture Research Centre, BARI, Gazipur during Rabi season of 2005-2006 & 2006-2007. The objective was to investigate and evaluate the response of gladiolus to B and Zn and their optimum requirement for growth, flowering, flower quality and corm production of gladiolus. Both the analyzed soil samples and their nutrient status of Joydebpur experimental site is shown in Table 1. Nutrient status of experimental soils were found to be below critical level and organic matter was also far below of the optimum level.

There were sixteen treatment combinations comprising four levels of B (0, 1, 2 and 3 kg/ha) and four levels of Zn (0, 1.5, 3.0 and 4.5 kg/ha) were taken in the study. The experiment was laid out in randomized block design having replicated thrice. The unit plots size and plant spacing were 1m x 0.9 m and 25 cm x 15 cm respectively. BARI Gladiolus-1 was used as a test crop. The combined blanket dose of N_{375} P_{150} K_{250} S_{20} kg and cowdung (CD) 5 t/ha was taken in the study. The planting material 'corms' were sown on 5^{th} December 2005 & 2006 at both the locations. All P, K, S, B, Zn and CD except N were applied and mixed up with the soil during final land preparation. N was applied in three equal splits, first $^{1}/_{3}$rd of N at 30, second top-dress at 45 and remaining $^{1}/_{3}$rd at 60 days of sowing. Intercultural operations viz. weeding, irrigation, racking etc were performed in time. Full bloomed flowers were cut time to time to record the field data. The collected data of required parameters from 10 randomly selected plants were analyzed statistically and adjusted with DMRT and LSD tests at 5% level of significance.

Table 1.Chemical properties of the initial soil of the experimental field at Joydebpur

Location	pH	OM	Ca	Mg	K	Total N %	P	S	B	Cu	Fe	Mn	Zn
			meq/100g				µg/g						
Joydebpur	6.2	1.1	1.5	0.7	0.18	0.16	10	12	0.1	1.0	140	4.2	1.0
Critical level	-	-	2.0	0.8	0.20	-	14	14	0.2	1.0	10	5.0	2.0

RESULTS AND DISCUSSIONS

Effect of B

B played and critical role in augmenting the flower yield and other floral characters of Gladiolus. The results shown in Tables (2a and 2b) revealed that addition of B with increased dose from 0 to 2 kg B/ha made a profound response to the studied flower characters. It was also noticed in field data that all the growth and flower characters were found to be increased up to 2 kg B/ha but further increase with higher B level (3 kg B/ha) exerted slower response to the yield characters of Gladiolus. However, with increased dose of B @ 2 kg/ha significantly augmented the plant height up to (70.88 cm and 101.8 cm) and highest number of leaves (9.61 and 11.21/plant) but immediate higher B level (3 kg B/ha) did not respond significantly compared to lower B levels and B_0. Length of rachis and spite significantly responded to the added B fertilizer from 0 to 2 kg B/ha but subsequent addition of higher B level (3 kg B/ha) depressed these yield parameters. However, the highest rachis was 43.5 cm and 57.7 cm and spike (60.42 cm & 90.6 cm). Lengths were calculated from said B level (2 kg B/ha) but the higher (3 kg B/ha) and lower B levels (1.0 kg B/ha) did not perform better but significantly higher over B_0. In addition to, floret numbers and floret size were also greatly influenced by the added B fertilizer but immediate higher and lower doses of B did not exert the same. However, 2 kg B/ha significantly increased the highest floret numbers (11.72 and 12.23/spike) and largest floret (9.39 cm x 8.20 cm) and noticeable differed over B_0. Similar result trend was found as well in spike weight and flower yield by applied B levels from B_0 to $B_{2.0}$ kg/ha. This result was in partially agreement with the finding of Jhon *et al.*, 1997, and Barma *et al.*, 1998. The significantly highest spike weight (29.72 and 68.50 g) and highest flower yield (17.24 t/ha) were recorded in 2 kg B/ha which was found superior and higher over other B levels and B control. But the justification came in fact that deficient, optimum and toxicity levels of B were narrowly different to each other which reflected to the yield contribution.

Table 2a. Main effect of B on the yield and yield components of Gladiolus at Joydebpur during 2005-2006

Treatment (Kg/ha)	Plant ht.(cm)	Length of rachis (cm)	Length of Spike (cm)	Effective Leaves (no)	Florets/ Spike (no)	Length of Florets (cm)	Diameter of Florets (cm)	Wt of Stick (g)
B_0	46.13d	24.50d	41.70d	4.17d	4.52d	3.52d	3.56d	12.61d
$B_{1.0}$	67.40c	35.72c	57.51c	8.65c	10.38c	8.30c	7.28c	25.45c
$B_{2.0}$	70.88a	43.50a	60.42a	9.61a	11.72a	9.39a	8.20a	29.72a
$B_{3.0}$	67.82b	40.08b	57.63b	8.89b	10.75b	8.92b	7.84b	27.35b
CV(%)	8.8	6.8	7.7	9.6	6.5	9.4	9.3	8.7

Means followed by common letters in a column are not significantly different by DMRT at 5% level.
CV = Coefficient of variation

Table 2b. Main effect of B on the yield and yield components of Gladiolus at Joydebpur during 2006-2007

Treatment Kg/ha	Plant ht. (cm)	Length of rachis (cm)	Length of spike (cm)	Effective leaves (no)	Florets/ Spike (no)	Length of florets (cm)	Diameter of florets (cm)	Wt of stick (g)	Flower yield (t/ha)
B_0	58.53b	29.72c	56.03b	4.20d	4.45d	4.60d	3.58b	22.13c	7.14c
$B_{1.0}$	99.58ab	51.95bc	87.47b	9.10c	10.50c	8.78c	6.86b	55.09b	13.93b
$B_{2.0}$	101.8a	57.07a	90.63a	11.21a	12.23a	9.37a	7.14a	68.50a	17.24a
$B_{3.0}$	100.3ab	54.28ab	88.42ab	1.030b	11.12b	9.12b	6.79ab	67.56a	17.04a
CV (%)	5.88	6.57	4.27	7.5	4.92	8.45	6.33	5.33	9.35

Effect of Zn

The mean effect of Zn on the floral characters and flower yield of Gladiolus are shown in Tables 3a and 3b. The results revealed in Tables that Zn had a positive effect on the studied parameters. All the flower characters such as plant height, effective leaves, length of rachis and spike, number of flowers, size of floret, spike weight and flower yield were profusely influenced with different levels of added Zn fertilizers. However, the highest plant height (73.53 cm and 103.5 cm) and maximum effective leaves (10.42 and 13.07/plant) were recorded with the single application of Zn at higher dose (3 kg Zn/ha) while lower (1.5 kg Zn/ha) and higher doses (4.5 kg Zn/ha) of Zn did not reflect on to the plant height and effective leaves. The length of rachis and spike was highly influenced with the subsequent addition of Zn up to 3 kg/ha which was significantly different over higher and lower doses of Zn and Zn_0. However, farther augmenting Zn level (4.5 kg Zn/ha) and that dose (3.0 kg Zn/ha) did not respond positively. However, significantly the highest rachis length (46.62 cm and 57.07 cm) and spike (62.80 cm and 91.40 cm) was recorded with highest level of Zn (3.0 kg/ha) which was markedly differed over other Zn levels and Zn_0. Number of florets and florets length and diameter was also influenced by single doses of Zn at increasing levels. The highest floret numbers (12.42 and 13.20/spike) and largest floret (9.98 x 8.66 cm) was also obtained in said Zn level (3.0 kg Zn/ha) was closely followed by higher Zn rate (4.5 kg/ha) and statistically different over Zn_0. It was appeared in the tables that effect of B was more pronounced than single application of Zn. Besides, weight of spike and flower yield noticeably responded to the added Zn fertilizer up to 3 kg Zn/ha where higher dose of Zn failed to give desired flower yield of gladiolus. However, the higher level of Zn (3 kg Zn/ha) progressively increased the highest spike (35.52 g and 62.32 g) and flower yield (15.86 t/ha) which was sharply different over lower (1.5 kg Zn/ha) and higher levels (4.5 kg Zn/ha) and higher than Zn_0. This finding was supported by Mukherjee *et al.,* 1998, Potti *et al*, 1986 and Shah *et al*, 1984).

Table 3a. Main effect of Zn on the yield and yield components of Gladiolus at Joydebpur during 2005-2006

Treatment (Kg/ha)	Plant ht. (cm)	Length of rachis (cm)	Length of spike (cm)	Effective leaves (cm)	Florets/ spike (no)	Length of florets (cm)	Diameter of florets (cm)	Wt of stick (g)
Zn_0	49.56d	20.24d	40.82d	4.92d	4.21d	3.54d	2.45d	11.45d
$Zn_{1.5}$	65.82c	36.46c	55.44c	8.21c	10.30c	8.01c	7.67c	24.38c
$Zn_{3.0}$	73.53a	46.62a	62.80a	10.42a	12.42a	9.98a	8.66a	35.52a
$Zn_{4.5}$	68.60b	40.36b	57.11b	9.25b	11.63	9.21b	8.14b	26.45b
CV (%)	8.8	6.8	7.7	9.6	6.5	9.4	9.3	8.7

Table 3b. Main effect of Zn on the yield and yield components of Gladiolus at Joydebpur during 2006-2007

Treat. (Kg/ha)	Plant ht. (cm)	Length of rachis (cm)	Length of spike (cm)	Effective leaves (cm)	Florets/ Spike (no)	Length of florets (cm)	Dia. of florets (cm)	Wt of stick (g)	Stick yield (t/ha)
Zn_0	58.52b	28.72d	42.82c	4.72c	5.03d	4.93d	3.16b	24.57d	8.14d
$Zn_{1.5}$	98.78b	49.95c	87.15b	11.95bc	11.24c	8.65c	6.94ab	57.42c	13.19c
$Zn_{3.0}$	103.5a	57.07a	91.4a	13.07a	13.20a	9.82a	7.01a	62.32a	15.86a
$Zn_{4.5}$	99.78b	54.28b	87.18b	12.28ab	12.14b	9.12b	6.76ab	59.98b	14.73b
CV (%)	5.88	6.57	4.27	7.5	4.92	8.45	6.33	5.33	9.35

Interaction effect of B and Zn

The interaction between B and Zn was found statistically significant over floral components and flower yield. It was also appeared in Tables (4a and 4 b) that all the studied parameters like length of rachis and spike, number of florets per spike, floret size and weights of spike was greatly influenced with the increase of B and Zn integration as compared to their single application. Plant height and number of effective leaves per plant were progressively increased by the added B and Zn up to $B_{2.0}Zn_{3.0}$ kg/ha. But further increase of B and Zn beyond that level ($B_{2.0}Zn_{3.0}$ kg/ha) depressed the plant height and number of leaves. However the highest plant (78.5 g cm and 104.7 cm in first and 2nd year) and maximum leaves per plant (11.01 and 9.60) was recorded with T_{11} ($B_{2.0}Zn_{3.0}$ kg/ha) which was closely near to the $T_{16,}$ T_{15} and T_{12} respectively. Length of rachis and spike were significantly responded to the added B and Zn. It was observed in Tables (4a & 4b) that response of these parameters to the different combinations of B and Zn was markedly pronounced. The applied B and Zn @ $B_{2.0}Zn_{3.0}$ kg/ha significantly increased the length of rachis and spike ranged from 37.18 cm-58.40 cm and 61.13 cm 91.93 cm in 2nd year respectively while the highest dose of integration ($B_{3.0}Zn_{4.5}$ kg/ha) failed to perform better than other treatments combination. Besides, number of florets and its sizes (Length and dia.) were highly influenced with higher doses of B and Zn integration. The highest number of florets (12.75 and 15.47/spike) and longer floret size (9.82 cm x 8.82 cm) were obtained with T_{11} ($B_{2.0}Zn_{3.0}$ kg/ha) which was significantly higher over other combinations as well as B_0Zn_0. Similar trend of increase was also noticed in T_{11} for weight of spike and flower yield. However, the highest stick weight (41.74 g and 71.03 g in 2006 and 2007) and flower yield (12.62 t and 18.17 t) were received by said treatment combination ($B_{2.0}Zn_{3.0}$ kg/ha) which was greatly differed and higher over B_0Zn_0. The yield response was due to the added integrated chemical fertilizers applied to the study area as the native fertility failed to provide with balance nutrition. This result was corroborated with findings of Devecchi, 1997, Jhon *et al*, 1997 and Mukhurjee *et al*, 1998, respectively.

Table 4a. Interaction effect of B and Zn on the yield and yield components of Gladiolus at Joydebpur during 2005-2006

Treat. (Kg/ha)	Plant ht. (cm)	Leaves/ Plant (no.)	Length of Spike (cm)	Length of rachis (cm)	Florets/ Spike (no.)	Length of Florets (cm)	Dia.of Florets cm)	Wt of Stick (g)
T_1=B_0 Zn_0	42.20 de	4.15 g	30.45 I	22.17 k	5.24 f	4.23 k	3.23 k	19.48 j
T_2=Bo $Zn_{1.5}$	66.15 cd	8.23 ef	53.00 fg	33.30 h	9.41 gh	7.56 j	5.43 k	24.27 efg
T_3=B_0 $Zn_{-3.0}$	69.21 c	8.50 e	54.25 ef	42.77 d	10.75 ef	8.61e fh	6.30 fgh	26.55f
T_4=B_0 $Zn_{4.5}$	71.22 bc	9.92 cd	61.67 c	43.28 c	11.46 b	9.19 cde	7.85 def	33.23b
T_5=B_1 Z_0	63.56 de	7.61 f	50.00 h	30.27 j	10.01 dij	9.54 abc	8.45 cde	23.78i
T_6=B_1 $Z_{1.5}$	66.42 cd	9.32 de	54.53 fgt	33.89 I	9.92 I	7.44 I	6.13 j	24.98 fgh
T_7=B_1 $Zn_{3.0}$	68.62 c	9.57 cd	59.56 c	37.88 g	10.80 efg	8.60 fg	7.27 gh	26.83 de
T_8=B_1 $Zn_{4.5}$	63.38 bc	9.98 c	62.27 b	46.19 b	11.14 bc	9.26 cd	7.53 fg	35.40 ab
T_9=B_2 Zn_0	65.68 de	8.53 e	53.07 g	35.37 h	9.55 ij	9.83 ab	8.65 bc	23.17hi
T_{10}=B_2 $Zn_{1.5}$	68.74 c	9.12 de	56.25 dc	39.43 e	10.53 fg	8.65 hi	6.36 ig	25.37efg
T_{11}=B_2 $Zn_{3.0}$	78.53a	11.01a	66.34 a	48.72 a	12.75 a	9.82 a	8.82 a	42.74a
T_{12}=B_2 $Zn_{4.5}$	71.66 bc	9.45 cd	58.54 c	43.56 d	10.75 e	8.87 def	7.65 efg	29.23cd
T_{13}=B_3 Zn_0	67.30 c	9.12 e	55.45 ef	38.58 f	10.26 h	9.42 ab	8.67 b	24.86hi
T_{14}=B_3 $Zn_{1.5}$	68.88 c	9.45 cd	59.23cd	43.72c	11.69 cd	8.34 gh	6.84 hi	25.69ef
T_{15}=B_3 $Zn_{3.0}$	70.93 bc	9.87 bc	62.98 b	46.74b	11.75 b	9.45 abc	8.66 bc	26.62 ab
T_{16}=B_3 $Zn_{4.5}$	76.29 b	10.23 b	63.23 b	47.45ab	11.98 b	9.64 ab	8.79 ab	33.60 b
CV (%)	8.8	6.8	7.7	9.6	6.5	9.4	9.3	8.7

Table 4b. Interaction effect of B and Zn on the yield and yield components of Gladiolus at Joydebpur during 2006-2007

Treat. (Kg/ha)	plant ht. (cm)	Leaves/ Plant (no.)	Length of spike (cm)	Length of rachis cm)	Florets/ Spike (no.)	Length of florets (cm)	Dia. of Florets (cm)	Wt of Stick (g)	Stick yield (t/ha)
T_1=B_0 Zn_0	60.93d	4.60b	61.13c	37.13d	7.00c	4.01d	2.87d	35.17k	7.77k
T_2=Bo $Z_{1.5}$	98.80a-d	8.60b	81.33c	49.67cd	14.63ab	7.57cd	6.13cd	41.00j	9.50j
T_3=B_0 $Zn_{-3.0}$	99.27a-d	8.67ab	82.27bc	49.93cd	14.67ab	7.83bcd	6.46cd	45.17i	11.33i
T_4=B_0 $Zn_{4.5}$	99.73a-d	8.67ab	87.07a-c	50.47b-d	14.73ab	8.10a-d	6.65abc	47.20h	12.60h
T_5=B_1 Z_0	99.93a-d	8.73ab	87.67ab	52.47a-d	14.60ab	8.07a-d	6.70abc	45.77hi	13.37g
T_6=B_1 $Z_{1.5}$	100.8a-c	8.87ab	87.73ab	52.80a-d	14.67ab	8.15a-d	6.80abc	54.17g	14.97f
T_7=B_1 $Zn_{3.0}$	100.5a-c	9.00ab	88.47ab	53.53a-d	14.97ab	8.20a-c	7.01ab	58.43f	16.33d
T_8=B_1 $Zn_{4.5}$	102.6ab	9.00ab	88.8a	53.47a-d	15.0ab	8.40a-c	7.10ab	62.00e	17.13bc
T_9=B_2 Zn_0	102.8ab	9.07ab	89.2a	53.73a-d	15.07ab	8.51a-c	7.00ab	64.97d	17.63b
T_{10}=B_2 $Zn_{1.5}$	103.1ab	9.13ab	89.2a	53.33a-d	15.13ab	8.50a-c	7.13ab	66.60cd	18.17a
T_{11}=B_2 $Zn_{3.0}$	104.7a	9.60a	91.93a	58.40a	15.47a	9.13a	7.30a	71.03a	17.03bc
T_{12}=B_2 $Zn_{4.5}$	103.6ab	9.20ab	90.93a	57.33a	15.40a	9.09a	7.27a	67.63bc	16.77cd
T_{13}=B_3 Zn_0	103.7ab	9.33ab	90.87a	54.4a-d	15.2ab	8.51a-c	6.93ab	68.38bc	17.27bc
T_{14}=B_3 $Zn_{1.5}$	103.4ab	9.33ab	91.2a	54.3a-d	14.93ab	8.26a-c	7.23a	67.89bc	17.10bc
T_{15}=B_3 $Zn_{3.0}$	102.8ab	9.27ab	91.6a	54.47a-d	15.12ab	8.73a-c	7.20a	68.70b	17.13bc
T_{16}=B_3 $Zn_{4.5}$	103.2ab	9.07ab	90.9a	54.9abc	14.83ab	8.87a-c	7.07ab	69.04b	17.7bc
CV (%)	5.88	6.57	4.27	7.5	4.92	8.45	6.33	5.33	9.35

Comparative flower yield statement at Joydebpur

It appeared in table 5 reveals that mean weight of spike of spike and flower yield was significantly influenced with B and Zn combination. It was also noticed in results that spike weights and flower yield of Gladiolus was found to be greatly augmented with the successive addition of B and Zn at higher levels in both the years of study (2005-2006 and 2006-2007). Between two years comparison regarding flower yield, it was clearly found in tabulated data that further increase of the B-Zn integration beyond that level ($B_2Zn_{3.0}$ kg/ha sharply declined the mean stick weight and mean flower yield. However, the highest mean stick weight (55.19 g) and mean flower yield (14.70 t/ha) and 122% flower yield over control (B_0Zn_0) was derived from combined application of B and Zn @ B_2Zn_3 kg/ha.

Table 5: Comparative yield (stick weight) statement of Gladiolus at Joydebpur during 2005-06 and 2006-07

Treatment (kg/ha)	Wt. of stick (g)		Mean wt.(g)	Yield of stick (t/ha)		Mean yield (t/ha)	% increase over control
	2005-06	2006-07		2005-06	2006-07		
B_o Zn_o	19.48	35.17	27.33	5.47	7.77	6.62	-
Bo $Z_{1.5}$	24.27	41.00	32.64	6.80	9.50	8.15	23
B_0 $Zn_{-3.0}$	26.55	45.17	35.86	7.03	11.33	9.18	39
B_0 $Zn_{4.5}$	33.23	47.20	40.22	9.43	12.60	11.02	67
B_1 Z_0	23.78	45.77	34.78	6.15	13.37	9.96	47
B_1 $Z_{1.5}$	24.98	54.17	39.58	6.72	14.97	10.85	64
B_1 $Zn_{3.0}$	26.83	58.43	42.63	7.24	16.33	11.79	78
B_1 $Zn_{4.5}$	35.40	62.00	48.70	9.56	17.13	13.35	102
B_2 Zn_0	23.17	64.97	44.07	9.86	17.33	13.60	105
B_2 $Zn_{1.5}$	25.37	66.60	45.99	10.50	17.03	14.07	112
B_2 $Zn_{3.0}$	29.23	71.03	50.13	12.62	18.17	14.70	122
B_2 $Zn_{4.5}$	42.74	67.63	55.19	11.50	16.77	14.14	114
B_3 Zn_0	24.86	68.38	46.62	10.40	17.27	13.84	109
B_3 $Zn_{1.5}$	25.69	67.89	46.79	10.80	17.10	13.95	111
B_3 $Zn_{3.0}$	26.62	68.70	47.66	10.92	17.13	14.03	112
B_3 $Zn_{4.5}$	33.60	69.04	51.32	9.34	17.70	13.52	104

Response function

Regression analysis showed positive but quadratic relationships among number of florets, length of spike and applied boron and zinc (Figure A, B, C and D). Here, both B and Zn with different levels in regression curves reflected that floret number and length of spike significantly increased and positively correlated with applied B and Zn. It meant the values of x and y were appeared to be strongly associated and polynomic with their counter variables.

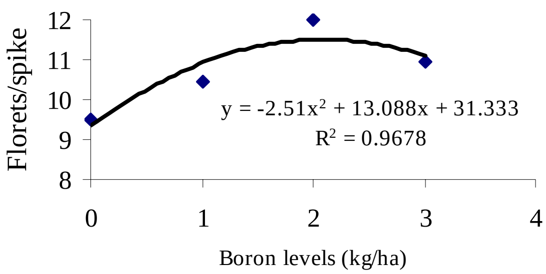

Figure A. Response of florets/spike to boron fertilization

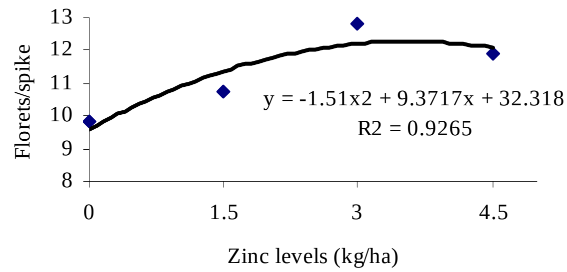

Figure B. Response of florets/spike to zinc fertilization

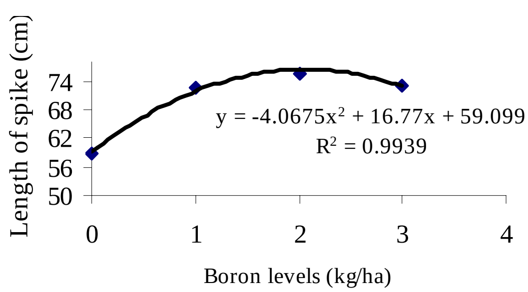

Figure C. Response of florets/spike to boron fertilization

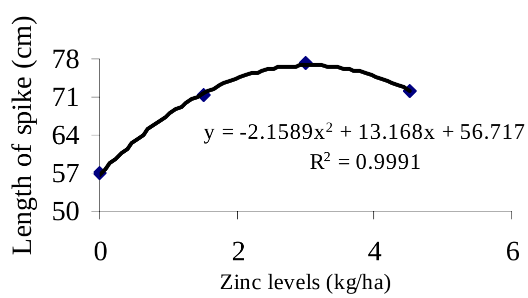

Figure D. Response of florets/spike to zinc fertilization

It was felt in two years study reveals that B @ 2.0 and Zn @ 3.0 kg/ha along with a combined blanket dose of $N_{375}P_{150}K_{250}S_{20}$ kg and CD 5 t/ha was found to be optimum for gladiolus production. So, it may be concluded that Boron and Zinc @ $B_{2.0}Zn_{3.0}$ kg/ha with said blanket dose could be recommended for maximizing flower yield and quality of Gladiolus at Grey Terrace Soil of Joydebpur region in Bangladesh.

REFERENCES

Afify, M.M. 1983. Effect of high fertilizer rates on the growth flowering of three gladiolus cutlivars, Kerleszefi Egyatem Kozlemenyel. 47(13): 75-82.

Barma, G.; Chanda, S.; Roychowdhury, N. 1998. Production of corm and cormels of gladiolus through application of nitrogen, phosphorus and potassium. Horticultural Journal. 11(2):87-92.

Devecchi, M. and E. Barni. 1997. Effect of fertilizers on the colour of gladiolus spikes. Colture protette, 26(2): 79-82.

Jhon, A.Q.; Paul, T.M. and M.M.A. Siddique. 1997. Nutritional studies in gladiolus I: Growth and floral chracters. Advances in plant Sciences, 10(1): 45-49.

Mukherjee, S.; Jona, S.C. and T.K. Chatterjee. 1998. Effect of nitrogen and phosphorus doses on production of flowers and corms of gladiolus. Indian Agriculturist. 36(3): 211-213.

Potti, S. K. and Arora, J. S. 1986. Effect of N, P and K on growth, flowering, corm and cormel production. Panjab Hort. J. 26(1/4): 125-128

Shah, A., S. D. Lal and Seth, J. N. 1984. Effect of different levels of nitrogen and phosphorus on growth, flowering and corm yield of gladiolus cv. Vinks Glory. Progressive Horticulture. 16(3/4): 305-307