



## **Foliar Application of Nutrients Solution (Macro and Micro) on Local Chilli (*Capsicum* sp.) Gremplasms**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author MSNC designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MNHS, RN and TS managed the analyses of the study, maintain laboratory responsibilities. Author TS managed the literature searches. Authors SS and AFMJU help to design the whole experimental work and supervised it. All authors read and approved the final manuscript.*

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### **ABSTRACT**

A field experiment was conducted to evaluate the morpho-physiological attributes, growth, quality and yield performance of five local chilli germplasm viz., Akashi (V<sub>1</sub>), Kajoli (V<sub>2</sub>), Deshi kacha morich (V<sub>3</sub>), Bogra morich (V<sub>4</sub>), Dongfou (V<sub>5</sub>) with liquid (macro & micro) nutrient solution viz. S<sub>0</sub> (Control), S<sub>1</sub> (Solution-1), S<sub>2</sub> (Solution-2) were exploited on the experiment. Major characters of growth and yield such as plant height, days to first flower bud initiation, number of flowers/plant, number of fruits/plant, individual fruit weight, fruit length, fruit diameter, yield/plant, protein, and vitamin C content were influenced by amalgamation of germplasm with foliar nutrient solution. However, in amalgamation, maximum number of fruit per plant (327.0) from V<sub>2</sub>S<sub>1</sub> and 1000 seed weight (3.8 g), yield (803.9 g/pant), fresh yield (19.6 t ha<sup>-1</sup>) obtained from V<sub>1</sub>S<sub>1</sub> whereas lowest number of fruit from V<sub>5</sub>S<sub>0</sub> (72.3/ pant) and 1000 seed weight (2.6 g), yield (116.2 g/ pant), fresh yield (10.4 t ha<sup>-1</sup>) obtained from V<sub>4</sub>S<sub>0</sub>.

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**Keywords:** Chilli germplasm (*Capsicum* sp); nutrient solution (macro & micro) fruits quality and yield.

## 1. INTRODUCTION

Chilli (*Capsicum frutescens*,  $2n=24$ ), a popular solanaceous an unavoidable spice crop, is cultivated throughout the world. It has a great demand throughout the year and generally grown in both winter and summer seasons. Capsaicin ( $C_{18}H_{27}NO_3$ ) is a pungent principle found in the placenta of *C. frutescens* that makes hot [1]. In Bangladesh, during 2016-2017 chilli production was only  $17.62 \text{ t ha}^{-1}$  [2]. Compare to other chilli growing countries this yield is low. Lowering yield in because of the scarcity of quality seed, chilli germplasm and their improvement through fertilizer management. Low yield in Bangladesh could be attributed to lack of suitable cultivars [3,4]. Yield and quality of agricultural products increased with foliar nutrients application, therefore human and animal health is protected with the feed of enrichment plant materials. Which respond constructively to the application of small quantities of micro as well as macro-nutrients [5]. This technique can assure quick translocation of nutrients to various plant parts through leaf tissues under various nutrient deficiencies [6] and [7]. It is a well-established verity foliar application (macro or micronutrients) as it become swiftly available to crop plants [5].

Considering the significance of foliar fertilizers for chilli germplasm, this study was carried out to investigate the effect of foliar application of macro and micronutrients on morph physiological attributes such as growth, fruit quality and yield of chilli germplasm.

## 2. MATERIALS AND METHODS

The experiment was accomplished at Horticulture Farm, Sher-e-Bangla Agricultural University, Dhaka during the period from October 2017 to July 2018 and was laid out in a randomized block design with four replications. The size of the plot was  $1.5 \text{ m} \times 1 \text{ m}$ . Distances between block to block and plot to plot were 1.0 and 0.5 meter, respectively. Plant to plant and row to row distance were maintained at 40 cm. In each unit plot, 14 plants were accommodated. After setting the experiment foliar spray of prepared nutrient solutions was started from 35 days and final harvesting up to 120 days. A hand garden sprayer was used to feeding of leaf by macro and micronutrient solution. Foliar fertilizers were applied on leaves in evening. The following composition was used to prepare foliar macro

and micronutrient solution. In solution-1:  $N_2$ -1.4%,  $K_2O$ -0.1%,  $Mg$ -0.71%,  $S$ -1.5%,  $Zn$ -0.12%,  $B$ -0.34%,  $Mo$ - 50 ppm,  $Mn$ -200 ppm and Solution-2:  $N_2$ - 8.0%,  $K_2O$ -6.0%,  $S$ -0.9%,  $Zn$ -0.005%,  $B$ -0.01%,  $Cu$ -0.007%,  $Mn$ -0.013%,  $Mo$ -0.001%,  $Fe$ -0.015%,  $Cl$ -0.9%.  $S_1$  (Solution-1) and  $S_2$  (Solution-2) were applied at every 15 days interval @ 21 ml solution per 7 litter of water for  $170 \text{ m}^2$  of land. At 10 days interval randomly selected different parameter data such as plant height (cm), leaf per plant were recorded at 45 to 85 DAT. Fifty fresh fruits from each treatment were weighed randomly from selected plant then, dry it at room temperature. Measurement of weight was done by Electric Precision Balance in gram (g). Length of fruit and diameter were measured using Digital Caliper-515 (DC-515) in millimeter (mm). Leaf area was measured by a destructing method using CL-202 Leaf Area Meter (USA). Chlorophyll content in leaf was measured by using chlorophyll meter SPAD-502. Vitamin-C content and protein content were evaluated by Oxidation Reduction Titration and Micro Kjeldahl method. MSTAT-C computer package program for analyzed statistical data. Treatments difference was assessed by Least Significance Difference (LSD) test at 5% level of significance [8].

## 3. RESULTS AND DISCUSSION

### 3.1 Plant Height

The effect of different treatments on chilli germplasms in terms of plant height exposed significant variation (Table 1). The maximum plant height (65.7 cm) was achieved from Kajoli with solution-1( $V_2S_1$ ) treatment combination at all DAT (Table 1). Whereas minimum (48.9 cm) from Bogra morich with solution-0 ( $V_4S_0$ ) treatment combination (Table 1). Chilli plant received foliar application of organic micronutrient chelate at the concentration of 2% resulted in maximum (60.1 cm) plant height [9]. Foliar application of macro and micronutrient solution 'HiGrow' that were established in leaves and increase plant height of chilli plant [10].

### 3.2 Leaf Plant<sup>-1</sup>

The effect of different liquid fertilizers on chilli germplasms in terms of leaf number also exposed significant variation (Table 2.). The maximum number of leaves (90.0) was achieved from  $V_2S_1$  treatment combination that was statistically similar with  $V_1S_1$ ,  $V_2S_2$ ,  $V_3S_1$  at 85

DAT whereas minimum (35.5) from  $V_5S_0$  treatment (Table 2). Findings are in tune with [11] who found similar results in chilli when treated with a mixture of organic and inorganic fertilizers.

### 3.3 SPAD Values (%)

Chlorophyll percentage was statistically significant in combination with local chilli

germplasm along with the interaction of different liquid fertilizers at mature stage highest chlorophyll percentage (60.9%) in Kajoli with solution-1 ( $V_2S_1$ ) and lowest (45.7%) in Dongfou with control ( $V_5S_0$ ) treatment combination (Table 3). Zinc deficient leaves appeared light green in color due to the low concentration reported synthesis of chlorophyll disrupted due to the deficiency of zinc [12].

**Table 1. Effect of foliar fertilizers on the plant height of chilligermplasm at different days after transplanting (DAT)<sup>Y</sup>**

Treatments <sup>X</sup>	45 DAT	55 DAT	65 DAT	75 DAT	85 DAT
$V_1S_0$	19.9 j	23.1 j	30.7 g	39.9 h	50.8 i
$V_1S_1$	26.4 b	33.7 b	42.4 b	52.8 b	62.6 b
$V_1S_2$	22.8 fg	28.2 efg	37.5 e	49.3 cd	57.7 d
$V_2S_0$	22.3 gh	26.1 hi	32.6 f	44.2 ef	53.1 gh
$V_2S_1$	28.9 a	36.0 a	45.7 a	55.9 a	65.7 a
$V_2S_2$	26.1 bc	29.9 d	38.9 cd	50.3 c	59.7 c
$V_3S_0$	20.8 i	25.1 i	32.6 f	42.4 fg	55.6 ef
$V_3S_1$	25.5 cd	31.3 c	39.3 c	50.4 c	59.9 c
$V_3S_2$	23.3 f	29.0 def	37.1 e	47.9 d	56.3 de
$V_4S_0$	19.5 j	23.1 j	28.8 h	43.4 efg	48.9 j
$V_4S_1$	24.3 e	27.1 gh	33.2 f	45.3 e	51.8 hi
$V_4S_2$	21.6 h	25.1 i	31.1 g	42.7 fg	51.4 hi
$V_5S_0$	19.7 j	23.5 j	30.8 g	41.5 gh	51.0 i
$V_5S_1$	24.9 de	29.4 de	37.9 de	48.4 cd	56.5 de
$V_5S_2$	23.0 fg	28.0 fg	37.0 e	45.1 e	54.0 fg
CV (%)	2.2	3.1	2.4	3.3	2.2
LSD (0.05)	0.7	1.2	1.2	2.2	1.7

<sup>X</sup>Akashi ( $V_1$ ), Kajoli ( $V_2$ ), Deshi kacha morich ( $V_3$ ), Bogra Morich ( $V_4$ ), Dongfou ( $V_5$ ), Control ( $S_0$ ), Solution ( $S_1$ ), Solution ( $S_2$ ). <sup>Y</sup>Means values are statistically identical and differ significantly at  $P < 0.05$

**Table 2. Effect of foliar fertilizers on the leaf plant<sup>-1</sup> of chilli germplasm at different days after transplanting (DAT)<sup>Y</sup>**

Treatments <sup>X</sup>	45 DAT	55 DAT	65 DAT	75 DAT	85 DAT
$V_1S_0$	51.8 e	57.0 e	64.0 ef	70.8 f	73.8 g
$V_1S_1$	63.3 a	73.3 a	75.0 ab	82.5 a	89.3 a
$V_1S_2$	55.5 d	63.8 cd	72.0 bc	79.3 ab	83.3 cd
$V_2S_0$	52.1 e	58.0 e	62.2 f	70.0 f	75.0 fg
$V_2S_1$	61.6 ab	74.0 a	76.0 a	82.8 a	90.0 a
$V_2S_2$	55.8 d	65.3 bcd	72.8 abc	78.3 bc	87.3 ab
$V_3S_0$	49.8 e	57.3 e	62.0 f	70.0 f	77.8 ef
$V_3S_1$	59.9 bc	67.5 bc	71.8 bc	76.3 bcd	87.3 ab
$V_3S_2$	55.6 d	63.0 d	70.0 cd	73.5 def	84.5 bc
$V_4S_0$	50.6 e	56.8 e	61.5 f	65.0 g	73.8 g
$V_4S_1$	60.8 ab	68.0 b	71.0 cd	75.0 cde	80.8 de
$V_4S_2$	56.8 cd	57.5 e	67.5 de	71.3 ef	77.0 fg
$V_5S_0$	11.5 g	15.8 g	21.5 h	31.0 i	35.5 i
$V_5S_1$	16.3 f	23.5 f	29.8 g	36.5 h	44.5 h
$V_5S_2$	14.0 fg	21.0 f	26.8 g	32.8 hi	41.3 h
CV (%)	4.9	4.9	4.6	4.4	3.5
LSD (0.05)	3.3	3.8	3.9	4.1	3.7

<sup>X</sup>Akashi ( $V_1$ ), Kajoli ( $V_2$ ), Deshi kacha morich ( $V_3$ ), Bogra Morich ( $V_4$ ), Dongfou ( $V_5$ ), Control ( $S_0$ ), Solution ( $S_1$ ), Solution ( $S_2$ ). <sup>Y</sup>Means values are statistically identical and differ significantly at  $P < 0.05$

### 3.4 Leaf Area (cm<sup>2</sup>)

The maximum leaf area (132.6 cm<sup>2</sup>) was achieved from Dongfou with solution-2 (V<sub>5</sub>S<sub>2</sub>) treatment that was statistically similar with Dongfou with solution-1 (128.0 cm<sup>2</sup>) treatment, whereas a minimum from Deshi kacha morich with control (V<sub>4</sub>S<sub>0</sub>) treatment (49.67 cm<sup>2</sup>) (Table 3). The effect of foliar spray of nutrients on plant to increase the concentration in leaves so that to produce healthy leaves [13].

### 3.5 Initiation of Flower Bud after Planting

Foliar fertilizer application on local chilli germplasms affected significantly days taken to flower bud initiation from transplanting of chilli seedlings 47.0 minimum days required for V<sub>4</sub>S<sub>0</sub> treatment combination whereas maximum 64.0 days for Dongfou with solution-1 (Table 3). The case of control plots, the early flower emergence was associated with a relatively reduced growth period, the flowering occurred earlier than those received treatment. Due to foliar spray of Zinc in chilli delay flowering and increase growth period of plant [14].

### 3.6 Flowers Plant<sup>-1</sup> (Counting up to 60 Days after First Flowering)

Foliar spray of macro and micronutrients significantly affected on the blooming period of flowers. Maximum number of the flower was found from Kajoli with solution-1 treatment combination 90.0 while minimum from Dongfou with control treatment combination 19.25 per plant up to 60 days after first flowering (Table 3).

### 3.7 Vitamin C (Ascorbic Acid) Content in Green and Dry Fruit (mg/100 g)

Chilli germplasm combination with liquid fertilizers significantly effect on quality attributes of fruit (Table 4). Highest Vitamin-C content in green and dry chilli fruits was (83.4 mg/100 g and 49.1 mg/100 g fruit) in Akashi with Solution-1 (V<sub>1</sub>S<sub>1</sub>) treatment and the lowest (50.1 mg/100 g and 24.4 mg/100 g fruit) was in Deshi kacha morich with solution-0 (V<sub>3</sub>S<sub>0</sub>) treatment (Table 4).

### 3.8 Percentage of Protein in Green Fruit

A significant variation was obtained in protein content due to different foliar liquid fertilizers application on germplasm. The result showed that the maximum protein content (5.1%) was obtained from the combination of V<sub>5</sub>S<sub>1</sub> (Dongfou

x solution-1). The lowest protein contents (2.5%) were gained from the combination of V<sub>2</sub>S<sub>0</sub> (Kajoli x Control) (Table 4). Zinc is required as structural and catalytic components of protein and enzymes for normal growth and development [15]. Foliar spray contains Mg element, which plays an important physiological and biological role in the synthesis of chlorophyll, enzymes activity, protein, carbohydrate metabolism and transfer of energy, as well as it acts an oxidation-reduction reactions catalyst in many in plant tissues [16].

### 3.9 Weight of 50 Fresh and Dry Fruits

Chilli germplasm in combination with foliar fertilizer significantly influenced the fresh and dry weight of chilli fifty fruits. Maximum fresh and dry fruits weight was gained from V<sub>5</sub>S<sub>1</sub> (Dongfou x Solution-1; 202.0 g; 21.42 g) whereas the minimum was offered by V<sub>2</sub>S<sub>0</sub> (Kajoli x Control; 31.75 g; 9.03 g) (Table 5). Maximum fruit weight was obtained by foliar application of HiGrow (macro and micro) nutrients [10]. Dry weight of chilli (*Capsium annuum* L.) fruits was increased by the combined application of Zinc and Boron [17]. Chilli germplasm in combination with foliar fertilizers significantly influenced fruit diameter. Fruit diameter was found highest in (V<sub>5</sub>S<sub>1</sub>; 11.3 mm) which were also statistically identical with V<sub>5</sub>S<sub>2</sub> (10.4 mm) and V<sub>1</sub>S<sub>1</sub> (10.8 mm). The lowest fruit diameter (V<sub>4</sub>S<sub>0</sub>; 6.900 mm) was found in Bogur morich with S<sub>0</sub> (Control) treatment, which was statistically similar to V<sub>3</sub>S<sub>0</sub> (7.8 mm), V<sub>4</sub>S<sub>2</sub> (7.7 mm), V<sub>2</sub>S<sub>0</sub> (7.1 mm) (Table 5).

### 3.10 Fruit Diameter and Length (mm)

Application of fertilizer in combination with chilli germplasms significantly influenced fruit length. Maximum fruit diameter and length were found from combination (V<sub>5</sub>S<sub>1</sub>) (11.3 mm) and (99.6 mm) of Dongfou with solution-1 treatment, followed by combination (V<sub>5</sub>S<sub>2</sub>) (10.4) and (96.8 mm) Dongfou with solution-2 treatment. Minimum fruit length was obtained from combination (V<sub>4</sub>S<sub>0</sub>; V<sub>2</sub>S<sub>0</sub>) (6.9 mm; 49.4 mm) (Table 5). Foliar application of HiGrow in chilli plant increase fruit length [10].

### 3.11 Single Fruit Fresh Weight

Combined effect of different treatments viz. S<sub>0</sub> (Control), S<sub>1</sub> (Solution-1) and S<sub>2</sub> (Solution-2) on chilli germplasm viz. V<sub>1</sub> (Akashi), V<sub>2</sub> (Kajoli), V<sub>3</sub> (Deshi kacha morich), V<sub>4</sub> (Bogra morich), V<sub>5</sub> (Dongfou) in terms of single weight of fruit also

exposed significant variation. The highest result (4.3 g) reported from  $V_5S_1$  treatment combination that was similar to  $V_5S_2$  treatment combination. The lowest single fruit fresh weight (1.1 g) was recorded from  $V_2F_0$  (Table 5).

### 3.12 Fruits Plant<sup>-1</sup>

Macro and micronutrient solution effects on chilli germplasm, played an important role for in promoting fruit plant<sup>-1</sup>. Fruit plant<sup>-1</sup> exposed significant inequality due to different germplasm and foliar treatment combination. The highest fruit (327.0) was recorded from  $V_2S_1$  (Kajoli with Solution-1) treatment combination. The lowest (1.7) fruit plant<sup>-1</sup> was recorded from  $V_2S_0$  (kajoli with control) treatment combination (Table 6). Treatment combinations  $V_3S_1$  (303.3),  $V_3S_2$ (294.5) and  $V_4S_1$ (294.8) provide the second highest fruit plant<sup>-1</sup> (Table 6). The application of amino acid chelated micronutrients in chilli plant that increased the number of fruits [09]. Hatwar, et al. [18] Reported that the combined spraying of zinc, boron and iron each @ 0.1 percent along with the recommended dose of NPK @150:50:50 caused the maximum number of fruits plant<sup>-1</sup>.

### 3.13 Seed Weight (g) (No.1000)

The chilli germplasms responded differently to different foliar fertilizers in respect of 1000 seed weight (Table 6). A maximum weight of 1000

seed (3.9 g) was found from dongfou with solution-1 ( $V_5S_1$ ) treatment combination, which were statistically similar to  $V_1S_1$ ,  $V_1S_2$ ,  $V_2S_1$  and  $V_5S_2$  treatment combinations. The minimum weight of seed (2.6 g) was found with the combined effect of Bogramorich with control ( $V_4S_0$ ), which was statistically similar to  $V_3S_0$  (Table 6).

### 3.14 Yield Plant<sup>-1</sup>

Five chilli germplasm combined with foliar fertilizer was significant effect on yield plant<sup>-1</sup>. The highest (803.9 g/plant) fruits were recorded from combination  $V_1S_1$  (Akashi x Solution-1) (Table 6). Whereas the lowest (116.2 g/plant) was found in untreated the combination  $V_4S_0$  (Bogramorich x Control) (Table 6). The application of nutrients as foliar spray showed increased growth and yield contributing parameters in chilli [19,20]. Macro and micronutrients were applied to chillies gave better growth and yield compared to other treatments in chilli [10].

### 3.15 Yield (t ha<sup>-1</sup>)

Maximum yield (19.6 t ha<sup>-1</sup>) was found from  $V_1S_1$  which was statistically similar to  $V_1S_2$  and  $V_3S_1$  treatment combinations (Table 6). Minimum yield (10.4 t ha<sup>-1</sup>) was recorded in  $V_4S_0$  combination, respectively (Table 6). Similar results were

**Table 3. Combined effect of germplasm and foliar fertilizers on chilli germplasm of growth related attributes<sup>Y</sup>**

Treatments <sup>X</sup>	Chlorophyll percentage (%) at mature stage	Leaf Area (cm <sup>2</sup> ) at 85 DAT	Days to flower bud initiation after transplanting	Number of flower plant <sup>-1</sup>
$V_1S_0$	50.1 ghi	79.9 defg	47.0 fgh	51.8 gh
$V_1S_1$	58.9 abc	93.7 cd	55.3 bc	83.0 b
$V_1S_2$	55.3 bcde	94.9 c	52.5 cde	59.0 f
$V_2S_0$	52.7 efghi	73.9 efg	46.0 fgh	68.3 cd
$V_2S_1$	60.9 a	86.8 cde	53.8 cd	90.0 a
$V_2S_2$	57.2 abcd	92.9 cd	47.8 efg	84.8 ab
$V_3S_0$	50.2 ghi	49.7 h	44.0 gh	52.5 gh
$V_3S_1$	59.3 ab	68.0 g	49.0 def	73.8 c
$V_3S_2$	53.6 defgh	69.5 g	46.0 fgh	62.0 ef
$V_4S_0$	48.7 ij	69.7 fg	35.5 j	47.3 h
$V_4S_1$	54.9 def	84.5 cdef	42.8 hi	65.8 de
$V_4S_2$	53.7 defg	89.4 cd	39.0 ij	56.5 fg
$V_5S_0$	45.7 j	116.7 b	59.3 ab	19.3 j
$V_5S_1$	51.2 fghi	128.0 ab	64.0 a	30.8 i
$V_5S_2$	49.7 hij	132.6 a	60.0 ab	23.8 j
CV (%)	5.3	11.8	6.7	7.5
LSD (0.05)	4.0	14.9	4.8	6.2

<sup>X</sup>Akashi ( $V_1$ ), Kajoli ( $V_2$ ), Deshi kacha morich ( $V_3$ ), Bogra Morich ( $V_4$ ), Dongfou ( $V_5$ ), Cntrl ( $S_0$ ), Solution ( $S_1$ ), Solution ( $S_2$ ); <sup>Y</sup>Means values are statistically identical and differ significantly at  $P<0.05$

**Table 4. Combined effect of foliar fertilizers and chilli germplasm related attributes of fruits quality of chilli<sup>Y</sup>**

Treatments <sup>X</sup>	Vitamin C contain in green fruits (mg/100 g)	Vitamin C content in dry fruit (mg/100 g)	Percentage (%) of protein in green fruit (100 g)
V <sub>1</sub> S <sub>0</sub>	67.3 e	35.3 e	3.1 gh
V <sub>1</sub> S <sub>1</sub>	83.4 a	49.1 a	3.8 d
V <sub>1</sub> S <sub>2</sub>	78.6 b	43.2 c	3.5 f
V <sub>2</sub> S <sub>0</sub>	50.8 i	25.7 hi	2.5 j
V <sub>2</sub> S <sub>1</sub>	72.8 d	46.4 b	3.2 gh
V <sub>2</sub> S <sub>2</sub>	61.9 g	30.9 g	3.3 g
V <sub>3</sub> S <sub>0</sub>	50.1 i	24.4 i	3.1 h
V <sub>3</sub> S <sub>1</sub>	67.7 e	33.0 ef	4.0 c
V <sub>3</sub> S <sub>2</sub>	55.8 h	26.6 h	3.2 gh
V <sub>4</sub> S <sub>0</sub>	65.4 f	33.1 f	2.8 i
V <sub>4</sub> S <sub>1</sub>	75.3 c	33.6 ef	3.6 ef
V <sub>4</sub> S <sub>2</sub>	67.4 e	37.5 d	3.8 de
V <sub>5</sub> S <sub>0</sub>	60.4 g	30.3 g	3.2 gh
V <sub>5</sub> S <sub>1</sub>	77.2 b	34.4 ef	5.0 a
V <sub>5</sub> S <sub>2</sub>	67.6 e	44.1 c	4.3 b
LSD (0.05)	1.7	2.0	0.2
CV (%)	1.6	4.0	4.2

<sup>X</sup>Akashi (V<sub>1</sub>), Kajoli (V<sub>2</sub>), Deshi kacha morich (V<sub>3</sub>), Bogra Morich (V<sub>4</sub>), Dongfou (V<sub>5</sub>), Cntrl (S<sub>0</sub>), Solution (S<sub>1</sub>), Solution (S<sub>2</sub>); <sup>Y</sup>Means values are statistically identical and differ significantly at P<0.05

**Table 5. Combined effect of chilligremplasm and of foliar fertilizers on fruits related attributes chilli<sup>Y</sup>**

Treatments <sup>X</sup>	Weight of 50 mature fruit (g)	Weight of 50 dried fruit (g)	Fruit diameter (mm)	Length of fruit (mm)	Single fruit fresh weight (gm)
V <sub>1</sub> S <sub>0</sub>	43.0 hi	10.2 ghi	8.5 cd	54.5 h	2.1 e
V <sub>1</sub> S <sub>1</sub>	50.0 ef	15.5 c	10.8 ab	65.3 ef	2.6 c
V <sub>1</sub> S <sub>2</sub>	48.5 efg	12.8 de	9.9 b	62.6 f	2.4 cde
V <sub>2</sub> S <sub>0</sub>	31.8 j	9.0 i	7.1 ef	49.4 h	1.1 g
V <sub>2</sub> S <sub>1</sub>	51.0 e	11.5 efg	8.9 c	64.2 ef	1.4 f
V <sub>2</sub> S <sub>2</sub>	40.0 i	10.3 ghi	7.8 de	61.4 f	1.6 f
V <sub>3</sub> S <sub>0</sub>	41.0 i	9.4 hi	7.8 def	54.9 gh	1.6 f
V <sub>3</sub> S <sub>1</sub>	47.0 fg	13.7 d	9.9 b	74.2 cd	2.1 e
V <sub>3</sub> S <sub>2</sub>	46.0 gh	12.1 def	8.8 c	68.7 de	2.3 cde
V <sub>4</sub> S <sub>0</sub>	42.0 i	10.8 fgh	6.9 f	60.4 fg	1.6 f
V <sub>4</sub> S <sub>1</sub>	56.5 d	16.5 c	8.6 cd	77.6 c	2.5 cd
V <sub>4</sub> S <sub>2</sub>	50.0 ef	13.5 d	7.7 def	73.8 d	2.2 de
V <sub>5</sub> S <sub>0</sub>	165.3 c	16.8 c	8.0 cde	84.9 b	3.2 b
V <sub>5</sub> S <sub>1</sub>	202.0 a	21.4 a	11.3 a	99.6 a	4.3 a
V <sub>5</sub> S <sub>2</sub>	184.4 b	19.9 b	10.4 ab	96.8 a	4.2 a
CV (%)	3.5	8.0	7.3	5.7	9.6
LSD (0.05)	3.6	1.6	1.0	5.7	0.3

<sup>X</sup>Akashi (V<sub>1</sub>), Kajoli (V<sub>2</sub>), Deshi kacha morich (V<sub>3</sub>), Bogra Morich (V<sub>4</sub>), Dongfou (V<sub>5</sub>), Cntrl (S<sub>0</sub>), Solution (S<sub>1</sub>), Solution (S<sub>2</sub>); <sup>Y</sup>Means values are statistically identical and differ significantly at P<0.05

reported by Jiskani [20] who obtained that similar results from the application of micronutrient in combination with NPK in chilli. Lovatt [21] reported that foliar spray of 1%

either Polyfeed or Multi 'K' at 45, 60 and 75 days after planting increased the crop yield by about 10% over unsprayed control in chilli.

**Table 6. Combined effect of germplasm and foliar fertilizers related to fruits yield<sup>Y</sup>**

Treatments <sup>X</sup>	Fruits plant <sup>-1</sup>	Seed weight (g) (No.1000)	Yield plant <sup>-1</sup> (g)	Yield (t ha <sup>-1</sup> )
V <sub>1</sub> S <sub>0</sub>	139.1 f	3.1 de	324.0 e	15.8 cd
V <sub>1</sub> S <sub>1</sub>	214.8 d	3.8 a	803.9 a	19.6 a
V <sub>1</sub> S <sub>2</sub>	179.6 e	3.5 abc	577.8 bc	18.9 a
V <sub>2</sub> S <sub>0</sub>	201.6 d	3.2 de	220.4 g	11.8 f
V <sub>2</sub> S <sub>1</sub>	327.0 a	3.6 abc	434.6 d	17.6 b
V <sub>2</sub> S <sub>2</sub>	235.8 c	3.4 bcd	460.4 d	16.3 bc
V <sub>3</sub> S <sub>0</sub>	207.3 d	2.7 fg	332.4 e	14.5 de
V <sub>3</sub> S <sub>1</sub>	303.3 b	3.3 cde	603.7 b	19.0 a
V <sub>3</sub> S <sub>2</sub>	294.5 b	3.2 de	529.0 c	17.3 b
V <sub>4</sub> S <sub>0</sub>	207.3 d	2.6 g	116.2 i	10.4 g
V <sub>4</sub> S <sub>1</sub>	294.8 b	3.2 de	203.7 gh	15.1 cde
V <sub>4</sub> S <sub>2</sub>	226.0 c	3.1 e	193.5 gh	14.3 e
V <sub>5</sub> S <sub>0</sub>	72.3 g	3.0 ef	153.7 hi	11.4 fg
V <sub>5</sub> S <sub>1</sub>	81.8 g	3.9 a	287.6 ef	16.5 bc
V <sub>5</sub> S <sub>2</sub>	80.0 g	3.6 ab	242.7 fg	15.6 cde
CV (%)	4.2	6.8	11.9	6.3
LSD (0.05)	10.6	0.3	61.9	1.4

<sup>X</sup>Akashi (V<sub>1</sub>), Kajoli (V<sub>2</sub>), Deshi kacha morich (V<sub>3</sub>), Bogra Morich (V<sub>4</sub>), Dongfou (V<sub>5</sub>), Control (S<sub>0</sub>), Solution (S<sub>1</sub>), Solution (S<sub>2</sub>); <sup>Y</sup>Means values are statistically identical and differ significantly at P<0.05

#### 4. CONCLUSION

The present study showed the combined effect of Akashi treated with solution-1 performed as the best combination. Looking upon the above circumstances it can easily articulate that fruit quality and yield Akashi (V<sub>1</sub>) was the most outstanding local chilli germplasm and solution-1 was the most excellent foliar macro and micronutrient solution for modulation of growth, yield and quality attributes of chilli germplasm.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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