Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2019; 8(4): 2287-2289
Received: 24-05-2019
Accepted: 26-06-2019

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# Effect of micronutrients (Mg, Zn & B) on yield contributing characters of Sweet corns

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**Abstract**

The experiment was conducted on experimental site of Wheat and Maize Research Unit, VNMKV, Parbhani during *kharif* season 2016-17. The soil was medium black with moderate moisture retention capacity. The land having uniform topography was used to study the responses of micronutrient's (Mg, Zn and B) to crop hybrid (Phule Madhu) under irrigated condition, by using soil and foliar application of (Mg, Zn and B) micronutrients in presence of RDF @ 120:60:50 NPK kg/ha. The experiment was laid out in RBD with three replication and ten treatments. Yield contributing parameter such as cob length, cob girth, cob weight with husk/ without husk, cob yield plot$^{-1}$ and cob yield ha$^{-1}$ also were recorded and data was analyses statistically. Among all the treatment $T_7$ (RDF + $MgSO_4$ + $ZnSO_4$ + B spraying @ 1% at 30 and 45 DAS) (41.93 kg plot$^{-1}$ and 436.80 q ha$^{-1}$) showed higher in yield which was at par with treatment $T_8$ (RDF +Mg @ 1% spraying at 30 and 45 DAS) and significantly superior over rest of treatments. Among all the treatment $T_7$ (RDF + $MgSO_4$ + $ZnSO_4$ + B spraying @ 1% at 30 and 45 DAS) showed higher cob yield (41.93 kg plot$^{-1}$) and yield attributing character over the rest of the treatments. Application of micronutrients through foliar sprays gave significant results as compared to soil application under irrigated condition.

**Keywords:** Sweet corn, micronutrient and yield

## Introduction

Sweet corn (*Zea mays* L.) is the world's most widely cultivated food crop providing ample food calories and protein for more than one thousand million human beings in the world. The demand for maize grain is increasing because of its use as poultry feed and industrial uses. Micronutrient play an active role in the plant metabolic process starting from cell development to respiration, photosynthesis, chlorophyll formation, enzyme activity, hormones synthesis, nitrogen fixation etc. The micronutrients are going to play a major protective role in bringing stability and sustainability in food production. The role of macro and micronutrients is crucial in yields. Nitrogen is a primary constituent of proteins and thus all enzymes (Raun and Johnson, 1999) [13]. P is involved in almost all biochemical pathways as a component part of energy carrier compounds, ATP and ADP (Khalil and Jan, 2003) [7]. Six micronutrients i.e. Mn, Fe, Cu, Zn, B and Mo are known to be required for all higher plants (Welch, 1995) [15]. These have been well documented to be involved in photosynthesis, N- fixation, respiration and other biochemical pathways (Marschner and Romheld, 1991 and Warman, 1992). Micronutrient requirements of the maize (*Zea mays* L.) crops are relatively small and ranges between their deficiencies and toxicities in plants and soils are rather narrow. Maize is a plant with a high productivity potential, which requires a much larger amount of nutrients during its growth and development compared to other cereal crops. Magnesium (Mg) is one of 18 nutrients essential for plant growth. It is actively involved in Photosynthesis as a component of chlorophyll and also plays an important role in plant respiration and energy metabolism. Zinc required in small but critical concentrations to allow several key plant physiological pathways to function normally. Uniform application of boron in the field is very important. However, growing suitable varieties with proper dose of fertilizer increase growth and yield of crop.

## Material and Methods

Sweet corn seeds of hybrid Phule Madhu were used for the experiment. Seed of sweet corn hybrid (Phule Madhu) was obtained from Wheat & Maize Research Unit, VNMKV Parbhani. The recommended seed rate 15-20 kg ha$^{1}$ used for sowing. FYM was applied @ 16-20 t ha$^{-1}$ at the time of land preparation. Recommended dose of fertilizer were applied @ 120 Kg N, 60 Kg $P_2O_5$ and 50 Kg $K_2O$ ha$^{-1}$ as under 1/3 N + complete $P_2O_5$ and $K_2O$ was given the time of sowing while the remaining 2/3 N was given in two split doses at an interval of 30 days. Basal dose of fertilizer was applied by using 10:26:26 (mixed fertilizer), Urea, MOP etc.

Micronutrients viz. Mg, Zn and B applied @ (Zn =20 kg $ha^{-1}$, B = 5 kg $ha^{-1}$ & Mg =20 kg $ha^{-1}$) at the time of sowing and spraying of Zn, Mg & B @ 1% at 30 and 45 days after sowing.

**Treatments details**

$T_1$: Control
$T_2$: RDF (120:60:50 kg NPK $ha^{-1}$)
$T_3$: RDF + 3 Content, through soil (Mg + Zn + B) (20 kg, 20 kg, 5 kg $ha^{-1}$) respectively.
$T_4$: RDF + Mg (20 kg $ha^{-1}$) soil application at the time of sowing
$T_5$: RDF + Zn (20 kg $ha^{-1}$) soil application at the time of sowing
$T_6$: RDF + B (5 kg $ha^{-1}$) soil application at the time of sowing
$T_7$: RDF + foliar application of Mg + Zn + B at 30 & 45 DAS @ 1%
$T_8$: RDF+ foliar application of Mg at 30 & 45 DAS @ 1%
$T_9$: RDF + foliar application of Zn at 30 & 45DAS @ 1%
$T_{10}$: RDF + foliar application of B at 30 & 45 DAS @ 1%
(Soil application Dose: Zn=20 kg $ha^{-1}$, B=5 kg $ha^{-1}$& Mg=20 kg $ha^{-1}$)

## Result and discussion

### Yield contributing characters

**Cob length (cm) at harvest**

The data presented in Table no. I indicates that, the treatment differences were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (28.00 cm) was significantly superior over rest the treatments and at par with $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (27.56 cm) and significantly superior over rest of the treatments. These results are in agreement with Arya *et al.* (2005) [1] and Poterzycki and Grzebisz (2009) reported that cob length may increase due to availability of nutrients.

**Cob girth (cm) at harvest**

The data presented in Table no. I reveals that, the treatment differences were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (22.45 cm) was significantly superior over rest of the treatments and at par with treatment $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (21.81cm). Similar findings were recorded by Kumar *et al.* (2009) [8] and Arya *et al.* (2005) [1], it might be due to application of micronutrient which results in increase cob girth.

**Number of rows per cob**

The data presented in Table no. I indicates that, the treatment differences were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (17.20) which was significantly superior over rest of the treatments and at par with $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (16.72). Present results are supported by Kumar *et al.* (2009) [8] and Arya *et al.* (2005) [1].

**Number of kernels per row**

The data presented in Table no. I reveals that, the treatment differences were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (36.13) was significantly superior over rest of the treatments and it was at par with $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (35.77) and $T_9$ (RDF+ Zn @ 20 kg $ha^{-1}$ 1% spraying at 30 and 45 DAS) (63.36 SPAD). Similar results reported by Potarzycki and Grzebisz (2009) and Moghadam *et al.* (2012) [10].

**Number of cobs per plot**

The data given in Table no. I indicates that, the treatment differences were found significant. The treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (77.01) which was significantly superior for number of cobs per plot and at par with $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (75.67), similar results were reported by Kumar *et al.* (2009) [8] and Arya *et al.* (2005) [1].

**Green cob weight with husk at harvest (kg $cob^{-1}$)**

The data presented in Table no. I indicates that, the differences for biological yield were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (0.623 kg/plot) was at par with $T_8$ (RDF+ foliar application of Mg @ 1% at 30 and 45 DAS) (0.566 kg/plot) and significantly superior over rest of treatments, these results are confined by Ziaeiann *et al.* (2001) [16] and Solemani (2006).

The significant variations in cob weight with husk were evident due to application of NPK along with micronutrients. The data indicated that was decrease in cob weight decreased with the NPK along with micronutrients by soil application.

**Green cob weight without husk at harvest (kg $cob^{-1}$)**

The data presented in Table no. I indicates that, the treatment differences were found significant. Treatment $T_7$ (RDF+ Mg $SO_4$ + Zn $SO_4$ + B spraying @ 1% at 30 and 45 DAS) (0.533 kg/plot) was at par with treatment $T_8$ (RDF+ Foliar application of Mg @ 1% at 30 and 45 DAS) (0.473 kg/plot) and significantly superior over rest of the treatments, similar findings Ziaeiann *et al.* (2001) [16] and Solemani (2006).

The significant variations in cob weight without husk were evident due to application of NPK along with micronutrients. The data indicated that was decrease in cob weight decreased with the NPK along with micronutrients by soil application.

**Green cob sweetness (brix) reading (%)**

The data presented in Table no. I indicates that, the green cob sweetness (brix) reading (22.28%) was found non-significant.

### Yield

**Cob yield (kg $plot^{-1}$), Cob yield (q $ha^{-1}$)**

The data presented in Table no. I indicates that, the maximum cob yield (41.93 kg $plot^{-1}$) and cob yield (436.80q $ha^{-1}$) was found in $T_7$. Treatment $T_7$ (RDF+ Mg $SO_4$+ Zn $SO_4$+ B @ 1% spraying at 30 and 45 DAS) was found significantly superior over rest of treatments, in respect of cob yield (41.93 kg $plot^{-1}$) and cob yield (436.80 q $ha^{-1}$), and at par with treatment $T_8$ (RDF+ Foliar application of Mg @ 1% at 30 and 45 DAS) (36.42 kg $plot^{-1}$ and 379.39 q $ha^{-1}$ cob yield) and significantly superior over rest of the treatments, these results are confined by Ziaeiann *et al.* (2001) [16] and Solemani (2006).

**Table 1:** Influence of different treatments on various yield contributing characters of sweet corn.

| Treatments | Cob length (cm) | Cob girth (cm) | No. of rows/ cob | Cob length (cm) | No. of rows/ cob | No. of kernels/ row | No. of cobs/ plot | Cob wt. with husk (kg/cob) | Cob wt. without husk (kg/cob) | Brix reading (%) | Cob yield ($kg.plot^{-1}$) | Cob yield ($qt.ha^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | | | | | 13.06 | 30.00 | 74.33 | 0.321 | 0.230 | 17.74 | 17.38 | 181.02 |
| $T_2$ | 23.83 | 16.90 | 13.06 | 23.83 | 13.63 | 32.53 | 75.33 | 0.346 | 0.244 | 18.11 | 18.75 | 195.27 |
| $T_3$ | 24.50 | 17.70 | 13.63 | 24.50 | 15.00 | 34.13 | 75.33 | 0.504 | 0.414 | 19.91 | 31.72 | 330.39 |
| $T_4$ | 25.97 | 19.69 | 15.00 | 25.97 | 14.60 | 33.53 | 76.01 | 0.470 | 0.366 | 19.07 | 28.32 | 295.03 |
| $T_5$ | 25.57 | 18.85 | 14.60 | 25.57 | 13.97 | 33.31 | 76.00 | 0.442 | 0.342 | 18.91 | 26.49 | 275.92 |
| $T_6$ | 25.06 | 18.70 | 13.97 | 25.06 | 13.69 | 33.10 | 75.66 | 0.378 | 0.288 | 18.45 | 22.24 | 231.67 |
| $T_7$ | 24.89 | 17.95 | 13.69 | 24.89 | 17.20 | 36.13 | 77.01 | 0.623 | 0.533 | 22.28 | 41.93 | 436.80 |
| $T_8$ | 28.00 | 22.45 | 17.20 | 28.00 | 16.72 | 35.77 | 75.67 | 0.566 | 0.473 | 21.23 | 36.42 | 379.39 |
| $T_9$ | 27.56 | 21.81 | 16.72 | 27.56 | 15.46 | 34.67 | 76.00 | 0.536 | 0.433 | 20.31 | 33.48 | 348.71 |
| $T_{10}$ | 26.46 | 20.57 | 15.46 | 26.46 | 15.22 | 34.53 | 75.33 | 0.519 | 0.422 | 20.29 | 32.36 | 337.12 |
| S.E.± | 26.15 | 19.79 | 15.22 | 26.15 | 0.276 | 0.594 | 0.601 | 0.027 | 0.029 | 1.419 | 2.274 | 23.70 |
| C.D. 5% | 0.331 | 0.243 | 0.276 | 0.331 | 0.820 | 1.764 | 1.784 | 0.081 | 0.086 | NS | 6.747 | 70.31 |
| C.V % | 0.984 | 0.723 | 0.820 | 0.984 | 3.224 | 3.051 | 1.376 | 9.951 | 13.49 | 12.52 | 13.63 | 13.63 |
| GM. | 2.228 | 2.171 | 3.224 | 2.228 | 14.85 | 33.77 | 75.66 | 0.470 | 0.374 | 19.62 | 28.90 | 301.13 |

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