Effect of Potassium and Iron on Growth and Yield of Summer Baby corn (Zea mays L.)

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The Treatments consists of 2 levels of Potassium viz. K₁(40 kg K₂O/ha), K₂(50 kg K₂O/ha) and 4 levels of Iron viz.10 and 20 kg/ha as basal and 0.1 and 0.2% as foliar application. There were 9 treatments each being replicated thrice and laid out in Randomized Block Design. The results revealed that treatment T8 (50kgs potassium + 0.2% iron) recorded maximum Dry weight, Number of cobs per plant, cob length, cob girth, cob weight without husk, cob yield without husk, Green fodder and B: C ratio.

Keywords
Potassium, Iron, Growth and Yield, Baby corn

Article Info
Accepted: 15 October 2020
Available Online: 10 November 2020

Introduction

Maize, of all the cereal grains is the most highly valued for its multifarious uses, being utilized as human food, animal feed and raw materials in industry. Maize is the third most important cereal crop next to rice and wheat and has the highest production potential among the cereals. For diversification and value addition, as well as growth of food processing industries, an interesting recent development is of growing maize for vegetable purpose, which is known as ‘baby corn’. It is so called because young, fresh and finger like green ears are harvested when the silk length is of 2-3 cm but prior to fertilization (Pandey et al., 2000). Potassium (K) is substantially an important nutrient for plant growth, and has the capability to maximize plant growth and it influences soil-plant interactions as well (Xie et al., 2011). As, for acting as an essential nutrient for crop production and its development; it acts as a co-factor for more than 40 enzymes that are involved in metabolic pathways directly (Clarkson and Hanson, 1980). Its application effects on turgor potential, opening and closing of stomata, relativewatercontents,photosyntheticrate,leafwaterpotential,grainweighttranspiration rate, grain yield, biological yield of crops and disturbed consumption mechanism of fixed C (Aslam et al.,...
Another essential nutrient is Iron (Fe), the lack of which causes chlorosis and is responsible for significant decreases in yield and quality of plants. Foliar feeding is a new and controversial technique of feeding plants by applying liquid fertilizer directly to their leaves.

**Materials and Methods**

The field experiment was conducted during Zaid 2020 at CRF (Crop Research Farm). Department of Agronomy, SHUATS, Prayagraj (UP). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.3), low in organic carbon (0.57%), available N (230kg/ha), available P (32.10kg/ha) and available K (346kg/ha). The Treatments consists of 2 levels of Potassium viz. K₁ (40 kg K₂O/ha), K₂ (50 kg K₂O/ha) and 4 levels of Iron viz. Fe₁ (10 kg FeSO₄/ha), Fe₂ (20 kg FeSO₄/ha), Fe₃ (0.1% FeSO₄/ha) and Fe₄ (0.2% FeSO₄/ha) as both basal and foliar application, viz: whose effect is observed on Baby corn (var. G5414). There were 9 treatments each replicated thrice. The experiment was laid out in Randomized Block Design. The crop was sown on 29th February 2020 using variety G5414 with a seed rate of 20 kg/ha. The recommended dose of 120 kg N, 60 kg P, 40 kg K₂O & 10 kg Fe per ha was applied. Foliar spray of Fe was applied according to the treatment details through Feso₄ after 20 days of sowing.

**Results and Discussion**

Data presented in Table 1 revealed that maximum number of Cobs per plant (2.33) was recorded in T₈ (50kg potassium + 0.2% iron), which was significantly superior over rest of the treatments except. And on par with T₃ (40kg potassium + 0.1% iron) (2.06), T₇ (50kg potassium + 0.1% iron) (2.13) and T₄ 40kg (potassium + 0.2%) (2.2). Increase in cobs per plant by potassium application was probably due to its influence on various enzymatic activities which controlled the flowering and seed formation. These results are in accordance with those of Gamboa et al., (1990) who stated that K application increased prolificacy probably due to availability of more nutrients to plants. Number of cobs per plant may also be increased by iron foliar spray which helps inoculant for increasing iron transportation in maize plant.

Data presented in Table 1 revealed that maximum length of cob per plant (19.19 cm) was recorded in T₈ (50kg potassium + 0.2% iron) which statistically on par with T₂ (40kg Potassium + 20kg Iron) (16.74 cm), T₇ (50kg potassium + 0.1% iron) (17.18), T₄ (40kg potassium + 0.2% iron) (18.16 cm). Increase in cob length with potash fertilization might be due to the role of potassium in increasing cell division, improved plant growth conditions in water use efficiency and also results in quick transportation towards grain. The continuous filling of grains due to sufficient photosynthesis might have resulted in increased length and size of the cob.
foliar application of ferrous sulphate increased cob length as it plays critical role in metabolic processes such as DNA synthesis. Similar results were found in Gnanasundari et al., (2018).

Data presented in Table 1 revealed that maximum girth of cob per plant (8.03 cm) was recorded in T₈ (50kg potassium + 0.2% iron) which statistically on par with T₄ (40kg potassium + 0.2% iron) (7.59). Increase in Cob girth due to the role of potassium in increasing cell division, improved plant growth conditions in water use efficiency and also results in quick transportation towards grain. This may be due to continuous filling of grains with sufficient photosynthates that lead to increased size of cob and it resulted in increased cob girth. Higher cob diameter was also attributed to the supply of sufficient NPK nutrients essential for constituents of plant tissues involved in cell division and cell elongation (Shamim et al., 2015). Foliar spray of Iron increases the cob girth as it plays an important role in metabolic functions of plants from cell wall, cell elongation and nitrogen fixation and reduction. This finding was also supported by Srinivasa (2013).

Data presented in Table 1 revealed that highest weight per cob without husk of baby corn (19.35) is observed with treatment T₈ (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T₂ (40kg potassium + 20kg iron) (17.82), T₃ (40kg potassium + 0.1% iron) (17.93), T₄ (40kg potassium + 0.2% iron) (18.19). Though Iron needs in smaller amount it plays a major role in plant metabolic activity. Iron and Potassium is essential for many physiological processes such as photosynthesis and formation of ferredoxin which functions as electron transporter in photosynthesis, translocation of photosynthates into sink, activation of enzymes and it increases the NUE increase the metabolites and nutrients to develop reproductive structure seems to have resulted in increased cob girth, cob length, number of cobs, number of grains per cob, grain rows per cob, cob weight with and without husk, 100 grain weight and seed weight. The findings are close agreement with those obtained by Tariq et al., (2011).

Data presented in Table 1 revealed that highest cob yield without husk of baby corn (3.90 t/ha) was measured with application T₈ (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T₃ (40kg potassium + 0.1% iron) (3.52 t/ha), T₇ (50kg potassium + 0.1% iron) (3.61 t/ha) and T₄ (40kg potassium + 0.2% iron) (3.71 t/ha). These improved yield parameters mainly because of application of potassium overcome the harmful effects of water stress, retaining water in tissue and thus maintaining higher plant growth and regulating transpiration (Ram Rao, 1986). Whereas, application of nitrogen influence the higher growth parameters and improves dry matter accumulation which in turn improves yield parameters (Bhanu Prasad Reddy et al., 2016).

Data presented in Table 1 revealed that highest green fodder yield of baby corn (36.54 t/ha) was observed in T₈ (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T₂ (40kg potassium + 20kg iron) (30.71 t/ha), T₃ (40kg potassium + 0.1% iron) (31.71 t/ha), T₇ (50kg potassium + 0.1% iron) (31.73 t/ha) and T₄ (40kg potassium + 0.2% iron) (33.78 t/ha). Potassium application is the reason for the increase in green fodder yield due to higher plant height and dry matter production per plant. Plant hormones responsible for cell division and enlargement and higher facilitating optimum development of photosynthetic apparatus captures the incident light more efficiently Patil et al., (2018).
**Table 1** Growth and yield attributes of summer baby corn as influenced by potassium and Iron fertilization

| Treatment                                      | Dry weight (g) | No. of cobs/plant | Cob length (cm) | Cob girth (cm) | Cob weight without husk (g) | Cob yield without husk (t/ha) | Green fodder (t/ha) | B:C ratio |
|------------------------------------------------|----------------|-------------------|------------------|----------------|-----------------------------|-------------------------------|---------------------|-----------|
| 1. 40 kg/ha Potassium + 10 kg/ha Iron          | 79.11          | 2.00              | 15.82            | 6.87           | 15.84                       | 2.98                         | 27.85               | 1.64      |
| 2. 40 kg/ha Potassium + 20 kg/ha Iron          | 80.87          | 1.86              | 16.74            | 7.35           | 17.82                       | 3.44                         | 30.71               | 1.76      |
| 3. 40 kg/ha Potassium + 0.1 % Iron             | 81.98          | 2.06              | 15.54            | 7.05           | 17.93                       | 3.52                         | 31.71               | 2.32      |
| 4. 40 kg/ha Potassium + 0.2 % Iron             | 87.13          | 2.20              | 18.16            | 7.59           | 18.19                       | 3.71                         | 33.78               | 2.41      |
| 5. 50 kg/ha Potassium + 10 kg/ha Iron          | 83.88          | 2.00              | 16.37            | 6.02           | 15.53                       | 3.42                         | 28.73               | 1.96      |
| 6. 50 kg/ha Potassium + 20 kg/ha Iron          | 82.64          | 1.93              | 15.32            | 6.09           | 16.40                       | 3.33                         | 29.30               | 1.65      |
| 7. 50 kg/ha Potassium + 0.1 % Iron             | 85.21          | 2.13              | 17.18            | 5.77           | 17.60                       | 3.61                         | 31.73               | 2.37      |
| 8. 50 kg/ha Potassium + 0.2 % Iron             | 89.46          | 2.33              | 19.19            | 8.03           | 19.35                       | 3.90                         | 36.54               | 2.59      |
| 9. Control                                     | 76.02          | 1.73              | 14.96            | 5.41           | 14.88                       | 2.66                         | 23.71               | 1.58      |
| SEm(±)                                         | 2.53           | 0.10              | 0.89             | 0.17           | 0.51                        | 0.14                         | 2.07                |           |
| CD(p=0.05)                                     | 7.5            | 0.30              | 2.68             | 0.52           | 1.53                        | 0.42                         | 6.22                |           |
Plant height and Dry matter were significantly affected by foliar application of Fe. Iron is involved when a plant produces chlorophyll, which gives the plant oxygen as well as its healthy green colour which leads to increase in green fodder yield increases (Zayed et al., 2011).

Data presented in Table 1 revealed that maximum B:C ratio (2.59) were obtained in Baby corn fertilized with 50kg potassium + 0.2% iron. From this study, it was inferred that combination of potassium and Iron micronutrients gives higher yield as they play major role in assimilation rate and metabolic activities in plant. Rakeshkumar and Bohra (2014).

It is concluded on the basis of one year experimentation, application with 50kgs potassium + 0.2% iron was recorded higher baby corn yield, green fodder yield and was found economically viable with benefit cost ratio.

Acknowledgement

I express gratitude to my advisor Prof. (Dr.) Joy Dawson for constant support and guideline. I am indebted to Prof. (Dr.) Thomas Abraham and Dr. Vikram Singh and all the faculty members of SHUATS for inspiration.

References

Aslam .M, M.S.I. Zamir, I. Afzal and M. Amin. 2014. Role of potassium in physiological functions of spring maize (Zea mays L.) grown under drought stress. J. Anim. Plant Sci., 24(5): 1452-1465.

Bhanu Prasad Reddy, S, K.V. Naga Madhuri, Keerthi Venkaiah and T. Prathima. 2016. Effect of Nitrogen and Potassium on Yield and Quality of Pearl Millet (Pennisetum glaucum L.) International Journal of Agriculture Innovations and Research. 4(4); 2319-1473.

Clarkson, D.T. and J.B. Hanson. 1980. The mineral nutrition of higher plants. Annu. Rev. Plant Physiology., 31: 239-298.

Gamboa D, Perez FR and Arevalo CG (1990), Sweet corn evaluation of cultivars introduced by the E.E.A.D.C., Advance agro-industrial; 1: 23-24.

Gnanasundari R, Sellamuthu K.M and Malathi P. Effect of Potassium on Growth, Yield and NPK Uptake of Hybrid Maize in Black Calcareous Soil. Madras Agricultural Journal.2018; 10(2): 218.

Patil D.L, Y.R Jadhav and J.B Patil. Response of baby corn to fertilizer levels during summer season. International Journal of Chemical Studies 2018; 6(6): 48-50.

Pandey, A.K., Prakash, V., Mani, V.P. And Singh, R.D., 2000, Effect of rate of nitrogen and time of application on yield and economics of Baby corn. Indian J. Agron., 45(2): 338-343.

Rakeshkumar, Bohra JS. Effect of NPKS and Zn application on growth, yield, economics and quality of baby corn. Archives Agron. Soil Sci. 2014; 60(9): 1193-1206.

Rama Rao, N., 1986, Potassium requirements for growth and its related processes determined by plant analysis in wheat. Plant Soil; 96:125-131.

Shamim Gul, M.H Khan, B.A Khanday and Sabeena Nabi. 2015. Effect of Sowing Methods and NPK Levels on Growth and Yield of Rainfed Maize (Zea mays L.) Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Vol. 6: 198-575.

Srinivas, D.K. 2013. Studies on effect of graded levels of potassium under irrigated maize (Zea mays L.) in southern dryzone of Karnataka. Ph.D
Thesis, University of Agricultural Sciences, Bengaluru Xiaoyun Fan, RezaulKarim MD, Xinping C, Yueqiang Z, Xiaopeng G, Fusuo Z et al., Growth and iron uptake of lowland and aerobic rice genotypes under flooded and aerobic cultivation. *Communications in Soil Science and Plant Analysis* 2012; 43(13):1811-1822

Tariq, M., Saeed, A., Nisar, M., Main, I.A. and Afzal, M. 2011. Effect of potassium rates and sources on the growth performance and chloride accumulation of maize in two different textured soils of Haripur, Hazara Division. *Sarhad J. Agriculture*, 3:415-422.

Xiaoyun Fan, RezaulKarim MD, Xinping C, Yueqiang Z, Xiaopeng G, Fusuo Z et al., Growth and iron uptake of lowland and aerobic rice genotypes under flooded and aerobic cultivation. *Communications in Soil Science and Plant Analysis* 2012; 43(13):1811-1822

Xie, W.J., H.Y. Wang, J.B. Xia and Z.G. Yao. Influence of N, P, and K application on Zeamays L. growth and Cu and Pb accumulation. *Journal of Plant Soil Environment* 2011; 57(3): 128-134.

Zayed B.A, Salem A.K.M, El Sharkawy H.M. Effect of different micronutrient treatments on rice (*Oryza sativa* L.) growth and yield under saline soil conditions. *World J. Agric. Sci* 2011; 7(2): 179-184.

**How to cite this article:**

Polamreddy Vasu Deva Reddy, Joy Dawson and Ramya, B.J.N.S. 2020. Effect of Potassium and Iron on Growth and Yield of Summer Baby corn (*Zea mays* L.). *Int.J.Curr.Microbiol.App.Sci.* 9(11): 1871-1876. doi: [https://doi.org/10.20546/ijcmas.2020.911.221](https://doi.org/10.20546/ijcmas.2020.911.221)