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

Polamreddy Vasu Deva Reddy*, Joy Dawson and B.J.N.S. Ramya

Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj-211007, Uttar Pradesh, India

**Corresponding author*

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A B S T R A C T

The Treatments consists of 2 levels of Potassium *viz.* K_1(40 kg K_2O/ha), K_1(50 kg K_2O/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.

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 closingofstomata,relativewatercontents,photosyntheticrate,leafwaterpotential,grainweight transpiration rate, grain yield, biological yield of crops and disturbed consumption mechanism of fixed C (Aslam *et al.*, 2014).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*. K_1(40 kg K_2O/ha), K_1(50 kg K2O/ha) and 4 levels of Iron *viz*. Fe1 (10 kg $FeSO_4$/ha), Fe2 (20 kg $FeSO_4$/ha), Fe3 (0.1% $FeSO_4$/ha) and Fe4 (0.2% $FeSO_4$/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 K_2O &10 kg Fe per ha was applied. Foliar spray of Fe was applied according to the treatment details through $Feso_4$ after 20 days of sowing.

Results and Discussion

Data presented in Table 1 revealed that maximum plant dry weight (89.46) was recorded in T_8 (50kgs potassium + 0.2% iron), which was significantly superior over rest of the treatments. And on par with T_3 (40kg potassium + 0.1% iron) (81.98), T_6 (50kg potassium + 20kg iron) (82.64), T_5 50kg (potassium + 10kg iron) (83.88), T_7 (50kg potassium + 0.1% iron) and T_4 40kg (potassium + 0.2%) (87.13). Application of Potassium increased dry weight as the content of chlorophyll increases which leads to accumulation of starch. The interaction effect between potassium and Iron was found significant in respect of green and dry matter yield. And significant increases in shoot dry weight by Fe application under both aerobic and flooded plots (Xiaoyun *et al.,* 2012).

Data presented in Table 1 revealed that maximum number of Cobs per plant (2.33) was recorded in T_8 (50kg potassium + 0.2% iron), which was significantly superior over rest of the treatments except. And on par with T_3 (40kg potassium + 0.1% iron) (2.06), T_7 (50kg potassium + 0.1% iron) (2.13) and T_4 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 T_8 (50kg potassium + 0.2% iron) which statistically on par with T_2 (40kg Potassium + 20kg Iron) (16.74 cm), T_7 (50kg potassium + 0.1% iron) (17.18), T_4 (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. The 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 T_8 (50kg potassium + 0.2% iron) which statistically on par with T_4 (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 T_8 (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T_2 (40kg potassium + 20kg iron) (17.82), T_3 (40kg potassium + 0.1% iron) (17.93), T_4 (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 T_8 (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T_3(40kg potassium + 0.1% iron) (3.52 t/ha), T_7(50kg potassium + 0.1% iron) (3.61 t/ha) and T_4 (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 T_8 (50kg potassium + 0.2% iron) which was superior over rest of the treatments followed by T_2 (40kg potassium + 20kg iron) (30.71 t/ha), T_3 (40kg potassium + 0.1% iron) (31.71 t/ha), T_7 (50kg potassium + 0.1% iron) (31.73 t/ha) and T_4 (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:Cratio
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.

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