



## Research Article

# SELECTED MACRONUTRIENTS CONTENT IN GRAIN AND UPTAKE BY SWEET CORN VARIETIES UNDER DIFFERENT RATES OF NITROGEN AND PHOSPHORUS

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**Abstract-** An investigation on the "Response of sweet corn hybrid to varying nitrogen and phosphorus levels" was conducted during summer season, 2015 at College of Agricultural, Junagadh. Treatment consisted four sweet corn varieties viz., Bajaura sweet corn, Sugar 75, Win Orange and Priya and three levels of fertilizers (90-40, 120-50 and 130-60 kg N-P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>). Nitrogen and phosphorus concentration and uptake was found significantly highest in sweet corn variety Sugar 75 over the rest of varieties but potassium content remain unaffected by sweet corn varieties. Significant increase in NPK uptake by crop and were recorded with application of fertilizer 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>.

**Keywords-** Sweet corn, Fertility levels, Varieties, Nutrient uptake, Soil fertility

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## Introduction

Maize (*Zea mays* L.) is the third most important cereal crop of world and India after wheat and rice. Maize is a miracle crop called "Queen of Cereals" and is grown in more than 130 countries [1]. Sweet corn is one type of maize and contains 13 to 20% sugar in immature grains. Sweet corn is consumed at the soft dough stage with succulent grains, emerges as an alternative dish of urbanites namely, vegetable, roasted ears, soups, corn syrup and sweeteners etc. It also found a special niche in the preparation of native beer. Sweet corn can be harvested within 80 to 90 days after sowing. They are harvested earlier by 35 to 45 days compared to normal grain corn. Presently, greater emphasis is given to the cultivation of sweet corn due to increasing demand. There is an increasing tendency to produce sweet corn at commercial level to augment the income of the farming community dwelling in the outskirts of big cities and metropolis. Since there is limited scope to increase the area under sweet corn cultivation because of competition from other cereals and cash crops, the only alternative is through enhancement of productivity by various management factors [2]. The concept of balanced fertilization paves the way for optimum plant nutrient supply to realize full yield potential of crop. However, continuous use of imbalance fertilizers causes decline in soil fertility and yield reduction. Keeping these points in view, the present study was undertaken to investigate the effect of balanced fertilization for higher yield of maize and soil fertility in Junagadh district of Gujarat. Improved cultivars and optimum plant nutrition have the profound bearing on yield, nutrient content and uptake of maize. However, the relevant research on these aspects in sweet corn is lacking. Keeping this point in view, the present investigation was undertaken.

## Materials and Methods

The present study was conducted throughout summer season of 2015 at the College Farm, College of Agriculture, Junagadh Agricultural University, Junagadh

to study the Response of sweet corn (*Zea mays* L. *saccharata*) varieties to fertility levels under South Saurashtra region of Gujarat. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction with pH 7.9 and EC 0.38 dS m<sup>-1</sup> and organic carbon 0.62 %. The soil was low in available nitrogen (241.00 kg ha<sup>-1</sup>) and available phosphorus (31.60 kg ha<sup>-1</sup>) while medium in available potash (245.36 kg ha<sup>-1</sup>). The experiment was conducted in factorial randomized block design with total 12 treatment combination consisting of 4 varieties viz., Bajaura sweet corn (V<sub>1</sub>), Sugar 75 (V<sub>2</sub>), Win Orange (V<sub>3</sub>) and Priya (V<sub>4</sub>) and 3 levels of fertilizers (90-40, 120-50 and 130-60 kg N-P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> as F<sub>1</sub>, F<sub>2</sub> and F<sub>3</sub>, respectively). These treatments were replicated four times in a Randomized Block Design with factorial concept. The entire dose of phosphorus and half dose of nitrogen were applied as basal application in form of urea and DAP at just before sowing in the furrows. Remaining half dose of nitrogen was top dressed as urea at knee height stage of the crop.

## Results and Discussion

### Nutrient content:

The different varieties and fertility levels had significant influenced the nutrient content and uptake by sweet corn. Among different sweet corn varieties, Sugar 75 was recorded highest nitrogen (1.88%) over the rest of the varieties and phosphorus (0.58%) content was at par with Win orange variety while in case of potassium content, all four varieties did not show any significant difference. This might be due to that sugar 75 has a vigorous growth habit which grow fast in the initial stage and utilize more resources viz., light, water, space and nutrient and finely accumulate more nutrient content in plant body. The results corroborate with the findings of Singh [3] in grain maize; Bairwa and Kaushik [4].

Amongst fertility levels, an application of 130 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (1.85 %) resulted in significantly higher nitrogen content over 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (1.68 %) but statistically at par with 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (1.74 %). In case

of phosphorus content in plant 0.52 %) was registered with the application of 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> which was significantly higher over 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub>. Application of nutrients in excess of this treatment did not significantly influence P content of grains. The variation in K content [Table-1] by sweet corn grains was not observed with change in fertility levels. Highest K content was found in grain with application of 130 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> (0.50 %) which was statistically equal with application of fertility levels 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> (0.48 %) and 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> (0.46 %). The significant increase in N and P content of grain at harvest seems to be on account of capabilities of variety 'Sugar 75' for efficient absorption, translocation and utilization of mineral nutrients. The increased contents of nutrients in grain of variety 'Sugar 75' was expected as most of nutrients from vegetative parts are translocated towards grain. Singh [3] in grain maize; Bairwa and Kaushik, [4]; Suthar *et al.*, [5] and Kumawat *et al.*, [6] also found same results.

**Table-1** Effect of different fertility levels on N, P and K content in grain of sweet corn varieties

Treatments	N content (%)	P content (%)	K content (%)
<b>Varieties (V)</b>			
Bajaura sweet corn	1.74	0.46	0.48
Sugar 75	1.88	0.58	0.50
Win Orange	1.74	0.52	0.50
Priya	1.66	0.45	0.44
C. D. (P = 0.05)	0.15	0.09	NS
<b>Fertility levels (F) ha<sup>-1</sup></b>			
90 kg N + 40 kg P <sub>2</sub> O <sub>5</sub>	1.68	0.44	0.46
120 kg N + 50 kg P <sub>2</sub> O <sub>5</sub>	1.74	0.52	0.48
130 kg N + 60 kg P <sub>2</sub> O <sub>5</sub>	1.85	0.55	0.50
C. D. (P = 0.05)	0.11	0.06	0.07

**Nutrient uptake:**

From [Table-2] the maximum nitrogen and phosphorus and potassium uptake was registered under 'Sugar-75' which was significantly higher over rest of the varieties. While in case of fertility levels, an application of 130 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (32.94 kg ha<sup>-1</sup>) significantly enhanced nitrogen uptake over 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (28.92 kg ha<sup>-1</sup>) and 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (32.25 kg ha<sup>-1</sup>). An application of 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (5.36 kg ha<sup>-1</sup>) significantly improved phosphorus and potassium uptake by grain over 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> (4.23 kg ha<sup>-1</sup> and 5.37 kg ha<sup>-1</sup>, respectively). Further enhancement in rate of nutrient application did not affect the nutrient uptake significantly. The results are in close conformity with the findings of Kumar [7]; Suthar *et al.*, [5]; IIMR, [8] in QPM and Kumawat *et al.*, [6].

**Table-2** Effect of different fertility level on N, P and K uptake by grain of sweet corn varieties

Treatments	N uptake (kg ha <sup>-1</sup> )	P uptake (kg ha <sup>-1</sup> )	K uptake (kg ha <sup>-1</sup> )
<b>Varieties (V)</b>			
Bajaura sweet corn	29.04	4.95	4.78
Sugar 75	39.59	5.90	5.75
Win Orange	30.66	4.62	5.36
Priya	26.18	4.69	4.84
C. D. (P = 0.05)	0.91	0.28	0.33
<b>Fertility levels (F) ha<sup>-1</sup></b>			
90 kg N + 40 kg P <sub>2</sub> O <sub>5</sub>	28.92	4.23	4.58
120 kg N + 50 kg P <sub>2</sub> O <sub>5</sub>	32.25	5.36	5.37
130 kg N + 60 kg P <sub>2</sub> O <sub>5</sub>	32.94	5.55	5.59
C. D. (P = 0.05)	0.64	0.20	0.23

**Nutrient Status of Soil after Crop Harvest**

A perusal of the data reveals that varieties of sweet corn brought about significance variation in available nitrogen content of soil after harvest of crop. The plots with 'Priya' (286.46 kg ha<sup>-1</sup>) had significantly higher nitrogen over remaining three varieties but in case of potassium Bajaura sweet corn remained statistically equal to Win Orange and Priya after harvest. Sweet corn varieties failed to make significant difference in phosphorus content in soil after harvest.

A reference to data [Table-3] indicates that plots fertilized with highest level of

fertilizer *i.e.* 130 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> had significantly highest available nitrogen, phosphorus and potassium content (287.35, 20.63 and 250.05 kg ha<sup>-1</sup>) over 90 kg N + 40 kg P<sub>2</sub>O<sub>5</sub>, (279.83 kg ha<sup>-1</sup>) but remained statistically at par with 120 kg N + 50 kg in case of nitrogen and phosphate content after harvesting of crop. The results of present investigation are in close conformity with findings of Gill [9]; Mathukia *et al.* [10] and Bhagwat *et al.* [11].

**Table-3** Effect of different fertility levels on available N, P and K content of soil after harvest of sweet corn varieties

Treatments	Available N (kg ha <sup>-1</sup> )	Available P (kg ha <sup>-1</sup> )	Available K (kg ha <sup>-1</sup> )
<b>Varieties (V)</b>			
Bajaura sweet corn	284.81	20.16	249.86
Sugar 75	283.89	19.25	245.13
Win Orange	282.46	19.78	249.21
Priya	286.07	19.97	247.10
C. D. (P = 0.05)	2.43	NS	2.68
<b>Fertility levels (F, ha<sup>-1</sup>)</b>			
90 kg N + 40 kg P <sub>2</sub> O <sub>5</sub>	279.83	18.60	245.93
120 kg N + 50 kg P <sub>2</sub> O <sub>5</sub>	285.75	20.14	247.48
130 kg N + 60 kg P <sub>2</sub> O <sub>5</sub>	287.35	20.63	250.05
C. D. (P = 0.05)	1.72	0.65	1.90

**Conclusion**

From the present study, it can be concluded that sweet corn variety Sugar 75 fertilized with 120 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> gave higher nutrient content in grain and post-harvest soil fertility was higher in plots which fertilized up to 130 kg N + 60 kg P<sub>2</sub>O<sub>5</sub>.

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**Abbreviations:** NPK : Nitrogen, Phosphorus, and Potassium

**Conflict of Interest:** None declared

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