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The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2020; 9(3): 622-625

www.thepharmajournal.com
Received: 25-01-2020
Accepted: 27-02-2020

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Effect of foliar nutrition on growth and yield of sweet corn

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Abstract
A field experiment was conducted during *rabi*, 2018-19 on sandy loam soils of Agricultural College Farm, Naira, to study the effect of foliar nutrition on growth and yield of sweet corn. The experiment comprised of nine foliar nutrition treatments and laid out in a randomized block design. Foliar application 19:19: 19 @ 1% one week before tasseling *fb*1.0% KNO_3 one week after silking (T_6) recorded tallers plants, higher dry matter production, no. of cobs plant^{-1}, cob girth, cob yield with husk and stover yield. The lowest values for growth parameters, yield attributes and yield were associated with non supply of foliar nutrients (T_1). yield. The lowest values for growth parameters, yield attributes and yield were associated with non-supply of foliar nutrients (T_1).

Keywords: Sweet corn, foliar nutrition, growth parameters, yield attributes, yield

Introduction
Of late, specialty corns such as sweet corn (*Zea mays* L. *saccharata*) has emerged as an alternative food sources, especially for the affluent sections of the society and has tremendous market potential not only in India but in international market as well. It was introduced to India from USA and has been mostly used for table purpose. Sweet corn is a mutant type with one or more recessive alleles in homozygous condition that enable the endosperm to accumulate twice the sugar content as that of seed corn. This specialty corn due to its high sugar content (14-20% sugar) and short duration has gained high popularity, thus making it a profitable crop for the farmers.

It is well known that maize is a heavy feeder of nutrients due to its C_4 nature. The intensive crop rotation and excessive fertilizer use have resulted in a wide range of nutrient deficiencies in field. To realize higher productivity balanced use of plant nutrients is the key as it contributes 40-60% of the crop yield (Dayanand, 1998) [3]. Under the current trend of exploitive agriculture in India, the innate soil fertility can no longer be maintained on the sustainable basis. Application of water-soluble fertilizers through foliar spray is a well-known method of supplying plant nutrients. Nutrient uptake by leaves is significantly faster than the roots and is extremely effective. Hence, foliar feeding of nutrients is recognized as an important method of fertilization in modern agriculture. This method provides utilization of nutrients more efficiently and straighten out deficiencies quickly, particularly for short duration crops.

Organic fertilizers like animal manures and composted materials, one of the major pillars of sustainable agriculture are important resources as they endow with large amounts of macro and micro nutrients for crop. Vermiwash, the indispensable part of vermicompost is a watery extract of earthworms. It contains N, P, K, Ca and hormones such as auxin, cytokinine and some other secretions. It plays a crucial role in the overall plant growth and development mainly contributing to promotion of growth rate and improvement in crop production. In general, foliar spray of vermiwash would be recommended as a better technique of supplying nutrients to plants at a more rapid rate than methods involving soil application. Hence, there is a need to evaluate the effective best foliar nutrition treatment to realize higher productivity of sweet corn.

Material and methods
A field experiment was carried out during *kharif*, 2018–19 at the Agricultural College Farm, Naira which is geographically situated at 15.54^0 N latitude, 80.25^0 E longitudes and at an

altitude of 5.49 m above mean sea level in the North Coastal Zone of Andhra Pradesh. The soil of the experimental site was sandy loam in texture, slightly alkaline in nature, low in organic carbon (0.42) and available nitrogen (263.2 kg ha^{-1}), medium in available phosphorus (22.9 kg ha^{-1}) and available potassium (230 kg ha^{-1}). The mean maximum and minimum temperatures recorded during crop period were 32.3^0C and 19.4^0C respectively. The treatments consisted of nine foliar nutrition treatments *viz.* T_1 Control (No foliar spray), T_2 (foliar application of 1% 19-19-19 one week before tasseling and one week after silking), T_3 (foliar application of 1% KNO_3 one week before tasseling and one week after silking), T_4 (foliar application of 0.2% Formula 4 one week before tasseling and one week after silking), T_5 (foliar application of 1% Vermiwash one week before tasseling and one week after silking), T_6 (foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking), T_7 (foliar application of 0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking), T_8 (foliar application of 1% Vermiwash one week before tasseling fb 1% KNO_3 one week after silking), T_9 (foliar application of 1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking). Of the recommended dose of 180:75:60 kg N, P_2O_5, K_2O ha^{-1}, one third of the nitrogen, total dose of phosphorus and half potassium was applied at the time of sowing as basal while, the remaining nitrogen and potassium was applied as top dressing at knee high stage and tasseling stage uniformly in all treatments.

Field operations such as weeding, irrigation and plant protection measures were taken as per requirement. The data on highest plant height, dry matter production, no. of cobs plant-1, cob yield (with husk), and stover yield were recorded as per standard procedures. Data were analyzed using ANOVA and the significance was tested by Fisher's least significance difference (p=0.05).

Effect on growth parameters

Plant height

Plant height and dry matter production of sweet corn sampled at 30 DAS did not differ significantly due to foliar application of nutrition treatments (Table1.)

Significantly taller plants and maximum dry matter production were observed at 60 DAS and at harvest due to foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking (T_6) which was on par with T_2 (foliar application of 1% 19-19-19 one week before tasseling and one week after silking), T_9 (foliar application of 1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking), T_3 (foliar application of 1% KNO_3 one week before tasseling and one week after silking) and T_8 (foliar application of 1% Vermiwash one week before tasseling *fb* 1% KNO_3 one week after silking) While, the plants were of their shortest stature in plots which did not receive any foliar nutrition T_1 (control) which was however, comparable with T_4 (0.2% Formula 4 one week before tasseling and one week after silking), T_5 (1% Vermiwash one week before tasseling and one week after silking) and T_7 (0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking). Foliar feeding of major nutrients at two crucial stages i.e. one week before tasseling (49 DAS) and one week after silking (70 DAS) at an interval of three weeks might have contributed to proper nourishment of the crop and also increased the activity of meristematic cells and cell elongation due to their favourable effect on metabolic processes and better vegetative growth. The potassium component of the foliar nutrition might have resulted in better regulation of osmotic balance and increased metabolic processes. Supplementation of N together with P and K through foliar nutrition stimulated vegetative growth, thus contributing to the dry matter accumulation. These results are in corroboration with those reported by Maravalli and Shekh (2019) [6], Prajwal Kumar *et al*. (2018), Nirere Drocelle (2016) [8], Ullasa *et al*. (2016) [11], Manasa and Devaranavadagi (2015) [5],

Effect on yield parameters and yield

Number of cobs plant^{-1}

No. of cobs plant^{-1} recorded at harvest was found to be non-significant due to different foliar nutrition treatments tried (Table 2.). Rizwan *et al*. (2003) [10] also reported non-significant difference in cob number plant^{-1} as this is basically a genetic character and not much influenced by supplemental nutrition to sweet corn. Similar opinion is also expressed by Anjum *et al*. (2017) [2] in maize.

Cob girth

Maximum cob girth (Table 2.) was observed when the sweet corn crop was fed with 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking through foliage (T_6) which was however, found on par with T_2 (1% 19-19-19 one week before tasseling and one week after silking), T_9 (1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking), T_3 (1% KNO_3 one week before tasseling and one week after silking) and T_8 (1% Vermiwash at one week before tasseling *fb* 1% KNO_3 one week after silking). Significantly lower values for cob girth were associated with non-supply of foliar nutrition (T_1- control) which was however, found parity with T_4 (0.2% Formula 4 one week before tasseling and one week after silking), T_5 (1% Vermiwash one week before tasseling and one week after silking) and T_7 (0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking).

Cob and stover yield

The highest cob yield (with husk) and stover yield (Table 3.) was registered with foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking (T_6) which was however, comparable with T_2 (1% 19-19-19 one week before tasseling and one week after silking), T_9 (1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking), T_3 (1% KNO_3 one week before tasseling and one week after silking) and T_8 (1% Vermiwash one week before tasseling *fb* 1% KNO_3 one week after silking). In case of cob yield with husk, T_8 was in turn found parity with T_7. Cob yield with husk and stover yield was minimum when sweet corn was not fed with any foliar nutrition T_1 (control) which was however, comparable with T_4 (0.2% Formula 4 one week one week before tasseling and one week after silking), T_5 (1% Vermiwash one week before tasseling and one week after silking) and T_7 (0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking).

Foliar feeding of major nutrients especially N resulted in development and maintenance of more chlorophyll and photosynthetic area in terms of leaf production which results in higher photosynthesis. In addition, foliar feeding of K helps in higher translocation of photosynthates from leaves to the developing kernels and resulted in higher fresh cob yield. Nitrogen being the major constituent of chlorophyll, amino acids and proteins, phosphates being the energy compound viz. ATP, NADP and potassium serving as an activator / cofactor for various enzymes involved in photosynthesis and CO_2 fixation could have promoted satisfactory plant growth, photosynthetic surface, yield structure and finally cob yield and stover yield under adequate and balanced supply of nutrients at higher level. Similar findings were aslo reported by Maravalli and Shekh (2019) [6], Prajwal Kumar *et al*.

(2018), Ullasa *et al*. (2016) [11], Keerthi *et al*. (2013) [4] in sweet corn and Al- Betar and Abdou (2010) in maize.

It can be concluded that *rabi* sweet corn can be grown in north coastal zone of Andhra Pradesh by giving supplemental nutrition through foliage @ 1.0% 19: 19: 19 one week before tasseling followed by 1.0% KNO_3 one week after silking (T_6) or in addition to the recommended dose of fertilizers (180:75:60 kg N, P_2O_5, K_2O ha^{-1}) through soil application.

Table 1: Plant height (cm) and dry matter production (kg ha^{-1}) of sweet corn at different intervals as influenced by foliar nutrition treatments.

Treatments	Plant height (cm)			Dry matter production (kg ha^{-1})		
	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest
T_1: Control (No foliar Spray)	86.8	167	179	1115	16139	26110
T_2: Foliar application of 1% 19-19-19 twice *	87.0	200	212	1148	18907	31604
T_3: Foliar application of 1% KNO_3 twice *	87.8	197	207	1138	18664	30284
T_4: Foliar application of 0.2% Formula 4 twice *	88.1	170	179	1132	16238	26200
T_5: Foliar application of 1% Vermiwash twice *	84.2	172	180	1073	16244	27910
T_6: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking.	86.3	202	217	1153	19132	32107
T_7: Foliar application of 0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking.	87.3	176	185	1147	16248	28623
T_8: Foliar application of 1% Vermiwash one week before tasseling *fb*1% KNO_3 one week after silking.	84.4	193	203	1160	18605	28891
T_9: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking.	84.1	198	210	1133	18769	30403
S.Em+	2.7	5.5	5.6	66.5	782	903
CD (P=0.05)	NS	16.4	17.0	NS	2346	2707
CV (%)	5.5	5.1	5.0	9.9	7.6	5.3

(Recommended dose of fertilizer: 180-75-60 kg 180-75-60 N, P_2O_5, K_2O ha^{-1})

*:one week before tasseling and one week after silking

Table 2: Number of cobs $plant^{-1}$and cob girth of sweet corn as influenced by foliar nutrition treatments.

Treatments	Number of cobs $plant^{-1}$ (cm)	Cob girth (cm)
T_1: Control (No foliar Spray)	1.03	11.9
T_2: Foliar application of 1% 19-19-19 twice *	1.10	14.3
T_3: Foliar application of 1% KNO_3 twice *	1.07	14.2
T_4: Foliar application of 0.2% Formula 4 twice *	1.03	12.1
T_5: Foliar application of 1% Vermiwash twice *	1.00	12.9
T_6: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 one week after silking.	1.13	14.5
T_7: Foliar application of 0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking.	1.10	13.0
T_8: Foliar application of 1% Vermiwash one week before tasseling *fb*1% KNO_3 one week after silking.	1.03	14.2
T_9: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking.	1.07	14.2
S.Em+	0.04	0.3
CD (P=0.05)	NS	1.1
CV (%)	5.7	5.0

(Recommended dose of fertilizer: 180-75-60 kg N, P_2O_5, K_2O ha^{-1})

*:one week before tasseling and one week after silking

Table 3: Cob (with husk) and stover yield of sweet corn as influenced by different foliar nutrition treatments.

Treatments	Cob yield with husk (kg ha^{-1})	Stover yield (kg ha^{-1})
T_1: Control (No foliar Spray)	16267	18233
T_2: Foliar application of 1% 19-19-19 twice *	19300	22230
T_3: Foliar application of 1% KNO_3 twice *	18933	21767
T_4: Foliar application of 0.2% Formula 4 twice *	16333	18023
T_5: Foliar application of 1% Vermiwash twice *	16367	19003
T_6: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% KNO_3 at one week after silking.	19567	22927
T_7: Foliar application of 0.2% Formula 4 one week before tasseling *fb* 1% KNO_3 one week after silking.	16640	19167
T_8: Foliar application of 1% Vermiwash one week before tasseling *fb*1% KNO_3 one week after silking.	18433	21640
T_9: Foliar application of 1% 19-19-19 one week before tasseling *fb* 1% Vermiwash one week after silking.	19033	21967
S.Em+	666	732
CD (P=0.05)	1995	2195
CV (%)	6.4	6.2

(Recommended dose of fertilizer: 180-75-60 kg N, P_2O_5, K_2O ha^{-1})

*:one week before tasseling and one week after silking

References

1. Al-Betar A, Abdou M. Effect of foliar nutrition on growth, green and fodder yield of sweet corn. Mansoura University Journal of Plant Production. 2010; 1(5):769-777.
2. Anjum SA, Saleem MF, Shahid M, Shakoor A, Safeer M, Khan I *et al*. Dynamics of soil and foliar applied boron and zinc to improve maize productivity and profitability. Pakistan Journal of Agricultural Research. 2017; 30(3):294-302.
3. Dayanand A. Principles governing maize cultivation during rainy season. Indian Farming. 1998; 48(1):84-87.
4. Keerthi S, Upendra Rao A, Ramana AV, Tejeswara Rao K. Effect of nutrient management practices on cob yield, protein content, NPK uptake by sweet corn and post harvest N, P_2O_5 and K_2O. International Journal of Advanced Biological Research. 2013; 3(4):553-555.
5. Manasa LP, Devaranavadagi SB. Effect of foliar application of micronutrients on growth, yield and nutrient uptake of maize. Karnataka Jounal of Agricultural Sciences. 2015; 28(4):474-476.
6. Maravalli SS, Shekh MA. Effect of water soluble fertilizers on growth parameter and economics of sweet corn (*Zea mays* L. var. *saccharata*). International Journal of Chemical Studies. 2019; 7(2):1077-1080.
7. Ministry of Agriculture, Government of India. 2016-2017. http:// *www.indiastat.com*.
8. Nirere Drocelle. Effect of foliar application of water-soluble fertilizers on growth and yield of maize (*Zea Mays* L.). *Doctoral dissertation*, University of Agricultural Sciences GKVK, Bengaluru), 2016.
9. Prajwal Kumar, G.K., Lalitha B.S., Kalyana Murthy, K.N and Bhavya, V. 2018. Foliar nutrition: a novel technology to increase growth and yield in baby corn (*Zea mays* L.). International Journal of Current Microbiology and Applied Sciences. 2019; 7(4):1136-1148.
10. Rizwan M, Maqsood M, Rafiq M, Saeed M, Ali Z. Maize (Zea mays L.) response to split application of nitrogen. International Journal of Agricultural Biology. 2003; 5:19-21.
11. Ullasa MY, Girijesh GK, Dinesh Kumar M. Effect of fertilizer levels and foliar nutrition on yield, nutrient uptake and economics of maize (*Zea mays* L.). Green Farming. 2016; 7(6):1383-1388.