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Effect of Different Doses of Vanadium on Yield Attributing Characters of Sweet Corn (*Zea mays* L.)

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A B S T R A C T

A pot experiment was conducted in the Department of Biological Sciences at SHUATS Allahabad during *rabi* session 2017-2018 to study the effect of different concentration of vanadium (0, 20ppm, 40ppm, 60ppm, 80ppm, 100ppm) on two variety of sweet corn (*Zea mays* L.) Madhuri & PhuleMadhu. Vanadium was applied mode of application at 30 DAS and flowering time. The observation was recorded at harvesting time. It was shows that maximum production observed in variety Madhuri in T_2 (20 ppm) compared to control. Minimum production shows variety Phule Mahu (100ppm) compared to control. Vanadium applied to plant in low concentrate resulted in improvement of yield of sweet

Introduction

Sweet corn (*Zea mays* L.) is the world's most widely cultivated food crop. It is a member of family *Gramineae (Poaeceae)* sub family *Panicoideae*. Maize is known as 'Queen of cereals' and 'King of fodder'. Sweet corn is a hybridized variety of maize specifically breeds to increase the sugar content. Its consumption at immature stage as roasted and boiled ears is a popular practice as the kernels are sweet (content 12–20% sugar), creamy, tender and crispy. After harvesting green cobs, the plants of sweet corn are used as green fresh or dry fodder. This speciality corn with its high market value is gaining popularity and now a day's its cultivation is the first choice of the farmers (Suthar *et al.,* 2014).

Sweet corn is a new choice of the progressive farmers as its green cobs as well as nutritious green fodder fetch higher market prices (Painyuli *et al.*, 2013). It is gaining popularity both in rural and urban areas because of its

higher sugar and low starch content and delicious (Singh *et al.*, 2012). Corn is one of the most important food resources of human and as a C_4 crop absorbs high amounts of nutrients from the soil. The important feature of this plant's growth is efficiency of micro elements in various conditions of soils (Safyan, 2012).

Micronutrients play an active role in the plant metabolism process starting from cell wall development to respiration, photosynthesis, chlorophyll formation, enzyme activity nitrogen fixation and reduction (Adhikary *et al.,* 2010). Vanadium (V) is a transition element widely distributed in nature and biological systems, as well as a part of fossil fuels, and agricultural supplies, such as chemical fertilizers which contain ammonium metavanadate (NH_4VO_3) (Hector *et al.,* 2017).

V is the 5th most abundant element among the transitional metals in the earth crust. V is extensively dispersed in the environment by different ways like leaching, combustion, use of fertilizers, and waste material from industries, resultantly; V contaminates the soil, water and atmosphere. The most common form of vanadium is Vanadium pentaoxide (V_2O_5), followed by ammonium metavanadate (NH_4VO_3) and sodium orthovanadate (NaH_2PO_4) (Imtiaz *et al.,* 2014). Vanadium is also essential for several species of fungi and nitrogen-fixing microorganisms but there is little evidence whether it is essential for higher plants (Saco *et al.,* 2013).

The role of vanadium in plants is very important during proper growth and development of plants, on the other hand there are many recent reports, which demonstrate the essentiality of V for plants growth and metabolism (Vachirapatama *et al.,* 2011). However, the adoption of improved agronomic practices, suitable varieties (Madhuri & PhuleMadhu) and suitable dose of vanadium can increase crop productivity. Ultimately growing suitable varieties with proper dose of vanadium increase growth and yield of crop. Therefore the objectives effect of Vanadium on yield of sweet corn.

Materials and Methods

The present experiment was undertaken at field of Department of Biological Sciences, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Allahabad, Uttar Pradesh, India during *Rabi* 2017-18. Sweet corn seeds of hybrid Madhuri and Phulemadhu were used for the pot experiment. Pot experiment was done according to completely randomized design with three replications, and recommended package of practices were followed to raise the crop. Approximately 8 kg of soil was filled in pot and sowing was done using 3-4 seed per pot by dibbling method. The observation were recorded on each plants of each pot and replication for Number of cob per plant, Cob length (cm), Cob girth (cm), Green cob weight (g/ plant). Sweet corn (30 DAS and flowering time) were allowed to apply Vanadium solution containing seven different Ammonium metavanadate (NH_4VO_3) concentration: 0, RDF, 20, 40, 60, 80, 100 PPM. The Vanadium solution were maintained a constant volume during the pot experiment. Analysis of variance (ANOVA) as suggested Fisher and Yates (1936) was used to determine the statistical significant of the difference between treatment means in all experiments.

Results and Discussion

The result in the table 1 indicate that the effect of different concentration of vanadium on same important parameters viz. Number of cob per plant, cob length (cm), cob girth (cm), Green cob weight (g/ plant) in two varieties of sweet corn Madhuri and PhuleMadhu.

Table.1 Analysis of variance for yield characters of sweet corn

Sr. No	Characters	Mean Sum of Squares			
		Treatments (df=7)		Error (df=21)	
		V1	V2	V1	V2
1	Number of cobs	0.20**	0.42**	0.09	0.04
2	Cob length (cm)	69.18**	8.33**	12.33	0.14
3	Cob Girth (cm)	40.15**	2688**	0.56	0.51
4	Green Cob weight (g/plant^{-1})	914.23**	1363**	24.03	3.22

** Significant at 1% Level

Table.2 Mean table of yield character of sweet corn Madhuri

Treatment	Number of Cobs/Plant	Cob Length (cm)	Cob Girth (cm)	Green Cob Weight (gm/plant)
Control	1.00	15.23	7.23	47.43
RDF	1.00	16.57	10.40	62.57
RDF+V(20 ppm)	2.00	20.33	16.13	112.57
RDF+V(40ppm)	1.33	18.90	14.87	93.57
RDF+V(60ppm)	1.00	18.03	13.87	90.00
RDF+V(80ppm)	1.00	17.27	12.80	86.80
RDF+V(100ppm)	1.00	16.87	11.53	81.63
Gen. Mean	**1.19**	**17.60**	**12.40**	**82.08**
MIN.	1.00	15.23	7.23	47.43
MAX.	2.00	20.33	16.13	112.57
C.V.	18.33	2.13	5.80	2.19
S.E.M.	0.13	0.22	0.42	1.04
C.D. 5%	0.38	0.66	1.26	3.15

Table.3 Mean table of yield character of sweet corn PhuleMadhu

Treatment	Number of Cobs/plant	Cob Length (cm)	Cob Girth (cm)	Green Cob Weight (gm/plant)
Control	1.00	3.40	2.47	2.07
RDF	1.00	8.23	5.17	13.77
RDF+V(20 ppm)	1.67	16.47	12.53	48.37
RDF+V(40ppm)	1.33	15.73	11.50	45.87
RDF+V(60ppm)	1.00	14.93	10.60	41.27
RDF+V(80ppm)	1.00	14.30	10.10	39.37
RDF+V(100ppm)	1.00	13.93	9.73	31.77
Gen. Mean	**1.14**	**12.43**	**8.87**	**31.78**
MIN.	1.00	3.40	2.47	2.07
MAX	1.67	16.47	12.53	48.37
C.V.	27.00	28.25	8.45	15.43
S.E.M.	0.18	2.03	0.43	2.83
C.D. 5%	0.01	6.15	1.31	8.59

Data presented in table 2 data shows that for Madhuri variety maximum all parameter was found in T_2 - RDF + Vanadium (20 ppm) followed by, T_3 - RDF + Vanadium (40 ppm), T_4 - RDF + Vanadium (60 ppm), T_5- RDF + Vanadium (80 ppm), T_6 - RDF + Vanadium (100ppm), T_1 - RDF and T_0 - Control. All treatments showed significant difference in all parameters over control. Data presented in table 3 data shows that for Phulemadhu variety maximum parameter was found in T_2 - RDF + Vanadium (20 ppm) followed by T_3 - RDF + Vanadium (100 ppm), T_4 - RDF + Vanadium (40 ppm), T_5 - RDF + Vanadium (60 ppm), T_5 - RDF + Vanadium (80 ppm), T_1 - RDF, T_0 - Control. All treatments showed significant difference in all parameters over control. Similar finding for plant height, no. leaf, root length, leaf area and yield was observed by Vachirapatama *et al.,* (2011) where he found that low concentration of vanadium increases the plant growth parameters of chines cabbage and tomato. This effect may be due to the fact that V at this concentration can help increase nitrogen in the form of ammonium compound activating the rice growth Nalewajko *et al.,* (1995). It is also essential for some species of nitrogen fixing bacteria, algae, and fungi. V plays a pivotal role in the formation of the holo-enzyme of peroxidase of bromine, iodine, and chlorine Hector *et al.,* (2017). Signifying amount of V in soil water we can shows to have inhibitory effect on plant some enzymes, growth & photosynthesis Kasim *et al.,* (1999). Similar finding was given by, the obtained result was yield decreases with increases the rate of vanadium because toxicity symptom in roots are club shaped, secondary root number reduction and necrosis Gil *et al.,* (2008). It is the concluded from studies, on vanadium 20 ppm was found as best treatment to increases the yield of sweet corn in pot experiment. The result of current study also indicated that the higher dose of vanadium shows reverse effect on the yield contributing character of the sweet corn.

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