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Effect of Some Growth Stimulating Compounds on Growth and Yield of Three Sweet Corn (*Zea mays* L. Saccharata) Cultivars

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A field trial was conducted throughout the course of the two summers that followed (2022 and 2023) in the Experimental Station of the Horticulture Dept., Agric. Fac., Benha Univ, to examine the impact of some growth stimulating compounds i.e., potassium silicate, lithovit and Cab-star (CaB_2) as spraying on growth and, yield component of three sweet corn cultivars (*Zea mays saccharata*) i.e., Hytech-3010, Nuzivedu-Misthi and Evergrow-25471. Results indicate that using Nuzivedu-Misthi cultivar combined with Lithovite (0.5 g l^{-1}) three times, beginning 1 month after sowing and at intervals of every 2 weeks recorded the best and significant values regarding plant length, number of leaves, leaf area, total yield per feddan (one feddan = 4200 m^2) and its compounds such as ear length (cm), number of row per ear and ear diameter as compared with the other used combinations during both seasons of the experiment. Furthermore, Nuzivedu-Misthi cultivar combined with spraying lethovit recorded the best and significant values regarding total starch, protein, reducing sugar and non reducing sugar except moisture % during both seasons of the experiment.

Keywords: Maize, Sweet corn, lithovite, potassium silicate, cultivars.

Introduction

In many nations around the world, sweet corn *(Zea mays*, L. var. Saccharata) is among the most popular veggies. Sweet corn is regarded as a significant crop for export in Egypt in the future. Its distinct flavour, pleasing aroma, and sweetness have made it popular among consumers. Due to its nutritional qualities that promote health, sweet corn is a staple in the human diet. Sweet corn kernels' nutritional value is correlated with their water content (72.7%) and total solids content (27.3%). Hydrocarbons (81%) and proteins (13%), lipids (3.5%), and other materials (2.5%), make up the solid portions. Sweet corn contains a significant amount of lutein, zeaxanthin and other carotenoids (Szymanek et al., 2012 and Junpatiw et al., 2013). Based on its sugar content and storage capacity, sweet corn is divided into three categories. In the first group, the sugar content decreases very quickly and turns into starch only 24 hours after harvest. While the second group converts sugars into starch more slowly after the harvest is slow. The third group contains the highest sugar content, and after harvesting, it can be preserved for roughly seven days in cold conditions (Salunkhe and Kadam, 1998 and Singh et al., 2014).

Calcium is essential for a number of structural functions in the cell wall and membranes and it plays a variety of physiological and biochemical roles in plants that might enhance production (Hunter et al, 1995; Marschner, 1995 and White & Broadley, 2003). Additionally, boron (B) has physiologically significant roles in the integrity of cell walls and membranes, as well as in the metabolism of nitrogen and phosphorus and the growth of pollen tubes, which is essential for flowering and fertilization. As a result, boron supply is required to improve fruit yield and the quality of vegetable crops (Uchida, 2000 and Esringü et al., 2011). Similar to this, a number of studies revealed that foliar supplies of Ca^{+2} and B improved the vegetative growth, production, and quality of vegetable crops (Davis et al., 2003, El-Tohamy et al., 2006, Abd El-Gawad & Osman 2014 and Buczkowska et al., 2016).

Silicon is a good element for plants (Epstein, 1999). It has been discovered that the element silicon reduces both biotic stress such as diseases and pests (fungal or bacterial) and abiotic stress such as metal toxicity, dehydration, salt, high temperatures, and cold (Epstein and Bloom, 2004; Ma, 2004). Potassium (K) is a crucial mineral nutrient for plants. It is required for numerous physiological activities in various crop species, including protein synthesis, photosynthesis, stomata regulation,

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enzyme activation, and osmoregulation (Xu et al., 2021).

Lithovite component is a naturally occurring nano-fertilizer which is composed of tiny particles from natural limestone deposits, 15% silica, 4% magnesium carbonate, and 75% calcium carbonate that improve the fertilizer's ability to penetrate plant stomata when sprayed (Cai et al., 2009). Lithovite particles decompose and release gaseous carbon dioxide within the intercellular spaces of plant leaves, raising the concentration of CO_2 at the site of photosynthesis (Thorn and Rogan, 2015). According to several studies (Azevedo Neto et al., 2005; Sabina, 2013; Maswada and Abd El-Rahman, 2014; Thorn, and Rogan, 2015), lithovite significantly improves the development of Zea maize, including stem length, and leaf number. Furthermore, Abdel Nabi et al., (2017) suggested that the best results for total leaf area, total yield, dry matter, total soluble solids (TSS), total sugars, and total carbohydrate content were obtained by spraying lettuce plants with nanomateerial (lithovite at a rate of 0.5 g l^{-1}).

With that in mind, the current study set out to assess the effects of applying potassium silicate, lithovite, and Cab star (CaB_2) topically on the vegetative growth, nutrient content, and yield of three different cultivars of sweet corn (*Zea mays*, L. var. Saccharata).

Materials and Methods

A field trial was conducted throughout the two successive summer seasons of April 2022 and April 2023 in the Experimental Station of the Horticulture Dept., Agric. Fac., Benha Univ. to examine the impact of some growth stimulating compounds i.e., potassium silicate, lithovite and Cab star (CaB_2) as spraying application on vegetative growth, nutrients content, yield component of three sweet corn cultivars (*Zea mays saccharata*) i.e., Hytech-3010, Nuzivedu-Misthi and Evergrow-25471. Seeds of these cultivars were obtained from Misr Hytech Seed (Egypt), Nuzivedu Seeds (India) and Evergrow seed (Taiwan) companies, respectively. Table (1) presents the experimental soil analyses.

TABLE 1: Analysing the experimental farm's soil

Physical analysis		Chemical analysis			
		Cations meq l^{-1}		Anions meq l^{-1}	
Coarse sand	18.3%	Ca^{++}	25.4	$CO3^{--}$	Zero
Fine sand	12.8%	Mg^{++}	22.10	$HCO3^{-}$	3.6
Silt	13.5%	Na^{+}	25.13	Cl^{-}	50.0
Clay	55.4 %	K^{+}	1.87	$SO4^{--}$	20.8
Texture class	clay				
Soil pH	7.7	Available N		18.71 mg kg^{-1}	
E.C, dS m^{-1}	1.3	Available P		17.9 mg kg^{-1}	
Organic matter	2.2%	Available K		75 mg kg^{-1}	

The seeds were put straight into the soil on April 1st in both seasons. The plot area was 24 m^2 included 3 lines x 10 m length x 0.80 m width. Four replications of a complete randomise design comprised the experiment treatments which contained twelve treatments which were the combos between sweet corn cultivars (Hytech-3010, Evergrow-25471 and Nuzivedu-Misthi), and 4 foliar application treatments i.e., Control (Tap water), Lithovite CO_2 (0.5 g l^{-1}), Cab star (2.0 cm^3 l^{-1}) and Potassium silicate (2.0 g l^{-1}). Thirty days after seeding (at the five-leaf stage), several treatments were applied topically and repeated every 15 day intervals, in three sprays until maturity stage. Every cultural activity, such as irrigation, weeding and hoeing, and fertilizer applications, was applied consistently to every treatment.

Data Recorded

Growth characteristics

Measurements of plant length (cm), number of leaves $plant^{-1}$, stem diameter (cm), and leaf area (cm^2) were made on ten randomly selected plants of every one for experimental unit at the taseling and silking stages (after 45–50 days from sowing date). After the sample plants' leaves were gathered, the leaf area was measured in the lab using a leaf area metre (LICOR Model 3100).

Yield characteristics

When the kernels were 75–80% moisture content during the milky stage of development (Evensen and Boyer, 1986), the husked ears of the plants of each sub-plot were collected 60–70 days after planting, depending on the cultivar. Yield (ton fed^{-1}), averages of ear length (cm), ear diameter (cm) and number of row per ear were determined

Kernels quality

The grain's components of starch, protein, moisture (%), reducing and non-reducing sugars, and starch expressed the quality of the kernels using harvest, random bulking of ear kernel samples was conducted from each experimental unit, using the previously described procedure, in order to ascertain the grain composition. Twenty grams samples of kernels were oven dried at 70 C for 4 days. After that, subsamples of dried kernels were obtained, and a grinder was used to crush them into a fine powder for the analyses of starch, protein, and reducing and non-reducing sugars. Determination of none reducing and reducing sugars concentricity (mg g^{-1}dry weight of grain) were behaved as outlined by Cornin and Smith

(1979). Phenol sulphoric acid method proposed by Malik and Singh (1980) was used to establish the starch content in grains. The AOAC (1984) procedures were used to determine the crude protein contents.

Results and Discussion:

1. Growth characteristics

The outcomes of the effects of cultivars, foliar spray with some growth stimulating compounds, and their interactions over the two growing seasons on the growth characteristics of sweet corn plants are shown in Table 2. The comparative analysis of the three cultivars utilised revealed, in general, that there were variations in these traits that seemed to be significant in terms of plant length, number of leaves per plant, and leaf area. The Nuzivedu-Misthi cultivar achieved the most significant mean values for plant length, number of leaves, and leaf area during the first season, according to the data. In the meantime, the cultivar Evergrow-25471 displayed the lowest leaf area, number of leaves, and plant length. The genetic makeup of a variety may be the cause of its variances.

Concerning the effect of growth stimulants treatments, such data in Table 2 show that spraying the plants three times through the growing season at 30 days after sowing (at the five-leaf stage) and repeated every 15 day intervals, in three sprays until maturity stage. Lithovite CO_2 (0.5 g l^{-1}), Cabstar (1.0 cm^3 l^{-1}) and Potassium silicate (2.0 g l^{-1}) significantly improved all measured growth traits (plant length, number of leaves per plant as well as average leaf area) compared with the control treatment. However, the greatest values were observed as a result of using Lithovite, during the first and second season. Such enhancing effect of natural growth stimulants may be attributed to their chemical constituents which include nutrient elements, growth hormones, vitamins affect positively.

Data in Table 2 signalize that using Nuzivedu-Misthi cultivar combined with Lithovite (0.5 g l^{-1}) three times started after 1 month from sowing and every 2 weeks intervals recorded the best and significant values regarding plant length, number of leaves as well as leaf area as compared with the other used combinations during both seasons of the experiment. Contrarily, using Evergrow-25471 cultivar combined with control tretment recorded the least values of all growth characteristics, meanwhile using lithovite with Hytech-3010 and cap star with Hytech-3010 came in between in this respect during both seasons.

Such results showed similar trend to those obtained by Abd El-Aal, and Eid (2018) who showed that when lithovite was applied topically at 500 mg l^{-1}, all growth characteristics such as plant length, stem diameter, number of leaves and branches per plant, total leaf area per plant, shoot fresh and dry weights per plant, and specific leaf weight per plant significantly increased when compared to the control treatment. The use of lithovite enhances photosynthesis, which may be connected to its high carbonate content, which serves as a source of calcium and CO_2. On the other hand, it was discovered that increased CO_2 and the application of exogenous calcium improve photosynthesis. Additionally, lithovite serves as a long-term CO_2 reservoir for plants, which helps boost photosynthesis net and promote the growth of plants, especially C3 plants like wheat and cotton. This is because elevated CO_2 levels can inhibit the activity of ribulose-1,5-bisphosphate (RuBP) oxygenase, reduce photorespiration, and increase carbon assimilates, all of which are necessary for plant growth and development. In general, higher CO_2 concentrations promote plant growth by increasing biomass, carbon uptake, and leaf area (Maswada and Abd El-Rahman, 2014). Furthermore, foliar application with lithovite at 500 mg l^{-1} significantly increased the amount of endogenous growth promoters and decreased the amount of growth inhibitor substance. These effects can be attributed to the drugs' ability to enhance the biosynthesis of growth promoters and decrease the biosynthesis and action of growth inhibitor (ABA) (Abd El-Aal and Eid, 2018). Furthermore, the dominance of potassium silicate compared to control may be due to the effect of potassium and silica which play an important role in plant metabolism and protein assimilation which is necessary for cells formation and consequently increased fresh and dry matter of plant which are good indicators for plant growth (Ghanaym et al., 2022 a&b).

TABLE 2:- Effect of cultivar and foliar spray with some growth stimulating compounds on some vegetative growth parameters for sweet corn plants during 2022 and 2023 seasons

Treatments		Plant length (m)		No. of leaves per Plant		Leaf area (cm^2)	
Cultivars	**Foliar Spray**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**
Hytech-3010		1.04	1.07	11.67	12.67	4.40	4.37
Nuzivedu-Misthi		1.20	1.23	13.08	13.08	4.70	4.88
Evergrow-25471		0.96	0.97	11.42	11.75	3.37	3.37
LSD $_{0.05}$		**0.05**	**0.08**	**0.85**	**1.13**	**0.12**	**0.19**
	Potassium silicate	1.02	1.06	11.89	12.22	3.94	4.06
	Cab star (CaB_2)	1.07	1.13	12.56	12.89	4.24	4.33
	Lithovite CO_2	1.16	1.17	12.89	13.67	4.64	4.59
	Control	1.01	1.00	10.89	11.22	3.79	3.84
LSD $_{0.05}$		**0.05**	**0.04**	**1.06**	**1.18**	**0.21**	**0.16**
Hytech-3010	**Potassium silicate**	1.01	1.05	11.33	13.00	4.23	4.13
	Cab star (CaB_2)	1.03	1.10	12.67	13.67	4.57	4.63
	Lithovite CO_2	1.12	1.15	12.00	13.00	4.90	4.73
	Control	0.98	0.99	10.67	11.00	3.90	3.97
Nuzivedu-Misthi	**Potassium silicate**	1.11	1.15	12.67	13.00	4.43	4.77
	Cab star (CaB)	1.20	1.31	14.00	13.00	4.70	4.97
	Lithovite CO_2	1.35	1.37	14.33	15.00	5.23	5.27
	Control	1.14	1.08	11.33	11.33	4.43	4.53
Evergrow-25471	**Potassium silicate**	0.94	0.98	11.67	10.67	3.17	3.27
	Cab star (CaB_2)	0.99	0.99	11.00	12.00	3.47	3.40
	Lithovite CO_2	1.02	0.99	12.33	13.00	3.80	3.77
	Control	0.91	0.93	10.67	11.33	3.03	3.03
LSD $_{0.05}$		**0.09**	**0.08**	**1.68**	**2.02**	**0.38**	**0.30**

2. Yield components:

Data demonstrated in Table 3 show effect of the cultivar and spraying with some growth stimulating compounds on yield components for sweet corn plants through 2022 and 2023 seasons Using Nuzivedu-Misthi cultivar showed significant increase regarding total yield per feddan and its compounds ear length (cm), number of row per ear and ear diameter as compared by Evergrow-25471 cultivar during both seasons of growth. Meanwhile using Hytech-3010 came in between in this respect through both seasons.

Spraying lithovite surpassed significantly both other treatments in total yield and its compound followed by cap star, meanwhile control came last in affecting total yield per feddan and its components during both seasons. The increment in total yield as a result of using such lithovite is connected with the increase in growth characteristics in Table 2, which affected positively vegetative growth of the plant and consequently tuber yield productivity.

That using Nuzivedu-Misthi cultivar combined with spraying lithovite recorded the greatest significant values regarding yield compound as compared with the other used combinations during both seasons of the experiment. Contrarily, using Evergrow-25471 cultivar combined with potassium silica or Evergrow-25471 cultivar without spraying recorded lastly values in total yield per fed .as well as its components during both season, meanwhile using cap star as foliar application combined with Nuzivedu-Misthi cultivar came in between in this respect during both seasons. Such results showed similar trend to those obtained by Abd El-Aal and Eid (2018) who showed that applying 500 mg of lithovite topically to soy plants increased the plant's flowering and yield characteristics. This might be as a result of lithovite particles increasing spontaneous photosynthesis, which encourages the growth of crops.

These outcomes are related to those that have been published by (Agrawal and Deepak, 2003; Maswad a and Abd El-Rahman, 2014; Wang et al., 2013).

Tomato plants were sprayed with lithovite nutritional particles, which transpired and turned into CO_2, according to Carmen et al. (2014). Because the natural concentration of CO_2 in the air is one of the external factors that limit photosynthesis, lithovite fertilizer has the potential to greatly increase photosynthesis. Furthermore, lithovite treatment dramatically raised the total chlorophyll and total carotenoids of the wheat plant, as demonstrated by Maswada and Abd El-Rahman (2014).

TABLE 3:- Effect of cultivar and foliar spray with some growth stimulating compounds on yield and its components for sweet corn plants during 2022 and 2023 seasons

Treatments		Yield (ton fed^{-1})		Ear length (cm)		Ear diameter (cm)		Number of row per ear	
Cultivar	**Foliar Spray**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**
Hytech-3010		11.573	11.488	22.23	22.13	4.05	3.98	16.13	16.08
Nuzivedu-Misthi		12.096	11.991	23.36	23.53	4.28	4.12	17.70	17.98
Evergrow-25471		10.072	10.076	20.89	20.88	3.81	3.95	15.09	15.17
LSD $_{0.05}$		**0.66**	**0.5**	**0.47**	**0.24**	**0.19**	**0.19**	**0.31**	**0.58**
	Potassium silicate	10.744	10.912	21.96	21.91	3.83	3.84	16.23	16.22
	Cab star (CaB_2)	11.299	11.303	22.28	22.36	4.16	4.07	16.44	16.47
	Lithovite CO_2	11.684	11.946	22.91	22.92	4.47	4.36	16.73	17.12
	Control	10.609	10.578	21.50	21.51	3.73	3.79	15.82	15.81
LSD $_{0.05}$		**0.75**	**0.55**	**0.24**	**0.33**	**0.19**	**0.22**	**0.32**	**0.43**
Hytech-3010	**Potassium silicate**	11.217	11.021	22.03	21.87	**3.83**	**3.70**	15.93	15.73
	Cab star (CaB)	11.739	11.756	22.50	22.37	4.13	4.17	16.13	16.07
	Lithovite CO_2	12.342	12.386	23.03	23.07	4.53	4.27	17.03	17.17
	Control	10.994	10.790	21.37	21.20	3.70	3.77	15.43	15.33
Nuzivedu-Misthi	**Potassium silicate**	11.723	11.702	23.20	23.40	3.90	4.00	17.77	17.80
	Cab star (CaB)	12.381	12.059	23.47	23.73	4.47	4.03	17.83	18.17
	Lithovite CO_2	12.854	12.854	24.00	24.17	4.93	4.67	18.10	18.67
	Control	11.426	11.349	22.77	22.80	3.83	3.77	17.10	17.27
Evergrow-25471	**Potassium silicate**	9.764	10.014	20.63	20.47	3.77	3.83	15.00	15.13
	Cab star (CaB_2)	10.217	10.095	20.87	20.97	3.87	4.00	15.37	15.17
	Lithovite CO_2	10.514	10.599	21.70	21.53	3.93	4.13	15.07	15.53
	Control	9.792	9.596	20.37	20.53	3.67	3.83	14.93	14.83
LSD $_{0.05}$		**0.9**	**0.88**	**0.50**	**0.53**	**0.31**	**0.41**	**0.55**	**0.75**

3. Organic constituents:-

Using either varieties as sweet corn did not show any significant differences regarding total starch on first season meanwhile Nuzivedu-Misthi cultivar showed significant those other cultivar in the second season regarding total starch. Nuzivedu-Misthi cultivar exceeded significantly other varieties in both seasons regarding protein percentage, reducing sugar % and non-reducing sugar %, but least moisture% during both seasons. Evergrow-25471 cultivar ranged last in all studied protein, reducing sugar, non reducing as it produced the least significant values protein, reducing sugar and non reducing but highest in moisture during both season.

Spraying with all growth stimulants did not show significant differences regarding total starch on first season meanwhile spraying with lethovite showed significant those other growth stimulants in the second season. Spraying lethovit produced the best and significant values regarding Moisture %, protein, Reducing sugar and Non Reducing sugar contents during both seasons of the experiment, meanwhile control produced the least values in protein percentage, reducing sugar and Non Reducing sugar produced the highest values of moisture contents during both seasons.

Data tabulated in Table 3 indicate that using Nuzivedu-Misthi cultivar combined with spraying lethovit produced the best and significant values regarding total starch protein, reducing sugar and non reducing sugar except moisture % during both seasons of the experiment. Contrarily, using Evergrow-25471 cultivar combined with non spraying (control) recorded the least values in regarding total starch protein, reducing sugar and non reducing sugar contents as well as moisture contents during both seasons.

Other researchers noted that lithovite had similar encouraging effects. Shallan et al. (2016) showed that lithovite (nano- $CaCO_3$) fertilizer caused increases in total soluble sugars and total soluble protein contents.

TABLE 4:- Effect of cultivar and foliar spray with some growth stimulating compounds on chemical properties of sweet corn ear during 2022 and 2023 seasons

Treatments		**Total Starch %**		**Moisture %**		**Protein %**		**Reducing suger %**		**Non Reducing suger %**	
Cultivar	**Foliar Spray**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**
Hytech-3010		43.72	43.93	10.84	10.82	10.21	10.18	3.29	3.35	18.39	18.44
Nuzivedu-Misthi		44.79	45.20	10.70	10.51	10.35	10.37	3.46	3.48	18.56	18.62
Evergrow-25471		44.95	42.56	11.10	11.08	9.80	9.79	2.85	2.86	17.84	17.94
LSD $_{0.05}$		**Ns**	**0.02**	**0.05**	**0.08**	**0.07**	**0.08**	**0.06**	**0.03**	**0.05**	**0.02**
	Potassium silicate	46.95	43.81	10.94	10.85	9.95	9.98	3.16	3.20	18.21	18.28
	Cab star (CaB_2)	43.48	43.87	10.86	10.82	10.14	10.15	3.28	3.29	18.32	18.40
	Lithovite CO_2	44.39	44.57	10.75	10.66	10.52	10.44	3.38	3.40	18.44	18.51
	Control	43.12	43.33	10.98	10.87	9.84	9.88	2.98	3.02	18.08	18.14
LSD $_{0.05}$		**ns**	**0.07**	**0.06**	**0.08**	**0.08**	**0.08**	**0.05**	**0.04**	**0.02**	**0.04**
Hytech-3010	**Potassium silicate**	43.33	43.69	10.84	10.84	10.08	10.08	3.24	3.31	18.34	18.39
	Cab star (CaB_2)	44.04	44.06	10.88	10.89	10.23	10.20	3.39	3.42	18.43	18.51
	Lithovite CO_2	44.53	44.84	10.69	10.77	10.62	10.54	3.52	3.53	18.53	18.56
	Control	42.99	43.12	10.95	10.77	9.91	9.91	3.02	3.13	18.25	18.30
Nuzivedu-Misthi	**Potassium silicate**	45.13	45.27	10.82	10.58	10.16	10.21	3.47	3.49	18.51	18.57
	Cab star (CaB_2)	43.84	44.95	10.68	10.58	10.40	10.45	3.52	3.54	18.59	18.62
	Lithovite CO_2	45.84	45.89	10.54	10.21	10.81	10.71	3.61	3.66	18.66	18.79
	Control	44.36	44.70	10.77	10.68	10.02	10.10	3.25	3.23	18.49	18.50
Evergrow-25471	**Potassium silicate**	52.39	42.48	11.16	11.14	9.61	9.64	2.77	2.81	17.78	17.89
	Cab star (CaB_2)	42.56	42.60	11.03	10.99	9.88	9.81	2.93	2.92	17.95	18.06
	Lithovite CO_2	42.81	43.00	11.01	11.00	10.13	10.07	3.02	3.01	18.13	18.20
	Control	42.02	42.17	11.20	11.17	9.59	9.63	2.68	2.70	17.49	17.60
LSD $_{0.05}$		**8.4**	**0.11**	**0.10**	**0.14**	**0.016**	**0.15**	**0.09**	**0.07**	**0.05**	**0.06**

Conclusion

This investigation proved that Lithovite as nano particles and potassium silicate as spraying played a critical role in enhancing growth, yield and quality production of sweet corn plant. Therefore, Lithovite at 0.5 g l^{-1} and Potassium silicate at 2 g l^{-1} foliar spraying is recommended in sweet corn fields.

Consent for publication:

All authors declare their consent for publication.

Author contribution:

The manuscript was edited and revised by all authors.

Conflicts of Interest:

The author declares no conflict of interest.

References

Abd El-Aal, M. M. M. and R. S. M. Eid. (2018). Effect of foliar spray with lithovit and amino acids on growth, bioconstituents, anatomical and yield features of soybean plant. 4th International Conference on Biotechnology Applications in Agriculture (ICBAA), Benha University, Moshtohor and Hurghada, 4-7 April 2018, Egypt. Plant Biotechnology, 187-202

Abd El-Gawad, H.G. and H.S. Osman (2014). Effect of exogenous application of boric acid and seaweed extract on growth, biochemical content and yield of eggplant. Journal of Horticultural Science &Ornamental Plants, (6) 133-143.

Abdel Nabi, H. M. A. K. K. Dawa, E. I. El-Gamily and Y. F. E. Imryed (2017). Effect of magnetic water, foliar application with nano material and nitrogen levels on productivity and quality of head lettuce. Int. J. Adv. Res. Biol. Sci., 4(5): 171-181.

Agrawal, M. and S. S. Deepak (2003). Physiological and biochemical responses of two cultivars of wheat to elevated levels of CO_2 and SO_2 singly and in combination. Environ. Pollut., (121)189-197.

Azevedo, N. A. D., J. T. Prisco, J. Eneas-Filho, J. V. R. Medeiros and E. Gomes-Filho (2005). Hydrogen peroxide pretreatment induces stress acclimation in maize plants. J. Plant Physiol, (162) 1114-1122.

Buczkowska, H., Michałojc, Z., and R. Nurzynskawierdak (2016). Yield and fruit quality of sweet pepper depending on foliar application of calcium. Turkish J. of Agriculture and Forestry (40) 222-228.

Cai, K., D. Gao, J. Chen, and S. Luo (2009). Probing the mechanisms of silicon-mediated pathogen resistance. Plant Signaling and Behavior, (4)1-3.

Carmen, B., R. Sumalan, S. Gadea and S. Vatca (2014). Physiological indicators study involved in productivity increasing in tomato. Pro-environment, (7) 218-224.

Cornin, D.A. and S. Smith (1979) . A simple and rapid procedure for the analysis of reducing , total and individual sugars in potato . Potato Res., (22) 99-103.

Davis T.M., Sanders, D.C. Nelson, P.V., Lengnick, L. and W.J. Sperry (2003). Boron improves growth, yield, quality and nutrient content of tomato. J Am Soc. Hort. Sci. (128) 441-446.

El-Tohamy, W.A., Ghoname, A.A. and S.D. Abou-Hussein (2006). Improvement of pepper growth and Productivity in sandy soil by different fertilization treatments under protected cultivation. J. of Applied Sciences Research, (2) 8-12.

Epstein, E (1999). Silicon. Annual Review of Plant Physiology and Plant Molecular Biology. (50) 641–664.

Epstein, E. and A.J. Bloom (2004). Mineral Nutrition of Plants: Principles and Perspectives. 2nd Edition. Sunderland, MA, USA, 280 p.

Esringü, A., Turan, M. Gunes, A. Eşitken, A. and P.Sambo (2011). Boron application improves on yield and chemical composition of strawberry', Acta Agriculturae Scandinavica, Section B – Plant Soil Science, 61, 245 - 252, First published on: 09 March 2011.

Evensen, K.B. and C.D. Boyer (1986). Carbohydrate composition and sensory quality of fresh and stored sweet corn. J. Amer. Soc. Hort. Sci. 111(5): 734-738.

Ghanaym, T.A.A., El-Said, Z.M., Ragab, M.I., Mohamed, M.H.M., Mohamed, A.S. (2022a). Chemical Constituents of Snap Bean Plant Foliage and Pods as Affected bySeveral Natural Safety Compounds. Egyptian Journal of Chemistry, 65(6), pp. 357–365.

Ghanaym, T.A.A., El-Said, Z.M., Ragab, M.I., Mohamed, M.H.M., Mohamed, A.S. (2022b). Chemical and Physical Quality of Snap Bean Pods duringStorage and Shelf Life as Affected by Some Natural Safety compounds. Egyptian Journal of Chemistry, 65(6), pp. 601–610.

Hunter, D.J., L.G. Yapa, N.V. Hue and M. Ea-qub (1995). Comparative effects of green manure and lime on the growth of sweet corn and chemi-cal properties of an acid Oxisol in Western Samoa Corn. Commu. Soil. Sci. and Plant Anal. 26 (3&4): 375-388.

Junpatiw, A., Lertrat, K., Lomthaisong, K. And R. Tangwongchai (2013). Effects of steaming, boiling and frozen storage on carotenoid contents of various sweet corn cultivars International Food Research J. 20(5): 2219-2225.

Ma, J.F. (2004). Role of silicon in enhancing the resistance of plants to biotic and abiotic stresses. Soil Science and Plant Nutrition, 50(1)11–18.

Malik, C.P. and M.B. Singh. (1980). Plant enzymology and histoenzymology. A Text Manual- Kalyani Publishers, New Delhi.

Marschner, H (1995). Mineral nutrition of higher plants. 2nd Edition, Academic Press, London, 889 PP.

Maswada, H. F. and L. A. Abd El-Rahman (2014). Inducing salinity tolerance in wheat plants by hydrogen peroxide and lithovit "a nano-CaCO3fertilizer". J. Agric. Res. Kafr El-Sheikh Univ., 40 (4): 696-719.

Sabina, P. D. (2013): Research concerning the use of some seed and material preparation method in the production of biological material in generative Koelreuteria paniculata Laxm. J. Hort. Forestry Biotechnol., (17)185-188.

Salunkhe, D. K. and S.S. Kadam (1998). Sweet corn Handbook of vegetable science and technology, production, composition, storage and processing. New York: Marcel Dekker, 742 p. ISBN 0-8247-0105-4.

Shallan, M. A., H. M. M. Hassan, A. A. M. Namich and A. A. Ibrahim (2016). The influence of lithovit fertilizer on the chemical constituents and yield characteristics of cotton plant under drought stress. Int. J. of Chem. Tech. Res., 9 (8): 1-11.

Singh, I. L,angyan and S. Yadava, P (2014). Sweet Corn and Corn-Based Sweeteners. In Sugar Technology, vol. (16) 144– 149. ISSN 0972-1525.

Szymanek M (2012). Processing of sweet corn, trends in vital food and control engineering. Ayman Amer Eissa (Ed.). InTech. Available at http://www.intechopen.com/books/trends-invital- food-and-control engineering/processing-of-sweet-corn. Accessed in May 22, 2013.

Thorn, A. J. and L. M. Rogan (2015). The effects of lithovit on production and returns in a Hayward kiwifruit orchard. Grower Services Manager, (1)1-13.

Uchida, R. (2000). Essential Nutrients for Plant Growth: Nutrient Functions and Deficiency Symptoms, Chapter 3, from Plant Nutrient Management in Hawaii's Soils, Approaches for Tropical and Subtropical Agriculture J. A. Silva and R. Uchida, eds. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, ©2000, pp. 31- 55.

Wang, L., Z. Feng and J. K. Schjoerring (2013). Effects of elevated atmospheric CO_2 on physiology and yield of wheat (Triticum aestivum L.). A meta-analytic test of current hypotheses. Agric. Ecosyst. Environ., (178) 57-63.

White, P.J and M.R. Broadley (2003). Calcium in Plants. *Annals of Botany*, 92, 487- 511.

Xu Q., Fu H., Zhu B., Hussain H.A., Zhang K., Tian X., Duan M., Xie X., Wang L(2021). Potassium improves drought stress tolerance in plants by affecting root morphology, root exudates and microbial diversity. Metabolites, 24: 131

تأثير بعض المركبات المحفزة للنمو على نمو ومحصول ثلاثة أصناف من الذرة السكرية (*Zea mays* L. Saccharata)

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أجريت تجربتين حقليتين متتاليتين خلال الموسم الصيف لعامى (2022 و2023) في محطة التجارب التابعة لقسم البساتين كلية الزراعة جامعة بنها لدراسة تأثير رش بعض المركبات المحفزة للنمو وهي سيليكات البوتاسيوم والليثوفيت والكاب ستار (كالسيوم بورون) على نمو النبات والمحصول ومكوناته لثلاثة أصناف من الذرة السكرية (*Zea mays* saccharata) وهما Hytech-3010, Nuzivedu- Misthi , Evergrow-25471. تشير النتائج إلى أن استخدام الصنف Nuzivedu-Misthi مع الرش بمركب الليثوفيت (0.5 جم لتر$^{-1}$) ثلاث مرات، بعد شهر من الزراعة وعلى فترات كل أسبوعين ادى الى الحصول على أفضل القيم المعنوية فيما يتعلق بطول النبات، عدد الأوراق، ومساحة الورقة و المحصول الكلى للفدان ومكوناته وهى طول الكوز (سم) وعدد الصفوف في الكوز الواحد وقطر الكوز مقارنة بالتوليفات الأخرى المستخدمة خلال موسمي التجربة. علاوة على ذلك سجل الصنف Nuzivedu-Misthi مع رش الليثوفيت أفضل القيم المعنوية للبروتين والنشا الكلي والسكريات المختزلة وغير المختزلة ماعدا نسبة الرطوبة خلال موسمي التجربة.