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Effect of spraying or ground drench from humic acid on growth, total output and fruits nutritional values of cucumber (*Cucumis sativus* L.) grown under plastic house conditions.

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Abstract : This research was infectious to locate the impact of spraying or ground drench of humic acid of cucumber growth, yield and fruit nutritional values ripe under soil situation in a plastic house. Various levels of humic acid at (3, 6 and 9L/fed.) were utilized of cucumber plants over every spraying sprinkle or soil drench in the root region. Spraying or ground drench of humic acid enforcement drove to safely great plant growth parameters, total yield than the control. Either soil drench or spraying of humic acid treatments significantly increased number of flours and fruits. Humic acid handling had no considerable influence on fruit tallness and wide. Moreover, humic acid implementation significantly influenced N%, Protein % and TSS% content. The study displayed that increasing the level of humic acid increased cucumber growth, fruit yield and quality with soil drench or spraying humic acid application.
Key words: Cucumber, soil drench or foliar application, humic acid, growth, yield, fruit quality.

Introduction

Cucumber (*Cucumis Sativus* L.) is one of the most vegetable crops which are predominating grown under covers. It is the major plastic houses vegetable kind cultivated in Egypt. Though its calorie and nutritional amount is very low, it is a essential provenance of vitamins and minerals in the human regimen [1]. In addition to its scrumptious relish and fully perfect caloric amount, it has high medicinal account for human existence. It is well famous for naturalistic diuretic and thus can avail as an live drug for excrete and elevate flux of urine. Due to high content of potassium (50-80 mg/100g), cucumber can highly be beneficial for both high and low blood squeeze [2]. Compared with much crops, cucumber ranges harvest stage rapidly. The cucumber fruit outputs are used not only for fresh diet and culinary cuisine, but also for salad and pressing [3].

Humic material is created over organic order putrescence and utilize as ground fertility in demand to ameliorate soil constructing and ground microorganisms. Humic acid, as a mercantile production include 42-46% O, 44-58% C, 0.5-4% N and 6-8% H as well as frequently another elements [4]. Likewise, it get better ground fecundity and improved the availability of nourishing elements by possession they on mineral superficies. The humic material are especially utilized to take out or lessening the unfavorable effects of chemical fertilizers on the ground and reign a major effect on plant growth, as shown by much scholars [5]. Spraying drizzle of these materials also elevate plant growth, and increased total yield and fruits goodness in a number of plant kind [6]. Therefore, humic materials possess been found to catalyzed stems and root development and alimentary uptake of vegetable produce [7]. The commercial humic acids increased development, total yield produce, fineness and considerable improved in the cumulating of K, P, Fe, Ca, Mg, Mn and Zn in texture of

plants and improved cumulating of N and Ca in roots[8]. Also, humic substances, diverse supposition proposition the forming on a congregation amidst those materials and metal ions, they partnership on increase of sourness catalysis, they effect of activating breathing, photosynthesis and their hormonal efficiency and nucleic acid metabolism reign been announce [9]. In the same esteem, [10] found that humic acid on soil employment safely improved grow length, numeral of leaves, shoot, leaf area/plant and dry matter. However, [11]found that foliar spraying of humic acid at 0.1% displayed significant improved in uptake of nutrients than the control. Moreover, [12] reported that, foliar implementation of humic acid at different levels i.e. 3, 6 and 12 L/fed. had a significant effect on growth characters and total yield and its components as well as chemical parameters commonalty from the resulted its highest values only with that onion cultivate, whose sprayed together with humic acid at 6 L/fed. But that onion plants which sprayed with humic acid at levels of 12 L/fed resulted minimal plant growth as well as yield and its ingredients, in addition give rise to increase in TSS, N, P K Fe, Mn and Zn in bulb tissues. Moreover, [13] communicate that yield of squash variety after soil drench with humic acid increase by 16-29.78% compared to control plants, and cluster of fruit in 6.6-7.4%. However, [14] found that, spraying or soil drench of humic acid drove for safely rising average fruit weightiness, premature and total harvest than no treated. These studies reported such cucumber fruit output and nutrition values ability safely be increased together with ground drench and spraying of humic acid. In the same respect, [15] on pepper and [16] on cucumber reported that the stream benefit in foliar fertilization can be clarify by several research studies carried out with vegetable crops. Moreover, [17] reported that the best treatment which caused the tallest cucumber plants with the highest number of internodes per plant was weekly spray application of humic acid with 1.5g/L concentration. On the other hand, [18] reported that treatment with fertilizers containing humic acids leads to growth promotion quicken the development of plants, improved yield and enhanced quality of crops. In the same respect, [19] found that spraying splash of elevation average of humic acid (4g/L) limited the rise amount of growth parameters, such as issue of leaves and stems, fresh weighing of complete plant and its different accessories as well as total harvest and its ingredients (pod highness and numeral of pod/plant). Also, accord the elevated proportion of protein and nitrogen contents as well as Fe on broad bean pods textile. On the other hand, [20] communicate that, by increasing level of humic acid increased growth parameters, root yield and increment the percentage of protein, N, P, K, carbohydrate and Fe contents of turnip root tissues. Also, [21] showed that, hot pepper plants which received 100 Kg of nitrogen with 2 g/L of humic acid fulfill highest growth characters i.e. plant height, stem number and leaf chlorophyll content and venereal factors expressed as fruits number and weight per plant as well as total yield / m^2 as well as N %, protein % and VC values.

In this research, we locate the effectiveness from exogenously utilized humic acid on growth characters, fruitiness harvest and nutritional values of cucumber mature beneath immediate soil situation on a plastic houses.

Material and methods

Two experiments in plastic house were conducted at Experimental Station of National Research Centre at Nubaria region, North Egypt. Physical and chemical properties of the soil are presented in Table (1).

Table (1): physical and chemical properties of the experimental soil.

Physical properties							
Sand		**Clay**	**Silt**	**Texture**	**f.c. %**	**w.p. %**	
90.08		9.26	0.66	Sandy	16.57	5.25	
Chemical analysis							
E.c. M/m	**pH**	**Meq/ L**					
		Ca	**Mg**	**Na**	**K**	**Hco3**	**Cl**
1.7	8.2	7.02	0.527	0.982	0.31	1.3	0.566

During of two successive seasons 2014 and 2015. Hybrid F1 Pracodo cv. were transplanting in the third week of Des. in both seasons on one side of each ridge 50 cm apart. The agricultural practices were followed as recommended. Drip irrigation system was used. The treatments were arranged in a split plot design with three replicates. Where the tow of method of application of humic acid (foliar and or soil application) were arranged within the main plots, but the 4 levels of humic acid (0, 3, 6, and 12 L/fed.) were distributed in the sub-plots.

Each experiment included 8 treatments with 3 replicates. Spraying was conducted three times; first one was after 20 days of transplanting and then every 15 days for the second and third spray. Spraying was applied in early morning. Furthermore, the same concentrations of humic acid solutions were applied three times to the plant root area during the growth period at 15 day intervals. The normal cultural practices of cucumber production under plastic house commonly used as in the growing area. Cucumber fruits were harvested twice a week from the third week of March until the second week of May. Their weight and number were recorded each time. Fruits were harvested in their commercial maturity stage with length of 10- 15 cm and free from decay.

Data recorded:

Plant height (cm), number of leaves/ plant, leaf area /plant (was determined on the leaves No.4 from the plant top using a digital leaf area meter was calculated according to[22], total number of flowers, fruit and total yield per plant and physical fruit characters expressed as fruit length, fruit diameter (cm) were determined. However, the chemical fruit characters i.e. N % was determined using the micro-kjeldahl method [23]. In addition, protein percentages in fruits were calculated by multiplying nitrogen content by 6.25. TSS% was determined using hand refract meter**.**

The obtained data of experiments were subjected to the statistically analysis of variance procedure and means were compared using the LSD method at 5% level of significance according to [24]**.**

Results and discussion

Growth characters:

The belongings of humic acid treatments on growth parameters of cucumber plants are presented in Tables (2). Both soil drench and foliar spray of humic acid treatments significantly increased cucumber growth characters in both seasons i.e. (plant length, number of leaves/plant and leaf area/plant) compared to control treatment.

Table (2): Effect of foliar or soil application of humic acid on growth characters of cucumber plants during 2014 and 2015 seasons.

Humic acid levels (L/fed.)	2014			2015		
	Plant length (cm)	Number of leaves/plant	Leaf area /plant (cm^2)	Plant length (cm)	Number of leaves/plant	Leaf area /plant (cm^2)
Control	153.33	36.33	68.67	153.67	35.00	65.00
Soil 3	164.33	39.67	69.67	161.00	39.00	66.33
Soil 6	176.00*	43.00*	75.67*	172.33*	41.00*	72.00
Soil 9	177.33*	46.33**	84.33*	174.00*	45.33*	80.67*
Foliar 3	165.00	40.33	68.67	161.67	38.33	65.33
Foliar 6	179.33*	45.00*	71.67	176.00*	44.00*	68.33
Foliar 9	183.67**	45.33**	75.33*	180.33**	44.67*	72.00*
LSD 5%	16.48	5.10	5.94	16.35	5.12	8.54

Soil drench or foliar spraying of humic acid at high concentration (9 L/fed.) significantly improved plant length and number of leaves/plant paralleled low level (3 L/fed.). These previous data were fully in both empirical seasons. The influence of humic acid soil drench on plant growth characters might be due to improving the soil physical and chemical characters. It could be concluded that, the causative juvenile of these consequence has been attributed also to many laborers like increasing in cell diaphragm permeability, oxygen uptake, breathing and photosynthesis, phosphate uptake, root and cell protraction and ion transport [25] chelating unavailable nutrients and buffering soil Ph [26]. Also, it appear that humic substances might influence both respiration and photosynthesis [27]. Moreover, [17]specified that**,** humic acid might indirectly influence nutrient uptake through the assignment of humic acid, and directly impact the plants when they were absorbed by roots. Humic acid confirmed the accumulation of crushing sugar which increased withered resistance through promote

the osmotic squeeze inside plants, growing by humic acid of peroxides activity, seed germination, nutrient uptake and root growth. Conformable conclusion was recorded by [11,12,16,21].

Total fruit yield and its quality:

Both soil drench and spraying humic acid treatments significantly improved cucumber fruit yield and number of flours and fruits (Table 2). The highest yield was specified from (9L/fed.) foliar treatment (2.12 and 2.09 kg/plant) in first and second season respectively. The lowest yield was gained in (1.89 and 1.72 kg/plant) in first and second season respectively after not using of humic acids (control). The influence of humic acid on increasing cucumber fruit could be refer to increase plant development that are formed by improved vigor of micro huckleberry such as (bacteria, fungi, yeasts and moss [(28).] Moreover, the favorable effectiveness of humic acid by the output and goodness of cucumber could likewise be primarily due to hormone- parallel vigor of the humic acid meanwhile them involvement in cell breathing, oxidative phosphorylation, photosynthesis, protein synthesis, and different enzymatic response [29] who found that handling carrots cells with humic substances improved those expansion and stimulate morphological major changes similar to these generated through auxins.

Table (3): Effect of foliar or soil application of humic acid on total yield of cucumber plants during 2014 and 2015 seasons.

Humic acid levels (L/fed.)	2014				2015			
	Number of		Average fruit weight (g)	Total yield /plant (kg)	Number of		Average fruit weight (g)	Total yield /plant (kg)
	flower /plant	Fruit /plant			flower /plant	Fruit /plant		
Control	46.00	17.00	96.33	1.89	42.67	14.00	92.67	1.72
Soil 3	50.33	19.00	100.00	1.90	47.00	15.67	96.67	1.80
Soil 6	53.00	21.33	104.00	2.00	49.67*	18.00	100.33	1.90*
Soil 9	57.67*	23.00*	107.33	2.11*	54.33*	19.67*	103.67	2.02*
Foliar 3	47.00	18.33	97.00	2.02	43.33	15.00	93.00	1.91
Foliar 6	53.00	21.67	109.33	2.10*	49.33*	18.33	101.33	2.07*
Foliar 9	54.67*	24.00*	111.00	2.12*	51.33*	20.67*	102.33	2.09*
LSD 5%	8.39	5.23	NS	0.14	5.38	5.52	NS	0.15

An alternative explanation is the presumption that plant growth organizer might adsorb on to humates and transformation on in amalgamation with them to performance plant output. Actually, [30] proposition that thither were commutable auxin combination of humic acids. At all events, the outcome of the sitting research suggestion that soil drench and/or spraing of humic acid may expeditiously be applied to gain high fruit output and can safely elevate fruit goodness of cucumber.

Chemical fruits quality:

The implementation of humic acid Table (4) had a great effect on the value of cucumber fruit tissues in the two studied seasons. Jointly soil drench or spraying of humic acid did not significantly influence of fruit wide and fruit length. Comparable consequence was furthermore acquired for pepper fruit remedy with humic acid [15]. In another study, [6] have found a significant raise in fruit diameter and length as a result of exogenous HA application in tomato but the author did not find any significant difference between soil HA application and control in terms of fruit diameter. Moreover, increasing levels of soil or foliar HA caused an increment in N %, Protein % and TSS%. The statistical analysis of the acquired data reported that the differences within different humic acid levels with regard to the studied chemical properties were great reach the 5% level of significant in two seasons. Similar results were obtained by [11,12,16,21].

Table (4): Effect of spraying or soil drenching of humic acid on physical and nutritional values of cucumber fruits during 2014 and 2015 seasons.

Humic acid levels (L/fed.)	2014					2015				
	Fruit length (cm)	Fruit diameter (cm)	N %	Protein %	TSS %	Fruit length (cm)	Fruit diameter (cm)	N %	Protein %	TSS %
Control	11.11	3.27	4.05	25.30	4.32	10.56	3.00	4.00	23.42	4.21
Soil 3	11.33	3.73	4.30	26.88	4.57	11.22	3.30	4.23	25.25	4.49
Soil 6	11.33	3.83	4.43*	27.71*	4.63*	11.78	3.50	4.33*	27.00*	4.55*
Soil 9	12.00	3.70	4.60*	28.75*	4.77*	12.40	3.37	4.40*	27.96*	4.68*
Foliar 3	10.85	3.73	3.93	24.59	4.50	11.25	3.53	3.87	22.92	4.43
Foliar 6	10.67	3.97	4.57*	28.54*	4.92*	10.56	4.03	4.20	27.29*	4.81*
Foliar 9	11.33	4.20	4.60*	28.75*	4.96*	11.79	4.00	4.27*	27.42*	4.85*
LSD 5%	NS	NS	0.26	1.64	0.25	NS	NS	0.25	2.45	0.34

In inference, spraying or soil drench of humic acid competence outcome in an amelioration in the cucumber fruit output and goodness. The conclusion could be due to the communicate increase in growth of cucumber in restraint to the incorporation of humic acid till plant growth media[31]. Such stimulatory activity might have also been concerning to improved uptake of metal nutrients communicate formerly[32] and the plant hormone-like efficiency of humic substances [(9).] However, the convenient effectiveness of humic acid on the output and goodness of cucumber could also be primarily due to hormone- such as vigor of the humic acid meanwhile their partnership in cell breathing, photosynthesis, oxidative phosphorylation, protein structure and various enzymatic response [33].

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