

EFFECT OF FOLIAR SPRAYING WITH HUMIRON ON GROWTH AND YIELD OF TWO SWEET PEPPERS HYBRID (*CAPSICUM ANNUUM L.*) IN OPEN FIELD

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(Received: November 1, 2021; Accepted for Publication: December 8, 2021)

ABSTRACT

This investigation was carried out in Malta research farm, Dohuk government, Kurdistan region / Iraq, in summer season 2019 in open filed to study the effect of Humiron on growth and yield of two peppers Hybrid (California wonder and Gulpiner). The results show that hybrid Gulpiner had a significant variance in plant high, superior in branches number, California wonder was significant difference in fruit number, fruit weight, yield per m² and total yield t.ha⁻¹. Humiron provided the highest value in number of branches at highest level of Humiron and vitamin C, fruits number per plant, and total yield t.ha⁻¹.

KEY WORD: Humiron, peppers Hybrid.

INTRODUCTION

Pepper (*Capsicum annum. L.*) is a member of the family Solanaceae. It is identified sweet pepper, green pepper or bell pepper (Kuharet al. 2017). It is a significant plant produce consuming great nutritious value. It is a same respectable source of usual colors and resistant-oxidant groupings vital for humanoid health (Howard et al., 2000). Capsicum, are native to South America (Cheng, 2014). It is now cultivated all over the world. Most of the peppers cultivated in temperate and tropical areas. Cultivar selection is a main choice for pepper farmers. With several variant available, knowing the planned market and faces desired by customers is vital. Cultivators selected variations that produce high yields, have resistance to infections, have an identical harvest ripeness, and durability of production. Fruit shape, color size, flavor, and Capsacin rate are all critical appearances (Kaiser and Ernst, 2014).

Humic acid increases the growth and yield of numerous produce including vegetable (Zandonadi et al. 2007). Humiron Fe Liquid Iron is a lack corrector, containing iron in the full of 2%, chelated and centers with Humic acid. So iron is providing in a form that is voluntarily accessible to remain kept up by plant life in an extensive change of difficult soils (e.g.

alkaline and calcareous soils, sandy soils with little biological substances satisfied, etc.).

The produce is planned to avoid and right iron lack in agriculture and horticulture produces. It can be beneficial both to the soil or a foliar spray. The existence of Humic acids in this construction procedures a helpful result on plant growth as well as on confrontation against biotic and abiotic pressures.

Humic acid is one of the greatest vital mechanisms of bio-fluid compound. Since of its molecular construction, it delivers several to produce manufacture. It assistance failure up clay compressed soils, contributions in moving micronutrients from the soil to the plant, improve water field, rises seed sprouting charges, rise water, air and roots diffusion and excites growth of microflora population in soil (Mackowiak 2001). Humic materials inspire plant growing with the mixing of main and slight element, activator and inhibitor of numerous enzymes, variations in skin permeability, biomass invention (Mackowiak et al., 2001). Humic acid on the crop size of soil contains of many mechanisms. Besides, certain investigators displayed that the foliar spray of Humic acid improved nutrient acceptance, plant growing, produce and superiority in amount of plant types (Karakurt, Unlu and Padem (2009) (El-Nemr, El-Desuki M., El-Bassiony A.M and

Fawziet al 2012). atsmallestpartlyover acumulative nutrient acceptance, portion as a foundation of mineral plant nutrient, these consequences are attributed to the genotypic changes among the three sweet pepper hybrids. Plant biomass has been revealed to compare with an rise of photo-assimilates, which regulate the amount of dry weight supply to basin organs (Dada and Ogunesu, 2016)

Therising in total yield of ‘Barbero’, ‘Ferrari’, and ‘Imperio’ is credited to the rise in number of fruit per plant and the increased ratio of the superior fruit results. Comparableresults were also stated in ‘Hybrid Ranco-365’ chili pepper (Fathima and Denesh, 2013).

It is likewiseimagined that plant development hormones may be adsorbed onto humicsections and thus effect plant growth and development in a collective hormonal/humicconsequence (Atiyehet al., 2002). The usefulproperties of potassium humate on plant growth may be stated to its temporary as source of vegetalgrowinghormones(Abd El-Aalet al., 2005).

MATERIALS AND METHODS

The investigates were approved in the summer seasons of 2019 in research station Malta Duhok government, Kurdistan region / Iraq, toward studying the consequence of foliar spraying with Humiron on growing and produce of two sweet pepper hybrids California wonder and Gulpinarpepper seeds (*Capsicmannuun L.*) were sown in trays thatcontained peat moss. Typical farming practices for Pepper nurserieswere approved out. Seedlings were transplanted in open field on the 10th of April.Two factors inrandomizecompleteblock Design (RCBD) was used by 3 replications, the

first factors was two pepper hybrids (California wider(A) and Gulpiner (B)) the second factors was Humironat four levels (0, 10, 20 and 30 ml.L⁻¹).and so the experiment contain of 8 treatments (2*4).

The first foliar spray was after two weeks from planting, second and third foliar spraying in interval of 15 days from other.Five plant was selected to taken the data. Data were analysed by using SAS program AL-Rawi, Kh.M. and A.A.M. KhalafAlah (2000)

RESULTS AND DISCUSSION

Plant height (cm)

Table (1) displaysthe significant difference between cultivars on plant height . Hybrid Gulpiner 85.17cm compared with California wonder 70.58cm increasing by 17.13%. Regarding the effect of Humiron acid no significant effect a supra plant height only little rising at level of 10ml.L⁻¹ 79.83cm compared with control 75.83cm. The interaction between Humic acid and cultivars, remarked significant difference 89.67cm in cultivar gulpiner in level 10ml.L⁻¹compared in a seam level in California wonder 70cm.These consequencesstay credited to the genotypic variances between the two sweet pepper hybrids. Plant biomass has stood shown to correlate with arise of photo-assimilates, which decide the extent of dry weight supply to sink organs (Dada and Ogunesu, 2016). Fathima andDenesh(2013)whostatedthatHumicacidrate was significant affected plant height of chilli. Yildirim(2007) has likewise findings in tomato crop.

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	77.33 ab	70.00 b	70.00 b	65.00 b	70.58 b
Gulpiner	74.33 ab	89.67 a	88.67 a	88.00 a	85.17 a
Effect of Humiron	75.83 a	79.83 a	79.33 a	76.50 a	

Table (1):-Effect of foliar spraying with different concentration of Humiron on plant height (cm) of two sweet peppers Hybrid

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan’s multiple range test at 5% level.

Branches Number.plant⁻¹

The result show that in table (2) no difference between cultivars concerning the number of branches, only little increasing in cultivar California wonder (4.82)branches compared by Gulpiner (4.49) branches. Regarding the effect of Humiron, the result shows number of branches significantly affected by level of Humiron (30ml. L⁻¹) 5.68 branches ,high dose offered baste result.Humic acid ratelikewisepretentious number of branches plant⁻¹significantly. Humic acid is actualvital

for root and shoot growth of the plant. It rises the approval of nutrients in vegetables plant (Cimrin and Yilmaz, 2005). Researchdisplayed that the foliar request of humic acid risevegetativegrowingoftheplant.Brownnel^{etal.}(1987) described that foliar presentation of humic acid significantly rising number of branches plant⁻¹in tomato. Concerning the intraction between cultivars and rate of humiron the result showed 6.15 branches in cultivar California winder at level of 30ml.L⁻¹ compared to control in a same cultivar (4.06) branches.

Table (2):-Effect of foliar spraying with different concentration of Humiron on number of branches.plant⁻¹ of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0 ml.L ⁻¹	10 ml.L ⁻¹	20 ml.L ⁻¹	30 ml.L ⁻¹	
California wonder	4.06 c	4.51 bc	4.56 bc	6.15 a	4.82 a
Gulpiner	4.29 c	4.26 c	4.19 c	5.21 b	4.49 a
Effect of Humiron	4.18 b	4.38 b	4.38 b	5.68 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Fernández-Escobar et al. 1999 found that application of HA and Ca stimulated.High rate of Humironsimilarlypretentious number of branches .plant⁻¹significantly. Humic acid is a samevital for root and shoot growth of the plant. It increases the uptake of nutrients in vegetables crop (Cimrin and Yilmaz, 2005). The consequences are alike with the results of *Dod et al.*(1989)whoinformedthathumicacidcansignificantly affect number of branches.plant⁻¹. The comparable results were toodescribed by Fathima and Denesh(2013).

Chlorophyll content

Table 3 indicate that the leaves content of total chlorophyll content,no significant variance between hybrids only California wonder with 60.05 was over Gulpiner 56.22 rise by 6.37%. The effect Humironshow that the chlorophyll contentedreallyreplied to the diverse foliar applicationbyHumiron,remarked that no significant among spraying with Humiron, 59.85 at rate of 30ml.L⁻¹ compared by un treated 55.05 Fernández-Escobar *et al.* found that application of HA and Caencouraged chlorophyll contentedConcerning the interaction between hybrids and spraying with Humiron, no significant difference, California wonder 63.00 was a supra Gulpiner 52.57 umtreated.

Table (3):-Effect of foliar spraying with different concentration of Humiron on chlorophyll of two sweet peppers hybrid.

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	57.53 a	56.50 a	63.17 a	63.00 a	60.05 a
Gulpiner	52.57 a	59.90 a	55.70 a	56.70 a	56.22 a
Effect of Humiron	55.05 a	58.20 a	59.43 a	59.85 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Fresh weight (kg)

Fresh weight is an important structure of plant, which is the centralbasisofnutritiontoplantasthephotosynthesis ensuedinit.Together foliar or soil presentation

of humic acid improved fresh mass and fullharvest in (Karakurtet *al.*, 2009) The result in table (4) showed that no significant difference between cultivars legate fresh weight. Regarding the effect of Humiron, result demonstrations

significant variance among rate of Humiron applicant, at level of 30ml.L⁻¹ 0.74 kg compared by other level of plant spraying high dose of Humiron due to increasing vegetative biomasses. Concerning the collaboration between Hybrids and level of Humiron, commented significant difference. At rate 30ml.L⁻¹ 0.81kg at

California wonder comparative by control 0.50 ay Gulpiner rise by 38.27% .

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	0.54 bc	0.41 c	0.68 ab	0.81 a	0.61 a
Gulpiner	0.50 bc	0.53 bc	0.67 a-c	0.68 ab	0.59 a
Effect of Humiron	0.52 bc	0.47 c	0.67 ab	0.74 a	

Table (4):-Effect of foliar spraying with different concentration of Humiron on fresh weight (kg) of two sweet peppers hybrid

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Dry weight(g)

Data present in table (5) shows that the dry weight in peppers hybrid, about the effect of hybrids no significant variance between hybrids. Regarding the effect of Humiron, no significant

difference among Humiron, only high amount of Humiron provided best result. Concerning the interaction between Hybrids and foliar application of Humiron no significant difference between parameter studies.

Table (5):-Effect of foliar spraying with different concentration of Humiron on dry weight (g) of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	81.17 a	80.83 a	93.83 a	83.37 a	84.80 a
Gulpiner	85.03 a	79.30 a	85.80 a	84.50 a	83.66 a
Effect of Humiron	83.10 a	80.07 a	89.82 a	83.93 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Vitamin C(ml.100 g⁻¹)

Table 6 shows that the content of vitamin C in two hybrids of pepper, no variance between hybrids regarding vitamin c content .About the consequence of Humiron on contented of vitamin Cobserved significant difference among

level of Humiron, 24,55 compared by un treated 18.81 ml.100g⁻¹.

g About the interaction between hybrids and Humiron, the high level in both hybrids are significant compared with untreated plant.

Table (6):-Effect of foliar spraying with different concentration of Humiron on vitamin C(ml.100 g⁻¹) of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	18.81 b	20.69 ab	21.46 ab	24.55 a	21.38 a
Gulpiner	18.81 b	20.69 ab	21.46 ab	24.55 a	21.38 a
DaEffect of Humiron	18.81 b	20.69 b	21.46 ab	24.55 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Fruit number/plant

Data presented in table (7) clearly shown that number of fruit/plant, hybrid California wonder was significant difference compared with hybrid Gulpiner 19.46 fruit compared with Gulpiner 18.68 fruit raised by 4%. Regarding the effect of foliar spray by Humiron , significant result obtained at level of 30ml.L⁻¹ 20.68 compared with control 17.80 . variation was observed between cultivars and fruit numbers plant⁻¹ and this difference may be due to genetic motives Padem and Ocal (1999) who decided that diverse concentration of humic acid application results a significant variation in number of fruits plant⁻¹.. The difference in

growing character below alike circumstances might be due to genetic influences (Kishan and Suryanarayan, 2004). Obidiebube *et al.*(2012)described that there is a significant difference between cultivars in number of fruits plant⁻¹. With the application of humic acid levels, number of fruits plant⁻¹ was significantly better. It has remained described by Karakurt et al. (2009). The interaction between cultivars and level of Humiron applicator at rate of 30ml.L⁻¹ were significant at hybrid of California wonder 21.63 fruits, compared with no sprayed in a seam hybrid 17.49 fruit.

Table (7):Effect of foliar spraying with different concentration of Humiron on fruit numbers of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	17.49 e	18.52 c-e	20.22 b	21.63 a	19.46 a
Gulpiner	18.11 de	17.85 de	19.06 b-d	19.69 bc	18.68 b
Effect of Humiron	17.80 c	18.19 c	19.64 b	20.66 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Fruit weight (g)

Data presented in table (8) show effect of Humiron a supra fruits weight of two peppers cultivar, California wonder was significant modification to Gulpiner 0.73g respective 0.67g. Concerning the effect of Humiron a supra fruits weight the above table shows spraying with 30ml.L⁻¹ provided significant difference

0.82g comparative with un treated 0.59g. Regarding the interaction between hybrids and Humiron, the result show that hybrid California wonder 0.88g was significant difference to un treated Gulpiner 0.55g rise by 37.5%. The variant of fruits weight due to genetic reason. Fitriani *et al.*(2013)

Table (8):-Effect of foliar spraying with different concentration of Humiron on fruit weight (g) of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	0.64 d-f	0.61 ef	0.77 b	0.88 a	0.73 a
Gulpiner	0.55 f	0.66 c-e	0.73 bc	0.76 bc	0.67 b
Effect of Humiron	0.59 c	0.64 c	0.75 b	0.82 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Plant Yield (kg.plant⁻¹)

Data presented in table 9 shows the yield/plant, there are significant difference between the hybrid, California wonder gave 1.478kg.plant⁻¹ comparative by gulpiner 1.347 kg.plant⁻¹. The difference due to high fruits/plant and fruits weight in hybrid California wonder. The effect of Humiron on kg.plant⁻¹ remarked significant variance among level of Humiron, At level of 30ml.L⁻¹ 1.863 kg.plant⁻¹ comparative

with untraded plant 1.170 kg.plant⁻¹ The variation yield plant⁻¹ in different chilli varieties was due to genetic reasons and big varietal differences (Rajput *et al.*, 1999). The interaction between Hybrids and Humiron observer significant difference between Hybrids and spraying by Humiron Hybrid California wonder at rate of 30ml.L⁻¹ 1.903 kg.plant⁻¹ comparative with un sprayed Gulpiner 1.013 kg.plant⁻¹

Table (9):-Effect of foliar spraying with different concentration of Humiron on yield kg.plant⁻¹ of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	1.327 bc	1.120 cd	1.560 b	1.903 a	1.478 a
Gulpiner	1.013 d	1.163 cd	1.387 bc	1.823 a	1.347 b
Effect of Humiron	1.170 c	1.142 c	1.473 b	1.863 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Yield(kg /m²).

Regarding the yield kg/m², in data present in table(10) shows the significant variance between hybrids, hybrid California wonder was superior over Gulpiner 4.19 kg/m² respective 3.57kg/m² rising by 14.80%.Concerning the effect of Humiron on yield kg/m², spraying with

30m.L⁻¹ gave 4.79 kg/m² compared with control 3.32.kg/m².About the interaction between hybrids and Humiron, hybrid California wonder at level of 30ml.L⁻¹ 5.40 kg/m² comparative by control no treated 2.87kg/m² in Gulpiner. Increasing the yield in California wonder due to number of fruit/plant and fruits weigh.

Table (10):-Effect of foliar spraying with different concentration of Humiron on yield kg.m²of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20 ml.L ⁻¹	30ml.L ⁻¹	
California wonder	3.76 bc	3.18 cd	4.42 b	5.40 a	4.19 a
Gulpiner	2.87 d	3.30 cd	3.93 bc	4.18 b	3.57 b
Effect of Humiron	3.32 c	3.24 c	4.18 b	4.79 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Yield (ton.ha⁻¹)

Table (11) illustrated the effect of hybrids on yield t.ha⁻¹, remarked that hybrid California wonder provided 41.91 t.ha⁻¹comparative with hybrid Gulpiner 35.82 t.ha⁻¹. Concerning the effect of Humiron on yield,foliar with humic acid leading to a significant growth in the amount per plant and total yield (Elnemiret *al* ;2012).highdoze gave better result 48.10 t.ha⁻¹comparative by untreated 33. 18 t.ha⁻¹rise by 31.01%.

Regarding the interaction between hybrids and spraying with Humiron the result shows the significant change, hybrid California wonder provided 54.00 t.ha⁻¹comparative with un treated at Gulpiner 28.73 t.ha⁻¹.The result due to better environmental suitable condition, or genetic variation even high number of fruits/plant and fruits weight (Zhang and Erwin, 2004),in hybrid California wonder. The fullproduce was better by foliar presentation of Humiron.

Table (11):-Effect of foliar spraying with different concentration of Humiron on yield ton.ha⁻¹ of two sweet peppers hybrid

Cultivars	Humiron				Effect of cultivars
	0ml.L ⁻¹	10ml.L ⁻¹	20ml.L ⁻¹	30ml.L ⁻¹	
California wonder	37.63 bc	31.77 cd	44.23 b	54.00 a	41.91 a
Gulpiner	28.73 d	33.00 cd	39.33 bc	42.20 b	35.82 b
Effect of Humiron	33.18 c	32.38 c	41.78 b	48.10 a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

CONCLUSIONS AND RECOMMENDATIONS

After the total results of the research, it is decided that hybrid California wonder do better under the climatic conditions of Duhok. Also, foliar application of Homiron at the rate of 30ml⁻¹ give greatest results. The application of 30ml⁻¹ Humiron to high California wonder Hybrid for the commercial production should be recommended for the climatic conditions of Duhok.

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پوخته

ئه ف كه كولينه يا هاتيه ئه نجام دان لنافا بيستانى كه كولينيت چاندنى يا كه كرى ل مالتا -دهوك- ههريما كوردستانى/ئيراق. ل وهرزى هاقينا 2019 بو زانينا كارتىكرنا هورميرون ا سه ر گه شه و به رهه مى دوو بيژبيت فلفلى (California wonder , Gulpiner) ئه نجام دياردكه ن كو بيژى گولبرين سه ركه فتى بو دبلنديا رووه كى و ژمارا تاكا و كليفورنيا ئو ووندهر سه ركه فتى بو بشيوه كى پشووه رى دژمارا به رهه مى و سه نگيا به رهه مى (به رهه م/م2) و كويى به رهه م (تهن/هكتار).

هوميرونى بلنديا رووه كى و ژمارا تاكا زيده كر بريژا بلند و قيتامين c و قه بارا به رهه مى (به رهه م /رووهك) ئو كويى به رهه مى (تهن/هكتار).