Evaluation of some Cucumber Varieties (*Cucumis sativus L.*) and effect of Spray Salicylic Acid in Vegetative Growth Indicators in Greenhouse

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Abstract:

The research was carried out during the growing season of 2022 in one of the greenhouses affiliated with the University of Baghdad's Horticulture Dept., College of Agriculture Engineering Sciences, to evaluate the performance of four cucumber varieties, namely Marketmore 76, Beit Alpha, Ocucmmol (st), and Lahoba, and was given the following codes (V4, V3, V2, V1) respectively. They were tested under three levels of (SA) (0, 0.25, 0.5) mg. L-1, by using a Split-plot design RCBD with three replications. Salicylic acid was sprayed once at the beginning of the flowering of the plants. Results revealed that the variety cucumber Beit Alpha is superior to the rest of the varieties in most vegetative qualities; the node number (47.22), leaf number (48.11), side branch number (14.22), and plant length (241.0 cm). It has been noted that application of Salicylic acid at 0.5 mg L-1 is the most suitable dose, as it gives the highest number of flowers (15.08), node number (44.83), leaf number (45.83), side branch number (12.08), and plant length (226.8cm); The results revealed a significant increase in. The interaction between the cucumber Beit Alpha and Salicylic acid (0.5) concentration was higher than the other varieties tested.

Keywords: cucumber, salicylic acid, varieties.

تقييم بعض أصناف الخيار (*Cucumis sativus L*) وتأثير الرش بحامض السالسليك في مؤشرات النمو الخضري في البيوت المحمية

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المستخلص:

نفذ البحث خلال موسم النمو 2022 في أحد البيوت البلاستيكية التابعة لقسم البستنه لكلية الزراعة – جامعة بغداد، لتقويم اداء اربعة اصناف من الخيار وهي Marketmore 76 وBeit Alpha و Ocucmmol (st) وLahoba واعطيت الرموز التالية (V4,V3,V2,V1) على الترتيب، وقد اختبرت تحت ثلاثة تراكيز من حامض السالسيليك Salicylic acid (SA) (0، 0.25، 0.5) ملغم. لتر$^{-1}$، باستخدام القطع المنشقة Split-plotتصميم RCBD وبثلاثة مكررات. وتم رش السالسيليك بواقع رشه واحده عند بدء تزهير النباتات. اظهرت النتائج تفوق صنف V4 (Lahoba) حيث اعطى اعلى معدل لعدد الازهار الانثوية العاقدة بلغت (15.00زهرة). تفوق صنف V2 (Beit Alpha) في معدل عدد الافرع الجانبية، وعدد الاوراق، وعدد العقد، وطول النبات بلغت (14.22فرع، 48.11 ورقه،47.22 عقد، 241.0سم) على التوالي. كما اظهرت النتائج تفوق التركيز 0.5 ملغم. لتر$^{-1}$ لعدد الازهار بلغت (15.08 زهرة)، وأعطى التركيزS50 ملغم. لتر$^{-1}$ اعلى معدل لعدد الافرع، وعدد الاوراق، وعدد العقد، وطول النبات بلغت (12.08فرع ،45.83 ورقه،44.83 عقد، 226.8 سم) على الترتيب. واظهرت معاملة التداخل تفوقا معنوياً للمعاملة $V4\ S_{0.5}$ بلغت(17.00 زهرة) لعدد الازهار، والمعاملة $V2\ S_{0.5}$ في معدل لعدد الافرع، وعدد الاوراق، وعدد العقد، وطول النبات بلغت(16.00فرع، 50.00 ورقه، 49.00عقد، 250.3 سم).

الكلمات المفتاحية: خيار، السالسليك، اصناف.

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Introduction

Cucumber (*Cucumis sativus* L.) one of the cool Climates' monoecious annual crops, belongs to the Cucurbitaceae family comprising 70 genera and 750 species (Thoa,1998 and Best,2000). According to (Shetty and Wehner, 2002) as well as (Arankumar et al, 2011), Cucumbers produce soft, luscious fruit that can be eaten fresh in salads or cooked with other vegetables. Cucumber fruit has the following nutritional makeup per 100 g edible portion: dietary fibers 1%, protein 1%, total fat 0.5%, and carbohydrates 3% (USDA,2014). Different crop types respond differentially to a range of climatic conditions, soil properties, and technical techniques in different seasons or environments (Makinde and Bello, 2009 and Singh and Ram, 2012). Cucumber production is becoming more and more popular, and it is grown year-round in the humid tropics with bimodal weather patterns. But information on how the crop reacts to the various seasons varies, necessitating focus on raising its yield.

One of the major commercial crops in many nations is cucumber, yet it is extremely vulnerable biotic and abiotic stress including salt, water and high temperatures tress. (Duan et al. 2008; Kubis 2008; and Zhang et al. 2009). Salicylic acid (SA), a common phenolic molecule found in plants, is essential for controlling some plant functions (Hayat et al., 2008). A significant aspect of salicylic acid's function in enhancing plant development includes nutrient uptake and processes such as stem elongation, leaf emergence, and fatalities (Rubio et al., 2009). Additionally, SA acts as a cofactor for enzymes like dismisses, peroxidases, and catalyses, which mitigate the effects of toxic free radicals such as H2O2, OH, and O2- radicals. Furthermore, SA influences growth development and ion uptake (Simaei et al., 2012). It promotes the growth of both roots and leaves as well as the generation of chlorophyll, which makes cucumber plants healthier and more vigorous. Growth, development, and other physiological functions like nitrogen metabolism, protein synthesis, cell division, and the production of cell walls all depend on boron (Havlin et al., 2017).

In this regard, found Nasrabadi et al. (2015), found, in comparison to untreated plants, melon plants treated with 100 ppm of SA had bigger leaf areas, greater chlorophyll contents, longer fruit ripening times, and higher total soluble solids (TSS). Nada and Abd El-Hady (2019), reported that foliar spraying with salicylic acid significantly improved cucumber traits under water shortage stress conditions. A study by Akshata et al. (2023) showed how parthenocarpic cucumber growth and productivity were affected by foliar spraying salicylic acid (SA) along with micronutrients (Zn and B). Noteworthy results included improvements in growth parameters such as vine length, node number, and leaf area sixty days following planting. This combination also yielded the highest overall production and fruit yield per vine. Thus, the goals of this investigation were to ascertain how salicylic acid affected the development and yield of four different types of cucumbers.

Material and Methods:

The study includes four varieties of Cucumber, Marketmore 76, Beit Alpha, Ocucmmol (st), and Lahoba, indicated by the code (V3, V2, V3, and V4) respectively. planted the seeds of the varieties in the dishes of glass in the greenhouses on 5/2/2022 After the completion of the formation of the first two real papers, transferred seedlings to one of the greenhouses of the Horticulture Dept., College of Agriculture Engineering Sciences – University of Baghdad on 9/3/2022 It was planted on a distance of about 1.75 m. The length of the floor was 12 meters, and the rate of four meters for each repeater each section was divided into three experimental units and four varieties. An experiment was conducted under different levels of Salicylic acid (0, 0.25 and 0.50 mg L-1), indicated by the code (S0, S 0.25 and S 0.5) respectively, by using a Split-plot design RCBD with three replications. The cucumber varieties are the main plots and the salicylic acid (SA) is in the sub-plots. Statistical analysis was carried out according to Genstat, 2012. Spray salicylic acid with one spray at the start of flowering plants.

Studied Traits

Every data measurement was conducted on a sample of five randomly chosen plants from every plot.

1. The number of female flowers was counted when they appeared on the main and sub-legs.
2. The node number, leaves, and plant length were counted at the end of the season along the main leg from its contact with the soil until the developing summit.
3. It counted the side branch number of a plant at the end of the season.

Results and Discussion

It is clear from Table 1: That for a female flower number; the variety V4 outperforms the highest female flowering rate of 15.00 while the minimum was recorded in variety V1 at 11.56. The reason for the difference between the varieties of Cucumber may be due to the difference between the genotypes (AL Jaf, 2017). Salicylic acid spray gave $S_{0.5}$ concentration with the highest rate, reaching 15.08 flowers and the lowest rate was at S_0 concentration which amounted to 11.17 flowers. The interaction between the variety V4 and the concentration $S_{0.5}$ gave the highest of female flowers number 17 flowers, while the minimum recorded in a female flower number was at variety V1 and the concentration S_0 9 flowers. The role of Salicylic acid in the increase of photosynthesis products has an excess of sugars that are ready to promote syphilis growth (Russell,1983), Or the role of Salicylic acid in the increase of toxins (Shakirova et al., 2003, Cleland and Ajami,1974) which leads to increased flowering in the plant.

It is clear from Table 2,3,4,5: for node number, leaf, side branches, and plant length; variety V2 gave the highest of (47.22 node, 48.11 leaves, 14.22 side branch and 241.0 cm), and the lowest rate of (38.67 side branch, 39.67leaf, 9.11 node and 168.4cm) in variety V4. The reason for the difference between the varieties of Cucumber may be due to the difference between the genotypes (AL Jaf, 2017). Salicylic acid spray gave the $S_{0.5}$ concentration highest; (44.83 nodes, 45.83 leaves, 12.08 side branches and 226.8cm), for node number, leaves, plant length and side branch number, and the lowest rate at S_0 concentration which amounted to (41.75 nodes, 42.67 leaves, 10.08 side branches and 202.7 cm).

The interaction between the variety V2 and the concentration $S_{0.5}$ gave the highest node number, leaves side branches, and plant length; (49.00 nodes, 50.00 leaves, 16.00 side branches and 250.3cm), and the lowest side branch number was at variety V1 and the concentration S_0 (6.67 side branches), While minimum was recorded in a side branch number was at variety V4 and the concentration S_0 and $S_{0.25}$ (38.00 nodes and 39.00 leaves) for an of nodes number and leaves Plant, variety V4 and the concentration S_0 (136.7 cm) for a plant length. Many studies have been conducted on the effects of salicylic acid on plant growth and its ability to accelerate photosynthesis (Hayat and Ahmed, 2007), including the finding that applying salicylic acid enhances plant growth and increases plant responses to stress in the environment (Pal et al., 2002). Additionally, exposed to 0.5 Mm salicylic acid, the apical meristem's cell division increased and the growth of the plant was enhanced (Shakirova et al., 2003). The results are in agreement with [Preciado-Rangel et al. (2019) in cucumber, Nada and El-Hady (2019) in cucumber, Bommesh et al. (2016) in cucumber, Yadav et al. (2022) in pointed gourd, Yadav, et al. (2020) in bitter gourd, Yadav et al. (2019) in bottle gourd, and Abd et al. (2024) in cucumber.

Table1. The effect of spraying with salicylic acid on the number of female flowers of four varieties of cucumber.

varieties Salicylic	V 1	V 2	V 3	V 4	mean
S_0	9.00	11.67	11.00	13.00	11.17
$S_{0.25}$	13.67	13.67	15.00	15.00	14.33
$S_{0.5}$	12.00	14.67	16.67	17.00	15.08
mean	11.56	13.33	14.22	15.00	
LSD	V = 2.01	S = 1.16		V*S = 2.55	

Table 2. The effect of spraying with salicylic acid on the number of node of four varieties of cucumber.

varieties Salicylic	V 1	V 2	V 3	V 4	mean
S_0	41.00	45.33	42.67	38.00	41.75
$S_{0.25}$	41.33	47.33	43.67	38.00	42.58
$S_{0.5}$	42.67	49.00	47.67	40.00	44.83
mean	41.67	47.22	44.67	38.67	
LSD	V = 3.76	S = 1.49	V*S = 4.14		

Table 3. The effect of spraying with salicylic acid on the number of leaf of four varieties of cucumber.

varieties Salicylic	V 1	V 2	V 3	V 4	mean
S_0	42.00	46.00	43.67	39.00	42.67
$S_{0.25}$	42.33	48.33	44.67	39.00	43.58
$S_{0.5}$	43.67	50.00	48.67	41.00	45.83
mean	42.67	48.11	45.67	39.67	
LSD	V = 6	S = 16	V*S = 12.93		

Table 4. The effect of spraying with salicylic acid on the number of side branch of four varieties of cucumber.

varieties Salicylic	V 1	V 2	V 3	V 4	mean
S_0	6.67	13.67	10.33	7.67	10.08
$S_{0.25}$	9.00	13.00	11.00	10.00	10.75
$S_{0.5}$	10.00	16.00	12.67	9.67	12.08
mean	9.22	14.22	11.33	9.11	
LSD	V = 1.53	S = 0.72	V*S = 1.78		

Table 5. The effect of spraying with salicylic acid on the number of plant length of four Varieties of cucumber.

varieties Salicylic	V 1	V 2	V 3	V 4	mean
S_0	224.7	229.7	219.7	136.7	202.7
$S_{0.25}$	221.7	243.0	226.7	180.0	219.6
$S_{0.5}$	232.0	250.3	236.3	188.7	226.8
mean	226.1	241.0	227.6	168.4	
LSD	V = 39.32	S = 13.74	V*S = 42.12		

Conclusions

Because salicylic acid has a critical role in increasing the levels of plant hormones auxins and cytokines that may have aided in the vegetative growth of the cucumber crop, spraying salicylic acid on the crop had an impact on its growth and performance. The superiority of S0.5 concentration in the majority of vegetative growth features demonstrated a definite improvement in the vegetative growth values following treatment with salicylic acid. As for the varieties, they showed variation in most of the studied indicators. It is clear from the results that the Beit Alpha variety showed superiority over the rest of the varieties in most of the studied traits.

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