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Improving growth and productivity of cucumber plant using natural plant extract . (Review Article)

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ABSTRACT

Cucumber is considered one of the annual herbal vegetable crops with nutritional, indicative and economic value, many factors were used to increase growth and productivity. One of these factors is the use of chemical fertilizers with various sources, but the negative effects resulting from the use of chemical fertilizers on community health and environmental pollution and changing the strength and characteristics of the soil resulting from the use excess of these fertilizers stimulated researchers to find a safe environment for both humans and plants through the use of organic fertilizers that are produced naturally, and these natural fertilizers are humic acid and plant extracts, whether they are wild or marine plants, which, due to their positive physiological effects on the cucumber plant's development and productivity, are hailed as a healthy diet and an alternative to chemical fertilizers, as humic acid and plant extracts are one of the most important sources of organic fertilizers used, which increase the plant's ability to absorb nutrients, boost its content in proteins ,beneficial microscopic creatures, and enhance the physical, chemical, and biological aspects of soil while having no negative impacts on people.

1. Introduction

The demand for food increased as a result of the growing world population, and efforts were made to increase the rate at which food crops were produced, regardless of their quality. Due to the usage of huge quantities of nitrogen fertilizers to maximize production per unit area, the use of chemical additives (fertilizers and insecticides) grew [1]. A current practice among professionals in the field of agriculture has been to follow biological control method and substitute organic nutrition for chemical fertilizers. It is noted that the abundance of chemical fertilizers added by soil or sprayed on plants, and the majority of them are pollutants or toxins that leave their negative effects on humans and the environment in general, is concerning. [2], Finding natural molecules that can serve the same purpose as industrial substances while being generally less expensive and safe for people, animals, and the environment is another priority. [3Finding natural alternatives that are safe for both humans and animals, don't harm the environment, and are reasonably priced is so essential right now. Interests in many nations around the world tended to encourage organic production to, as a first step, partially meet the needs of the global market for products after it became clear that traditional products had issues in addition to the increase in economic returns to organic products provided by organic agriculture. As a result, there was an expansion in agricultural acreage, and organic production developed to the point where it was in direct competition with conventional production on worldwide markets, particularly in industrialized countries. One of the humic chemicals created when organic matter breaks down is humic acid., is one of the organic fertilizers that have become more popular in recent years as an alternative to chemical fertilizers or as a means of supplying vegetable crops with fewer chemical fertilizers[4]., This is because humic acid plays a part in improving soil quality, improving the ability of roots to collect water and nutrients from the soil for the plant, and improving the soil's susceptibility to holding water and nutrients. Additionally, humic acid is essential for encouraging the activity of soil microbes[5]., One of the organic acids that actively supports plant development and readiness is humic acid. (According to[6] in addition to multiple phenol, which acts as a respiratory chemical medium, humic acid enters the plant by boosting its important function, cell division and root system growth increase as the enzymatic system's efficiency rises, and as a result, more dry matter is produced. [7] proven that the chemical and physical properties are improved by humic acid in a significant way. [8] demonstrates that humic acids block the IAA enzyme's activity, boosting IAA activity, which is crucial for promoting the growth of roots and plants. Humic acids also improve the soil's ability to hold nutrients due to their interaction With sodium, the plant is able to withstand the high concentration of this element and protect itself against toxicity and osmotic issues. [9] discovered that humic acid enhances plant growth. The greater resistance to tensile conditions and enhanced output is the result of the plant's hormone content being higher than usual. As humic acid

improves plant nutrient readiness and promotes absorption of calcium, potassium, phosphorus, and magnesium from the soil, it was also determined that humic acid plays a substantial role in reducing the adverse effect. What is left over could be the application of foliar fertilizer to the soil [10,11] . According to [12,13] humic acid has a direct influence the soil by encouraging the root system's expansion and the uptake of nutrients by plants, as well as an indirect impact by encouraging plant roots to absorb water and nutrients. (According to[14,15] humic acid's high acidity is represented in increased soil ability to hold ketones, decreased nitrogen loss in the form of ammonia, and improved ammonium representation. According to[16] adding humic acid to soil or plants increases the proportion of nutrients received by means of the breakdown of organic material, which in turn impacts the soil's ability to retain acidity (pH). According to[17,18] adding humic acid stimulates plant growth by increasing the cell wall's permeability, which improves the uptake of oxygen, nutrients, and water, particularly in the root system, as well as root cell expansion and division activity, which stimulates the synthesis process, absorption of phosphorus and photosynthesis. Humic acid, according to[19] it is crucial for improving soil quality, boosting root efficiency in absorbing water and nutrients, and enhancing root retention. It also plays a role in encouraging microbial activity in the soil. Humic acid functions as a chelating substance to lessen the loss and volatilization of water and nutrients, which was also discovered to help minimize nutrient shortage and wash it in the soil[20].

2. The significance of humic acid in cucumber vegetative development

Studies and research have focused on how humic acid affects the cucumber crop's growth characteristics and yield. In their investigation of the impact of humic acid on cucumber yields. [21] noted that as the concentration of humic acid utilized increased, so did height of plant, and the vegetative population's dry weight. In a study on the cucumber, which was grown in Egypt's greenhouse over the course of two seasons. [22] observed that there was a substantial increase in the concentration (0.5 ml.L-1) for both plant length and number of branches utilizing 3 concentrations of marine extracts (0.5, 0.75, and 1 ml.L-1). leafy area of the plant, percent of chlorophyll in leaves, early and total fruit output, although variations between the three concentrations in percent of total soluble solids in the fruits did not reach a significant level. [23] demonstrated that humic acid a substantial increase in plant length, leaf area, dry matter of the vegetative total and percentage of chlorophyll in the leaves in the investigation of the influence of humic acid and various marine extracts on cucumber plants compared to non-fertilizing treatments, the addition of organic fertilizers raised the dry weight of plants by a significant amount. In Nigeria, [24] found that three types of cucumbers responded well to fertilization with four different compost concentrations (0, 2, 3, and 4 tons. Ha-1) the higher concentration of organic fertilizer significantly increased the length of the plant, the average length, diameter, and weight of the fruit, as well as the yield of one plant and the overall yield of fruits. In a study by[25] the development and yield of the planted cucumber within the greenhouse were affected by utilizing five levels of humus leaf fertilizer (0, 4, 5, 6 and 7 cm 3 liters -1). High concentrations revealed a considerable difference in plant length, branch count, average fruit size and weight, and fruit quantity. Low concentrations versus plant-1, single plant yield, early and total greenhouse yields. In a study on the impact of adding organic fertilizers at three concentrations (0, 5 and 10 tons ha-1), It was found that when the concentration increased, the length, width, and diameter of the fruit dramatically increased as well, yield of one plant, and total yield when compared to the comparison treatment. [26,27]found that adding three different amounts of humic acid to cucumber plants 0, 0.8, and 1.6 g.L-1 significantly enhanced the plant's length and branch count, leafy area, leaf chlorophyll content, leaf dry matter content, and fruit production per Plant, the typical fruit weight, the early and overall output, particularly in the high concentration. [28] reported a substantial increase in plant length, percentage of chlorophyll in leaves, average length, diameter, weight of the fruit, and number of fruits when cucumber plants were sprayed with dry bread yeast and seaforce extract (2.5 ml. L-1)., early and total fruits, and% of the fruit's overall soluble solids. In a study conducted in Baghdad by[29] discovered that applying organic fertilizers (humic acid + amino acids) greatly enhanced the plant's length, its green area, its dry weight, and its average fruit weight, and the quantity of fruits. [30] found that the option of spraying cucumbers with some marine extracts (Algae seaweed extract Alg 600 with a concentration of 3 ml.L-1 and Algaton 3 ml.L-1 with the interference between the two extracts as well as the comparison treatment) significantly outperformed as compared comparison treatment in all quotient attributes in a study where Algean extract was used to enhance the productivity and growth of cucumbers cultivated within greenhouses According to[31] the usage of this organic significantly increased the overall fruit output. The impact of humic acid atv 2, 4 , 6 ml.- 1 use on cucumber yield was examined in a study by [32] for two consecutive growing seasons in Egypt they findings revealed a considerable increase in both the quantity and average fruit weight, the vegetative group's fresh and dry weight, and the greater concentration's total yield in comparison to the other two concentrations. [33] found that the high concentration (3 g.L-1) of humic acid significantly increased the average length and diameter of the fruit as well as the overall production after investigating the effects of four concentrations of humic acid (0, 1, 2, 3, 4 g.L-1) on the yield of cucumbers. [34] examined the effects of spraying Seaforce and Seamino seaweed extracts for each extract at a concentration of (0.1,5 ml. L-1) and a combination of the two on two varieties of cucumber (Rim and Carroll) grown indoors, spraying with a mixture of the above extracts in comparison to the comparator treatment, single plant yield, early yield, and total yield all increased significantly, length of the plant, percentage of the dry matter for leaves, leafy area of the plant, percentage of chlorophyll in the leaves, and percentage of total also increased. [35] revealed that when adding humic acid to the soil with three concentrations (0, 2 and 4 g. L-1), the addition

of (4 g. L-1) of humic acid was the most effective overall fruit output are to blame for the considerable increase in fruit production, whereas the plant's leafy area significantly increased with the concentration of acid (2 g.L-1). In a study on the cultivar of the Babylon option .[36] found that spraying with the algae extracts Marine Algaton and Alga600 (3 + 3 ml. L-1) significantly increased plant length and branch count, plant's leafy area, dry weight of the vegetative group, percentage of chlorophyll in the leaves, average fruit length, diameter, weight, quantity, and the fruit yield as a whole in comparison to the comparison plants, as well as the yield of one plant. [37] found that applying five different organic fertilizer treatments to two hybrids of cucumbers grown in greenhouses in Tikrit significantly increased the length, diameter, weight, and number of fruits as well as the percentage of chlorophyll in the leaves, the yield of one plant, and the percentage of the total soluble solid. [38] found that adding three different types of organic fertilizers (Nitrgreen 3 cm.L-1, Humistar 2g.L-1, and Org-Vit with a concentration (3cm.L-1) to two cucumber varieties Sayff and Date hybrid grown in a greenhouse without heating led to a noticeably increased length of the plant, leafy area of the plant, and number of fruits. The reason for the increase in growth and yield indicators in the humic acid-fertilized plants may be related to the lengthening of the plant and an increase in the leafy area, both of which have a positive impact on the plant's ability to absorb nutrients and improve the efficiency of the photosynthesis process, which in turn results in an increase in the yield components and to the role of nutrients in humic acid, especially nitrogen, in promoting cell division by contributing to the synthesis of the amino acids DNA and RNA, as well as the content of humic acid among the nutrients, particularly nitrogen, and many amino acids that work to improve the indicators of quality growth and yield they promote cell elongation and division, which increases leaf area and photosynthesis, resulting in a notable boost in growth and outcome [39] . Humic acid and natural plant extracts have been shown to have a considerable impact on cucumber productivity conducted by[40] . The positive effects of humic substances on cucumber shoot development may be directly related to nitrate-related effects on the shoot concentration of several active cytokines and polyamines, according to research by [41] who discovered that the action of humic acid on promoting cucumber shoot growth involved nitrate-related changes associated with the root to shoot distribution of cytokinins, polyamines, and mineral nutrients. According to[42] adding humic acid to the soil of cucumber, leaf area, dry matter ratio, all grew significantly. According to[43]the cucumber plant yield like fruit length, fruit diameter, fruit yield per hectar, and total chlorophyll were significantly impacted by the humic acid and nirtoxin organic treatments. [44] discovered a significant increase in the quantity and weight of fruits as well as the amount of leafy and dry matter in leaves while applying humic star fertilizer. According to[45] humic acid treatment increased the number of leaves and plant output on pumpkin plants. The use of Karma maxi as organic fertilizer significantly increased the majority of vegetative traits (Plant height, number of leaves, leaf area, and chlorophyll in the leaves, as well as the dry weight of vegetative growth, according to research by[46]. This treatment also significantly affected the number and weight of fruits, holds plant yield, and holds cultivated pumpkin plants in plastic houses. Cucumbers fertilized with humic acid produced substantially more cucumbers than those that weren't (plant height, number of branches, leaf area, and percent chlorophyll). [47,48] claim that the majority of vegetative parameters, such as dry matter in leaves, the quantity and weight of fruits, plant yield, and overall yield, significantly improved when humic acid was employed , they also showed that seaweed affected the productivity , development of cucumbers, a favorable, substantial difference in shoot characteristics and in all yield variables as compared to the untreated treatment. Cucumber plant height, branch count per plant, and leaf area were all dramatically increased by humic acid., according to[49,50]demonstrated that both foliar spray and soil drenching of two seasons (plant height, leaf area, and leaf count per plant) compared to control treatment for two seasons, they used different dosages of humic acid at (3, 6 and 9 L/fed).

3. Conclusion

The use of humic acid and natural plant extracts reduces environmental pollution, soil and water pollution and reduces the negative effects on human health when using chemical fertilizers. Additionally, by raising the proportion of nutrients in plants treated with these natural substances, their use increases both the quantity and quality of yield.

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