



EFFECT OF GIBBERELIC ACID GA₃ SPRAYING AND ADDITION OF ORGANIC FERTILIZATION HUMO BACKTER IN THE GROWTH AND YIELD OF *BROCCOLI OLERACEA* VAR. ITALICA

Harith Burhan Al-deen Abdul Rahman

Department of Horticulture and Landscaping, College of Agriculture

Tikrit University, Tikrit, Iraq

Corresponding author: Harith_b76@yahoo.com

Abstract

The experiment conducted in the fields of Horticulture and Garden Engineering, College of Agriculture, University of Tikrit for the year 2018-2019. The aim of studying the effect of a combination of gibberellic acid and organic manure (HumoBackter) and was as follows (addition of distilled water only, spray with gibberellic acid at a concentration of 5 mg. Sprinkle with 5 mg.L⁻¹ with the addition of the HumoBackter, sprinkle with gibberellic acid at a concentration of 10 mg L⁻¹, and add the HumoBackter only. The gibberellic acid sprayed two times, first after 45 days of the seedlings transferred; the second was 14 days after the first sprayed. The fertilizer was added one time only after two weeks of planting (2.5 kg/ha) and 10 cm in feeding method. The experiment was carried out according to the complete random sector design of R.C.B.D. The results were statistically analyzed and the averages were measured according to the Dunkin Multipliers test at a 5% probability level. The results showed that the treatment with gibberellic acid 5 mg.L⁻¹ had the highest value in length, weight of the main disk, the yield of plant and the total yield of plant. The treatment of gibberellic acid was superior to 5 mg.L⁻¹ with the addition of the HumoBackter in the main disk display, and total chlorophyll ratio, and the treatment of gibberellic acid spray showed a concentration of 10 mg. L⁻¹ with addition of the HumoBackter superiority in the significance of the leaf area, and for the number of leaves, all the treatments significantly exceeded the treatment of control, while the addition of the fertilizer HumoBackter only has exceeded the height of the plant and the number of floral heads.

Keywords: gibberellic acid, HumoBackter, *Broccoli oleracea*

Introduction

The Brassicaceae family includes many important vegetable crops such as Cauliflower, Halana, Chalgham, Rachad, and Chinese Bokchoy. Broccoli is one of the plants of this family and its scientific name is *Brassica oleracea* var. *italica*. Broccoli contains many health benefits the Cancer Research Center of the United States of America noted that broccoli has several anti-cancer effects (Damato *et al.*, 1994). Broccoli is an ideal food because of its nutritional content Which contains 100 g of broccoli syrup on 40 calories, 5 g protein, 1 g fat, 15 carbs, 3880 vitamins, 0.14 A mg of vitamin 0.3 B1 mg of vitamin 2.50 B2 mg of calcium 1.7 mg of iron (Splitsoesser, 1990). It is from the vegetable that has increased its spread in a number of countries in the world, especially in the United States, using either fresh or frozen or packaged. The part that is eaten from the plant is floral discs before the opening of their buds and contain these tablets on ascorbic acid and also contains amounts of riboflavin and niacin, and in Iraq this plant is limited in prevalence (required and others, 1989) Because of its high nutritional value and the amount of crops it competes with during its time in the market, demand for its consumption has increased and has attracted the attention of many farmers and consumers in recent years in the country with interest and expansion in its cultivation (Troanh and Sbaylh, 2006). Although the role of organic fertilizer is important note that the organic fertilizer used in Iraq according to them components, whether they are plant or animal and form the latest types of different source important to the organic matter added to the soil whose content varies according to different sources, and the proportion of nitrogen and phosphorus in poultry fertilizer in which the proportion Potassium is high in sheep fertilizer, but these ratios may differ for each compost (Anonymous, 1975; Anont-Bahadure *et al.*, 2006). The role of organic matter is important in the

chemical behavior of many soil elements through their active compounds (follic acids and helium) It is noticeable that farmers use chemical fertilizer in the field by spraying it on the plant, which is expensive at the same time and may have negative or long-term effects on humans and the environment in general (Zoubi *et al.*, 2007). There are problems In the basal soils, including the soil of the province of Salah al-Din (gypsum soil), which works to stabilize the nutrients in the soil, so it is necessary to resort to other means to nutrition the plant, the most important of these means the use of organic fertilizers technical nutrients that reduce the base of the soil and While at the same time minimizing the use of chemical fertilizers at the same time and having no adverse side effects on humans, organisms and the environment (Abo-Arab, 1998). Due to the lack of studies on the use of organic fertilizer, which has been recorded as a complement to the chemical fertilizer and not a substitute for it especially in the province of Salah al-Din, characterized by gypsum and its capital from the effects of production, as well as the lack of studies in Salah al-Din province on the use of appropriate concentration of acid GA₃. Therefore the aims or this study were:

- 1- Study the extent effect of use organic HumoBackter in improving the production in quality and quantity.
- 2- The best concentration of GA₃ in giving the best production yield of broccoli.

Materials and Methods

A simple experiment carried out in the fields of Horticulture and landscape department for the year 2018-2019 after the preparation of the field of experiment through the planting and settlement and division into the mues. The seeds planted in the dishes of broccoli Green in the wooden canopy on 3/9/2018. After the seedlings become to the appropriate size the seedlings transferred to the field on

10/10/2018. The experiment carried out according to the design of the complete randomized segments (R.C.B.D). The results statistically analyzed and the averages measured according to the Dunkin Multipliers test at a 5% probability level.

The experiment land divided into three replicates, and each replicator contains 6 experimental units $4m^2$, and each experimental unit contains 3 lines distributed in each line 4 plants, the distance between the plant and other 50 cm and 12 plants per experimental unit, and the number of experimental units of the experiment 18 units. Then perform all the service operations from the fertilizer and cultivator as it is followed by farmers and used irrigation system for drip.

The following traits were studied by taking 5 plants from each experimental unit randomly and as follows:

- 1- Indicators of vegetative growth included:
 - Leaf area (cm^2)
 - Plant height (cm) Number of leaves leaf. $Plant^{-1}$
- 2- Indicators of Qualitative Quantities of Broccoli:
 - Main head Weight (Gm) Total Ton. Ha^{-1}
 - number of floral heads to each plant
- 3- Qualitative Qualities
 - Main disc length (cm)
 - main disc width (cm)
 - total chlorophyll ratio of spad

Study factors

The study included a single factor study consisting of a combination fertilizer of gibberellic acid and organic HumoBackter and as follow:-

- 1- Add distilled water only and its code C
- 2- Spray of 5 mg L^{-1} of gibberellic acid. Its called GA35+F.
- 3- Spray of 5 mg L^{-1} of gibberellic acid with HumoBackter . Its called GA310.
- 4- Spray of 10 mg L^{-1} of gibberellic acid. Its called GA310.
- 5- Spray of 10 mg L^{-1} of gibberellic acid with HumoBackter . Its called GA310+F.
- 6- Add only the HumoBackter fertilizer and its symbol F

Table 1 : Vegetative growth characteristic of Broccoli

No. leaves	Plant height cm	Leaves area cm^2	Treatments
8.533 B	39.600 d	243.33 c	C
12.200 A	45.367 dc	298.29 b	GA35
11.967 A	58.700 ab	279.39 B	GA35+F
11.933 A	53.333 bc	312.47 b	GA310
11.767 A	56.567 ab	475.26 a	GA310+F
11.067 A	65.467 a	298.00 b	F

Table 2 shows significant differences between the coefficients and the characteristics of the specific yield. The length of the main head diameter is higher than that of the gibberellic spray with a concentration of 5 mg.l^{-1} . The main diameter length was 20.767 cm compared to the lowest value

The gibberellic acid spray sprayed with two times after 45 days of planting the seedlings. The second was 14 days after the first one. The fertilizer of the HumoBackter addition only after two weeks of cultivation and the quantity (2.5 kg / ha) and 10 cm in feed

Results and Discussion

Table 1 showed a significant differences ($p<0.05$) between the parameters of vegetative growth characteristics. Spray of 10 mg L^{-1} of gibberellic acid with organic fertilizer as leaf area 475.26 cm^2 compared to the lowest value of leaf area was at the comparison treatment amounted to 243.33 cm^2 . The reason for the increase of leaf area in the plant or works gibberellic to direct the processed nutrient towards the spray area on the plant (total vegetative). This may be due to the fact that manure is a source of the major and minor elements necessary for plant growth and provides humus soil which improves its physical properties by increasing its ability to absorb and retain water and reduce loss of nutrients As well as increasing the biological activity of microorganisms and yielding high quality crops (Yassin, 2018). The plant height exceeded the treatment of organic fertilizer (HumoBackter) and the height of the plant 65.467 cm and did not differ significantly from the treatment of spray gibberellic at a concentration of $5\&10\text{ mg. L}^{-1}$ with organic fertilization, which recorded 56.567 and 700.85 cm respectively. The reason is that manure is a source of the major elements necessary for the growth of the plant and provides humus soil, which improves its physical properties by increasing its ability to absorb and retain water, and reduce the loss of nutrients and Increase the biological activity of microorganisms and produce high quality crops (Graut *et al.*, 2002). In character of the leaves number in plant, all the transactions were significantly higher at 11.067, 11.767, 933, 11.967 and 12.200 respectively, compared with the lowest of the control, which recorded 8.533. The reason is that gibberellic acid plays a role in the growth of side buds (Fayadh, 2006). The increase in the role of the HumoBackter may be due to the provision of an adequate amount of nutrients around the root propagation area, causing an increase in absorption and thus increasing vegetative growth, including increasing the number of leaves help the transfer of organic matter resulting from the process of photosynthesis in final maturity.

of the main diameter length at 9.233 The reason for the increase in the length of the main diameter may be due to the effects of Gaberlin in the characteristics of vegetative growth, especially the properties of leaf area and number of leaves, which was positively reflected in the length of the

main diameter as in Table (1). The reason may be due to the role of gibberellic acid to increase the level of active oxides. The way to reduce the oxidants salary or inhibited by oxidation of peroxidase or taaoxidase. It also help gibberellic acid to build and produce phenols and biodegradable phenols, and that increased levels of oxyens lead to elongation and division of cells (Abu Zeid, 2000). As for the length of the main head, the treatment of gibberellic acid sprayed with 5 mg/L⁻¹ with organic fertilization. The length of the main disk was 15.133 cm compared to the lower length of the main disk. The comparison was 6.100 cm. The main disk of the broccoli plant, which used in gibberellic, also attributed to the fact that this regulator stimulates cell division and increases its size (Abdel Rahman and Ramadan, 2015; Daries, 1994). In the total chlorophyll ratio, the treatment of gibberellic acid spray was higher than 5 mg.L⁻¹.

with organic fertilization and the total chlorophyll ratio was 59,000 compared with the lowest value of total chlorophyll ratio was at the comparison treatment amounted to 37.067. The reason for the increase of chlorophyll by the algebra may be due to this regulator prevents the break of this pigment by stopping the chlorophylls enzyme and collect the food in Securities (Abu Zeid, 2000), it may be due to the role of the HumoBackter and organic fertilizer which play an important role in improving the physical properties of the soil, it increases the degree of improvement of the organic matter with small clay pellets and form larger granules increase porosity and avoidance and ventilation of the soil and provide the oxygen needed to breathe roots and activity of microorganisms, Mud-soils reduce water accumulation in the root area (Hayes & Clap, 2001; Jalli, 2002).

Table 2 : Shows the characteristics of qualitative growth

Total chlorophyll %	main head length cm	main head width cm ²	Treatments
37.067 c	6.100 d	9.233 e	C
50.867 ab	14.100 ab	20.767 a	GA35
59.000 a	15.133 a	13.500 c	GA35+F
51.300 ab	8.100 dc	11.700 d	GA310
47.400 bc	9.333 dc	16.533 b	GA310+F
46.633 bc	10.467 bc	14.333 c	F

From table 3 we saw that a significant differences between the coefficients and the total growth characteristics. The treatment with gibberellic by 5mg/L⁻¹ of main weight of the main disk was 123,000 gm, compared with the lowest value of the main weight of the main disk, when compared to 39,000 g for control treatment. The reason for the role of gibberellic may be due to an increase in the weight of the main disk obtained by these treatments. Thus increasing the effectiveness of photosynthesis and other processes and thus increasing their growth and improving their overall characteristics (Qawami *et al.*, 2002). In the whole yield characteristic, the treatment of gibberellic acid treatment 5mg/L⁻¹ had the highest value of total yield 4.6130 tons-H⁻¹ and may be attributed to the increase in the total yield when spraying with a concentration of 5 mg. L⁻¹ of gibberellic, which increased the plant yield, which was reflected on the

total yield. In the characteristic of experimental unit yield, exceeded the coefficient of spray gibberellic concentration 5mg/L⁻¹ and amounted to 1.8450 kg compared to the lowest value in the treatment of the comparison amounted to 0.5850 kg may be due to the role of Jabrlin, which increased the plant and the total and reflected positively on the rate of the unit In terms of number of floral tablets, the organic fertilization coefficient was higher than 6.3000 kg compared to other treatments. The reason for the role of the hymocter may be due to the source of the major and minor elements necessary for plant growth and provide the soil with humus which improves its physical properties by increasing its ability to absorb water and It preserves and reduces nutrient loss as well as increases activity for micro-organisms and gives high-quality yield (Grandy *et al.*, 2002).

Table 3 : Characteristics of quantitative yield

No. of head flower/ plant	Plant yield (kg)	Total yield (ton)	Mean weight (gm) of main head	Treatments
4.8667 b	0.5850 c	1.4630 c	39.000 c	C
4.6333 b	1.8450 a	4.6130 a	123.000 a	GA35
4.0000 b	1.3000 b	3.2500 b	86.667 b	GA35+F
4.8667 b	1.0500 b	2.0500 b	70.000 b	GA310
3.6667 b	1.3100 b	1.3100 b	87.333 b	GA310+F
6.3000 a	0.9900 b	0.9900 b	66.000 b	F

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