

## Effect of Biohealth Biostimulant and Dry Yeast Suspension on Growth and Yield of Two Varieties of Kohlrabi *Brassica oleracea* var *Gongylodes*

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**Abstract.** This study was conducted in the field of the Department of Horticulture and Landscaping / College of Agriculture / University of Karbala for the season 2021-2022 in order to know the effect of adding the Biohealth stimulator and spraying dry bread yeast suspension on the growth and yield of two cultivars of *Brassica oleracea* var *gongylodes*, where the experiment included two factors: The first factor includes eight fertilizer combinations without adding (T1), adding Biohealth (T2), spraying the yeast suspension at a concentration of 2 gm L<sup>-1</sup> (T3), spraying the yeast suspension at a concentration of 4 gm L<sup>-1</sup> (T4), spraying the yeast suspension at a concentration of 6 gm L<sup>-1</sup> (T5), add Biohealth + spray yeast suspension at a concentration of 2 gm L<sup>-1</sup> (T6), add Biohealth + spray yeast suspension at a concentration of 4 gm L<sup>-1</sup> (T7), add Biohealth + spray yeast suspension at a concentration of 6 gm L<sup>-1</sup> (T8) ,The second factor is two varieties of words: (White Vienna and Purple delicacy), The most important results of the study can be summarized as follows: Treatment T8 outperformed on the other treatments in the average plant height and gave 27.27 cm and in the average number of leaves gave 18.15 leaves of a plant <sup>-1</sup>, It also gave the highest average leaf area and amounted to 31,268 cm<sup>2</sup> and in the percentage of dry matter in the leaves and gave 15.63% and the average weight of the pivot stem, which amounted to 279.2 g. The Purple delicacy was superior to the White Vienna cultivar in plant height 27.38 cm, number of leaves 19.24, leaf area 27,515 cm<sup>2</sup>, dry matter percentage 15.82%, and stem weight 234.8 g.

**Keywords.** Bio fertilizer, Biohealth, Yeast, Kohlrabi.

### Introduction

Kohlrabi (*Brassica oleracea* var *gongylodes*) is a plant belonging to the cruciferous family Brassicaceae, its leaves and leaves of cabbages are almost similar as they are oval in shape with a long stalk and are also similar in terms of taste, and in a study conducted by [1], where it was found that 100 gm From the pivoted stem of the kale plant, it contains 92.7 g of moisture, 1.1 g protein, 0.2 g fat, 0.7 g minerals, 1.5 g fiber, 3.8 g of carbohydrates, 12 mg sodium, 37 mg potassium, in addition to other elements in varying proportions. It is believed that the original home of the word is north of the coast of Europe, from which it

spread to Western Europe and Western Asia. Kohlrabi is of nutritional and medical importance, as it contains high levels of vitamins A, B1, B2, B5, B6 and E. It also contains minerals such as mg, Fe and Zn. It also contains antioxidants that prevent the formation of carcinogens, and it also contains a percentage of carbohydrates and fats [2.]

There is a trend in recent studies aimed at raising agricultural production, such as the use of some modern methods of environmentally friendly crop service, including foliar spraying with bread yeast (*Saccharomyces cerevisiae*) [3.]

Biostimulants such as Bio fertilizers are natural or artificial components used for seeds, plants, and soil [4]. These substances cause differences in essential and structural functions, affecting plant growth through enhanced toleration to abiotic stresses and improving seed and/or grain yield and quality. In addition, bio stimulants decline the demand for fertilizers [5,6]. Bread yeast contains living organisms such as fungi, and its extract contains amino acids, proteins, vitamins and nutrients such as calcium, potassium, nitrogen, phosphorous and iron, in addition to some growth regulators such as auxin, gibberellin and cytokinin. It also has the ability to produce enzymes that convert monosaccharides into alcohol and CO<sub>2</sub> [7]. Some recent research is currently using methods that increase the availability of elements in the soil, and these methods are the use of bio fertilizers, which are cheap and environmentally safe food sources compared to chemical fertilizers. It also increase the efficiency of using chemical fertilizers in poor soils. with nutrients [8.]

#### Material and Methods

The experiment was carried out during the autumn agricultural season 2021-2022 in the vegetable field of the Department of Horticulture and Gardening / College of Agriculture / University of Karbala in Al-Hussainiya district. Where two varieties of seeds were planted, namely the Dutch variety White Vienna and the variety purple delicacy, in cork dishes (20 \* 11) on 9/19/2021 and then the seedlings were transferred to the field on 10/25/2021 and the experiment was completed on 22/2/2022. Plowing and leveling operations were carried out by mechanical machines and decomposed cow and sheep residues were added. The soil was moistened to obtain moisture homogeneity. Soil samples were taken at a depth of (0-30 cm) for the purpose of conducting a soil analysis process. The field was divided into 6 lines (two lines for each block), the width of each line is 60 cm, and the distance between the lines is 100 cm. Inliness .A dot was extended in the middle of each

line, where seedlings were planted with a planting distance of 30 cm and alternately on both sides of the zone. The area of the experimental unit was (250 x 60 cm) and the number of experimental units was 48.

The experiment was carried out according to the split plot system design, within the randomized complete block design, with three replications, representing the two types (P and W). The main plots in eight combinations of biofertilizer, adding the Biohealth biostimulant at two concentrations (B0, B1) and spraying yeast suspension with four concentrations (S0, S1, S2, and S3) represent the sub plots. The averages of the treatments were compared with the LSD test and at a probability level. 5% [9]. The catalyst was prepared by adding 1.6 g of it to 70 ml of distilled water and mixing it well and then adding it to the soil at the rate of 5 ml for each plant. The yeast suspension was prepared by dissolving yeast in distilled water with sugar in a ratio of (1:1) (weight of yeast: weight of sugar). The concentrations used were (2, 4, 6 gm per liter-1 distilled water) and left for 24 hours and they were filtered by boring cloth and sprayed on the leaves by hand sprayer.

#### Studied Trait

Plant height (cm.)

The number of leaves (leaf. Plant-1.)

Leaf area (dm<sup>2</sup> )

Percentage of dry matter in leaves.(%)

Average weight of the pivot stem (g.)

#### Results

Plant Height (cm )

The table shows that there are significant differences in plant height between the averages of fertilizer treatments, as the treatment T8 outperformed and gave the highest plant height of 27.27 cm and did not differ significantly from the treatment of T7 and T6, while the lowest height was 24.96 cm for the control treatment (T1). It is also clear from the results that there are no significant differences in the results of the average

variety, and the highest height was 27.38 cm for the P variety, and the lowest was 24.72 cm for the W variety. The results of the interaction between the fertilizer treatments and the cultivar showed significant differences, and the highest height of the interaction treatment T8 for the variety P was 28.58 cm, while the lowest height was in the comparison treatment (T1) for the variety W, which amounted to 23.38 cm.

**Table 1.** Effect of Biohealth Biostimulant and Dry Yeast Suspension on Growth and Yield of Two Varieties of kohlrabi.

Fertilization treatments (FT)	Variety (V)	Plant length (cm)	No. of leaves /plant	Leaf area ( $dc\text{m}^2$ )	dry matter in leaves (%)	Knob weight (g)
T1	W	23.38	13.54	13.560	13.61	172.6
	P	26.54	17.08	20.753	15.00	188.3
Mean		24.96	15.31	17.157	14.30	180.4
T2	W	24.58	14.04	13.993	15.70	259.2
	P	27.38	19.42	25.428	15.37	244.7
Mean		25.98	16.73	19.711	15.54	252.0
T3	W	24.33	13.58	13.580	14.70	194.6
	P	26.67	18.62	24.823	15.27	203.8
Mean		25.50	16.10	19.202	14.98	199.2
T4	W	24.38	13.75	14.913	13.66	200.0
	P	27.00	19.00	23.503	16.82	199.0
Mean		25.69	16.38	19.208	15.24	199.5
T5	W	24.63	14.62	14.840	14.29	244.1
	P	27.17	19.12	24.410	16.44	234.8
Mean		25.90	16.88	19.625	15.36	239.4
T6	W	24.79	14.08	14.927	15.43	260.5
	P	27.54	19.42	28.267	15.70	244.4
Mean		26.17	16.75	21.597	15.56	252.4
T7	W	25.75	14.21	20.607	15.72	269.6
	P	28.12	20.08	32.727	15.98	280.7
Mean		26.94	17.15	26.667	15.62	275.1
T8	W	25.96	15.12	22.327	15.31	276.0
	P	28.58	21.17	40.210	15.95	283.3
Mean		27.27	18.15	31.268	15.63	279.2
Varity mean	W	24.72	14.12	16.094	14.75	234.5
	P	27.38	19.24	27.515	15.82	234.8
L.S.D at 5%	FT	1.211	1.571	0.8142	1.083	9.77
	V	3.009	2.180	0.4071	0.184	20.05
	FT×V	2.369	2.344	1.1514	1.435	16.96

The Number of Leaves (leaf. Plant-1 (

The results show that the treatments T8, T7, T6 and T5 did not differ significantly between

them and outperformed on the other fertilizer treatments in the number of leaves. The largest number of leaves was for treatment T8, which gave 18.15 leaves -1 while the lowest number of leaves in the comparison treatment (T1) was 15.31 leaf -1. It was noticed from the results of the average variety a significant superiority of variety P over variety W in the number of leaves, which amounted to 19.24 leaves of plant-1 and 14.12 leaves. plant-1, respectively. The results of the interaction between the fertilizer treatments and the variety showed significant differences between the treatments. The interaction treatment T8 of the variety P was superior, and it gave the largest number of leaves, which reached 21.17 leaf.plant -1 while the least interaction was in the treatment of T1 of the variety W, which gave 13.54 leaves. plant -1.

#### Leaf Area (dm<sup>2</sup>)

It is clear from the results that there are significant differences in the leaf area between the averages of the fertilizer treatments, and it is clear from the table that treatment T8 is significantly superior on the other averages of the fertilizer treatments, as it gave a leaf area of 31.268 dm<sup>2</sup> while the least leaf area was in the comparison treatment and it amounted to 17.157 dm<sup>2</sup>. It is also clear that there are significant differences between the averages of the varieties, as the variety P gave the highest leaf area of 27,515 dm<sup>2</sup>, while the variety W gave the least leafy area of 16,094 dm<sup>2</sup>. The results show that there are significant differences in the interaction between the averages of fertilizer treatments and the averages of the varieties, and it shows a superiority for the treatment T8 of variety P, which gave the highest leaf area amounting to 40.210 dm<sup>2</sup>, while the lowest leaf area was in the treatment of the interaction T1 and variety W, and it amounted to 13,560 dm<sup>2</sup>.

#### Percentage of Dry Matter in Leaves (%)

The results presented show that there are significant differences between the averages of

fertilizer treatments in the percentage of dry matter in plant leaves. The results show that treatments T8 and T7 gave the highest percentage of 15.62 and 15.62% respectively, while the lowest percentage of dry matter amounted to 14.30% in the treatment of comparison (T1). The results show that there are significant differences between the averages of the cultivars in the percentage of dry matter in the leaves. It appears from the results that variety P gave the highest percentage of 15.82% compared to variety W, which gave a percentage of 14.75%. The results show that there are significant differences in the interaction between the averages of fertilizer treatments and the averages of the varieties. The interaction treatment T4 of the P variety gave the highest percentage of 16.82% compared to the comparison treatment of the variety W, which gave the lowest percentage of dry matter amounted to 13.61%.

#### Average Weight of the Pivot Stem (g)

The table shows that there are significant differences between the average fertilizer treatments in the weight of the pivot stem, as the results show that treatments T8 and T7 are significantly superior on the other of the average fertilizer treatments, and they gave the highest weight of 279.2 g and 275.1 g, respectively, while the lowest weight of the pivot stem was in the comparison treatment (T1) ) and reached 180.4 g. The table also shows that there were no significant differences between the averages of the varieties, and the highest weight was 234.8 g for the P variety, while the W variety gave 234.5 g. It is also noted from the results of the table that there are significant differences in the interaction between the averages of fertilizer treatments and the averages of the variety. The interaction treatment T8 for variety P gave the highest weight and reached 283.3 g, while the lowest weight was in the treatment of interference T1 for variety W and amounted to 172.6 g.

## Discussion

The increase in vegetative growth indicators in plants may be attributed to the role of humic acid (a component of Biohealth) as it stimulates root growth and increases the absorption of water and nutrients from the soil, which stimulates photosynthesis and vegetative growth [10].or, it may be due to the role played by sea algae in increasing vegetative growth indicators, such as increasing the leaf area of the plant, as well as increasing the plant's content of chlorophyll, which results in an increase in carbohydrates formed from the photosynthesis process, as well as a strong branched root system that gives the plant strength in growth and increases the absorption of elements Soil nutrients [11].As for the increase in the weight of the pivot stem, it may be attributed to the role of the biostimulant in increasing the vegetative growth indicators and increasing the rate of absorption on the surfaces of the roots and their entry into the plant tissue cells [12]. As well as due to its important role in stimulating plant enzymes and hormones [13] and [14], as well as the important role of humic acid in plant growth and development and increase the yield [15].The reason for the increase in vegetative growth may be attributed to the positive role that yeast plays in the vegetative growth indicators because it contains elements such as nitrogen, phosphorous, iron, carbohydrates, hormones and growth regulators (auxin, gibberellin and cytokinin) in addition to vitamins that work on cell division and elongation and this is reflected positively on the vegetative growth of the plant[16]. As for the discrepancy between the varieties, it could be due to genetic factors.

## Conclusions

Adding the biostimulant Biohealth had a significant effect on the indicators of vegetative growth and yield.

Spraying the yeast suspension had a significant effect on growth and yield indicators.

The combination of adding the biostimulant Biohealth with a suspension of yeast spraying at a concentration of 6 gm L-1 gave the highest rates of vegetative growth and yield indicators.

Purple delicacy outperformed White Vienna variety in vegetative growth and yield indicators.

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