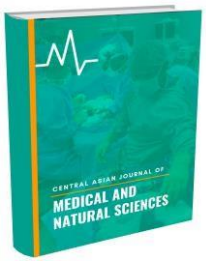

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 04 | October 2024 ISSN: 2660-4159

Article

Effect of Humic Acid Treatment Methods on Yield Traits of Some Bean Varieties Vicia faba

Maysam Ammar Mohamed Maadidi[1], Ayoub Juma Abdul Rahman Al Bayati[2]

1. College of Education for Girls, Tikrit University, Iraq
* Correspondence: Maysam.ammar23@st.tu.edu.iq
2. College of Education for Girls, Tikrit University, Iraq
* Correspondence: Dr_ayyub_bio@tu.edu.iq

Abstract: This study was conducted in one of the nurseries, Al-Sharqat district for the season 2023-2024 to study the effect of methods of adding humic acid (without adding acid to the soil and spraying on the plant) on the yield of different varieties of beans, namely (local, Dutch, Spanish and French). The treatment of adding acid to the soil significantly affected the characteristics of the yield, including the number of pods plant^{-1}, seed weight g, seed yield plant^{-1} and biological yield, with an increase of 60%, 74.24%, 15.62 and 14.85% respectively compared to the control treatment. The French variety excelled in the characteristics of counting pods by 60% compared to the local variety, while the local variety outperformed in the seed weight characteristic by 74.24% and compared to the French variety, and also outperformed in seed yield and biological yield by 42.86% 42.86% respectively compared to the Dutch variety. The same variety outperformed with acid and without acid with the highest number of pods $^{plant-1}$ amounted to 8.0 pods-1 and an increase of 60% compared to the local variety with acid and without acid, which gave the lowest number Of the pods, 5 pods were ^{1}, while the local variety to which acid was added outweighed the highest weight per seed was 1.17 g compared to the French variety that is not treated with acid, whose seed weight reached 0.65 g, and the same variety excelled in seed yield, plant^{-1} and biological yield, with an increase of 69.13 and 36.59% compared to the Dutch and Spanish varieties.

Keywords: humic acid, varieties, plant

Citation: Maadidi, M. A. M., & Al Bayati, A. J. A. R. Effect of Humic Acid Treatment Methods on Yield Traits of Some Bean Varieties Vicia faba. Central Asian Journal of Medical and Natural Science 2024, 5(4), 380-386.

Received: 16th July 2024
Revised: 23rd July 2024
Accepted: 30th July 2024
Published: 6th August 2024

1. Introduction

The bean plant Vicia *faba* L. belongs to the family Fabaceae, which is one of the important plant hosts as it includes large numbers of important economic crops chickpeas, beans, lentils and peas, as this family includes about 600 genera and 1300 species and is divided according to the size of its seeds into two groups *Vicia faba* var major and this group is characterized by large flat grains, which are mainly used in human nutrition, either the second group Vicia faba var minor This crop is of increasing importance as it is used as food for humans as well as animal feed and is characterized by its high content of protein 21.39% and carbohydrates up to 58.41%, in addition to containing dry seeds on calcium, vitamin C and vitamin A [1,2].

There are many factors that contribute significantly to increasing plant productivity, including a good variety adapted to the region, as it contributes significantly to increasing the productivity of the crop. The varieties of beans vary in their productivity and this is normal due to the genetic nature of this introduction of new varieties with high productivity affect the increase in production and improves quality and reduces costs, and the

selection of varieties suitable for the conditions of the region helps in increasing production and improves the quality [3,4].

Recently, the importance of using organic fertilizers for the nutrients needed by plants has emerged because they contain some organic acids such as humic and fulvic acids, amino acids and other materials, which are characterized by their cheap price, ease of use and low pollution to the environment and agricultural products, and their contribution to improving many of the physical, chemical and biological properties of the soil, which reflects positively on its growth and plant production [5,6].

2. Materials and Methods

Study Location

This study was conducted during the agricultural season 2023-2024 in one of the nurseries in Al-Sharqat District - Salah Al-Din Governorate using plastic pots for the period from 1/11/2023 to 20/4/2024.

Agricultural Process

Soil Preparation

The soil was taken from the Tigris River basin and sieved using a sieve with a diameter of (2) mm after it was air dried, then the soil was placed inside plastic pots with a height of (40) cm and a cat (30) cm by 15 kg.

Experience Design

The experiment was designed according to the Compete Randomize Design (C.R.D) with three repeaters with two factors. The first factor: liquid humic acid was used in three ways (without acid, adding acid to the soil, spraying plants) and (using four varieties of beans, namely Iraqi, Dutch, French, Fava da Orto and Spanish LUS DE OTONO 3 ML OF WATER^{-1} WAS USED of acid), whether directly added to the soil or foliar spraying after 40 days of planting and the second a month after the first spraying, and thus the number of factors reached 12 treatments and three repeats to become the number of experimental units 36 randomly distributed and was referred to humic acid symbol H where H0 without addition and H1 add acid to the soil and H2 spray acid on the plant. The varieties were referred to as V, with 1V being the local variety, V2 for the Dutch variety, V3 for the Spanish variety, and 4 V for the French variety. Table 1. The analysis of the experimental soil was conducted in the laboratories of the Faculty of Agriculture and the Faculty of Engineering, University of Tikrit Table 2.

Studied Traits

1. The number of plant $^{pods\text{-}1}$.
2. The number of seeds $^{pod\text{-}1}$: calculated from dividing the average number of seeds in the plant by the average number of pods in the plant (Al-Qaisi, 2013).
3. Seed weight^{-1} g: After mixing the seeds of the harvested plants for one plant, they are weighed and divided by the number of seeds.
4. Seed yield^{-1} g: calculated from the product of the number of pods×number of seeds per pod×average seed weight**.**
5. Plant biological yield^{-1} g: It was calculated from the sum of the dry weight of the plant with the weight of the seeds.

3. Results

The results of Table 1 show that the methods of treatment with humic acid have no significant effect on the characteristic of the number of pods per plant, while the varieties differed in this characteristic, as the French variety outperformed the rest of the varieties with the highest number of pods $^{plant-1}$ amounted to 8.0 pods and an increase of 60% compared to the local variety, which gave the least number of pods was 5.0 $^{pods-1}$.

From the results of the same table, we note the significant effect of the method of adding humic acid and varieties in the characteristic of the number of plant pods-1, as the French variety gave the highest number of pods in various ways of addition and non-addition amounted to 8.0 $^{pods-1}$.

From Table 2 we note that there is no significant difference between the methods of adding acid in the number of seeds, as well as the absence of a significant difference between the varieties in this characteristic, as it turns out that there is no significant effect as a result of the bilateral overlap between the methods of adding acid and varieties, as the average number of seeds reached 5 seeds $^{pod-1}$.

Table 1. Effect of Humic Acid Treatment Methods and Varieties on Number of Plant $^{Pods-1}$

Medium sour	French	Spanish	Dutch	Iraqi	Items / Humic acid
6.75a	8.00a	7.00b	7.00b	5.00c	0
6.75a	8.00a	7.00b	7.00b	5.00c	Add
6.75a	8.00a	7.00b	7.00b	5.00c	spraying
	8.00a	7.00b	7.00b	5.00c	Average Items

*Similar letters mean there is no significant difference between the transactions

Table 2. Effect of Humic Acid Treatment Methods and Varieties on the Number of Seeds $^{Pod\ -1}$

Medium sour	French	Spanish	Dutch	Iraqi	Items / Humic acid
5	5	5	5	5	0
5	5	5	5	5	Add
5	5	5	5	5	spraying
5	5	5	5	5	Average Items

*Similar letters mean there is no significant difference between the transactions

From Table 3 we note that there is no significant effect of the methods of treatment with humic acid in the recipe of seed weight, while the varieties differed in this trait, as the local variety excelled in giving the highest seed weight of 1.15 g and an increase of 74.24% compared to the French variety, which gave the lowest weight of 0.66 g, which did not differ significantly from the Dutch and Spanish varieties.

The interaction between the treatment and humic acid and the varieties was significant in which the local variety excelled with the addition of acid to the soil by giving the highest weight of 1.17 g and an increase of 80% compared to the French variety that is not treated with acid, whose seed weight reached 0.66 g.

Table 3. Effect of Humic Acid Treatment Methods and Varieties on Seed Weight (g)

Medium sour	French	Spanish	Dutch	Iraqi	Items / Humic acid
0.79a	0.65b	0.70b	0.70b	1.10a	0
0.88a	0.68b	0.77b	0.77b	1.17a	Add
0.81a	0.66b	0.72b	0.73b	1.13a	spraying
	0.66b	0.73b	0.73b	1.15a	Average Items

*Similar letters mean there is no significant difference between the transactions

The results in Table 4 show that the treatment methods have a significant effect on the characteristic of the individual plant yield of seeds, as the method of adding acid to the pots directly gave the highest yield of 16.75 g with an increase of 15.52% compared to the control treatment that gave a yield of 14.50 g, which did not differ significantly from the spraying method.

The varieties showed a significant difference in their yield of seeds, as the local variety gave the highest yield of 20.0 g and an increase of 42.86% compared to the Spanish variety, which gave a seed yield of 14.0 g, which did not differ significantly from the two varieties and the French.

From the table below, we note that the overlap between the methods of adding humic acid and varieties was significant, the interference gave the addition of acid to the local variety the highest seed yield of 22.0 g with an increase of 69.23% compared to the Dutch and Spanish varieties, whose seed yield reached 13.0 and 13.0 g respectively.

Table 4. Effect of Humic Acid Treatment Methods and Varieties on Plant Seed $^{Yield\text{-}1}$ (g)

Medium sour	**French**	**Spanish**	**Dutch**	**Iraqi**	**Items / Humic acid**
14.5b	14.0e	13.0ef	13.0	18.0c	0
16.75a	14.0e	14.0e	17.0cd	22.0a	Add
16.50ab	16.0m	15.0de	15.0de	20.0b	spraying
	14.66b	14.0b	15.0ab	20.0a	Average Items

*Similar letters mean there is no significant difference between the transactions

Table 5 shows a significant effect of the methods of treatment with humic acid in the biological yield, as the treatment of adding acid to the pot gave the highest biological yield of 46.09 g with an increase of 14.85% compared to the control treatment, which gave the lowest biological yield of 40.13 g.

From the table, we note the difference of varieties significantly from each other in biological yield, as the local variety gave the highest biological yield of 48.26 g and an increase of 18.66% compared to the Dutch variety, which gave the lowest biological yield was 40.67 g, which did not differ significantly from the Spanish variety.

The bilateral interaction between the method of adding acid and varieties showed a positive significant effect, as the highest biological yield reached 51.22 g when adding acid to pots planted in the local variety, with an increase rate of 36.59% compared to the Dutch and Spanish varieties, which gave the lowest biological yield of 37.50 and 37.50 respectively.

Table 5. Effect of Humic Acid Treatment Methods and Varieties on Biological Yield (g)

Medium sour	French	Spanish	Dutch	Iraqi	Items / Humic acid
40.13c	40.00g	37.50h	37.50h	45.50c	0
46.09a	45.20c	44.00min	43.95E	51.22a	Add
42.90b	42.40f	40.60g	40.55g	48.05b	spraying
	42.53b	40.70c	40.67c	48.26a	Average Items

*Similar letters mean there is no significant difference between the transactions

4. Discussion

The superiority of plants treated with humic acid in the number of pods and seed weight and yield tables (1, 3 and 4) may be due to superiority in its content of chlorophyll and in the description of the height of the plant table and the availability of nutrients of phosphorus and potassium due to treatment with humic acid and increase the process of photosynthesis, which leads to increased division and expansion of cells and phosphorus is a necessary and essential element in cell division and expansion (Nuaimi, 1999). All these factors contribute to the increase in seed weight Table 3, and the reason may be due to the effect of humic acid, which has a role in stimulating the activity of the hormone acetic acid, which encourages plant growth as well as its role in providing water and nutrients to the plant, and this in turn is reflected in the activity of the photosynthesis process, which is ultimately reflected in the seed yield Table 4 as well as the superiority of the acid addition treatment in Chlorophyll content, which means higher photosynthesis efficiency and then the production of more dry matter contributed to the production of high yield.

The number of grains is one of the most important qualities that contribute to the final yield among other components, and the number of grains in the spike is determined by the number of fertile florets in the spike, which is one of the most characteristic of the components of the yield associated with the yield (Anderson and Garlenge, 2000). The difference in varieties in the number of grains spike-1 is due to internal genetic factors associated with the same variety.

The reason for the increase in the weight of the seed when treating the addition of humic acid is due to an increase in the efficiency of photosynthesis resulting from an increase in the content of chlorophyll dye and the ease of ion exchange in the soil and its availability to the plant due to the use of acid in addition to the nutrients contained in the acid that contribute to increasing plant growth and reflect positively on the components of the yield, including the weight of the seeds, including Potassium, which is of great importance in the formation, storage and transport of starch, sugars and proteins, which reflects positively on the weight gain of grains [7].

Perhaps the reason for the superiority of acid addition in the characteristic of the yield of humic acid is due to its superiority in the quality of seed weight (Table 3) resulting from improving soil texture and easy absorption of water and ion exchange. The difference in taxa among them in the quality of biological yield may be attributed to internal genetic differences associated with the variety [8].

The increase in the biological yield in Table 5 as a result of the addition of humic acid may be due to the superiority of the weight of the seed and the dry weight of the plant, as the biological yield includes the weights of the growth components and the yield together.

5. Conclusion

The study showed that different bean types' yield attributes are affected differently by humic acid treatment techniques (*Vicia faba*). The number of pods per plant, seed weight, seed yield per plant, and biological yield were all markedly increased by the application of humic acid to the soil. In particular, the local variety outperformed the French variety in terms of seed weight, seed yield, and biological yield after being treated with humic acid. The French variety displayed the greatest number of pods.

REFERENCES

[1] H. A. Younes, "Production and Improvement of Field Crops," Ministry of Higher Education and Scientific Research, University of Baghdad, p. 469, 1993.

[2] M. A. EL-Debaa, H. Abd-Elkhir, and W. M. A. Nagdi, "Field Application of Clethodim Herbicide Combined with Tricoderm spp. for Controlling Weeds, Root Knot Nematodes and Rizoctonia Root Rot Disease in Two Faba Bean Cultivars," Journal of Plant Protection Research, vol. 59, no. 2, 2019.

[3] S. T. K. A. R. Alabbar, "Yield Response and E Components to Three Varieties of Wheat (L. Triticum Aestivum to Fragment the Addition of Nitrogen Fertilizer and Remove the Flag Paper," M.S. thesis, Dept. Haqqa Crops, College of Agriculture and Forestry, University of Mosul, 2021.

[4] N. W. R. Mohamed, "Response of Breadwheat Genetic Structures to Different Levels of Foliar Compound Fertilizer," M.S. thesis, Faculty of Agriculture, University of Kirkuk, 2021.

[5] Z. Muktamar, S. Sudjatmiko, F. Fahrurrozi, N. Setyowati, and M. Chozin, "Soil Chemical Improvement Under Application of Liquid Organic Fertilizer in Closed Agriculture System," International Journal of Agricultural Technology, vol. 13, no. 7.2, pp. 1715-1727, 2017.

[6] H. Ren, Y. Hu, G. Yang, and Y. Zhang, "Divergence of Compost Extract and Bio-Organic Manure Effects of Lucerne Plant and Soil," PeerJ, vol. 5, p. 3775, 2017.

[7] Y. M. Abu Dahi and M. A. Al-Younis, "Plant Nutrition Guide," Ministry of Higher Education and Scientific Research, College of Agriculture, University of Baghdad, p. 411, 1988.

[8] K. K. Mahmoud, R. A. Hussein, and A. J. Abdulrahman, "Effect of Fractionation of Nitrogen Fertilizer Quantity on the Growth and Yield of Three Varieties of Wheat (Triticum Aestivum L.)," Tikrit University Journal of Agricultural Sciences, vol. 9, no. 2, pp. 109-115, 2009.

[9] S. T. K. A. R. Alabbar, "The Response of the Yield and Its Components to Three Varieties of Wheat (L. Triticum Aestivum to Fragment the Addition of Nitrogen Fertilizer and Remove the Flag Paper," M.S. thesis, Dept. Haqqa Crops, College of Agriculture and Forestry, University of Mosul, 2021.

[10] W. K. Anderson and J. R. Garlinge, "The Wheat Book: Principles and Practice," Dept. of Agriculture and Food, Western Australia, 2000. [Online]. Available: Researchlibrary.Agric.Wa.Gov.Au

[11] Y. Zhang, "A Critical Review of the Application of Chelating Agents to Enable Fenton and Fenton-like Reactions at High pH Values," *Journal of Hazardous Materials*, vol. 362, pp. 436-450, 2019, doi: 10.1016/j.jhazmat.2018.09.035.

[12] J. Wang, "The Occurrence, Distribution and Degradation of Antibiotics by Ionizing Radiation: An Overview," *Science of the Total Environment*, vol. 646, pp. 1385-1397, 2019, doi: 10.1016/j.scitotenv.2018.07.415.

[13] X. Guo, "Humic Substances Developed During Organic Waste Composting: Formation Mechanisms, Structural Properties, and Agronomic Functions," *Science of the Total Environment*, vol. 662, pp. 501-510, 2019, doi: 10.1016/j.scitotenv.2019.01.137.

[14] J. Yu, "Hierarchical Porous Biochar from Shrimp Shell for Persulfate Activation: A Two-Electron Transfer Path and Key Impact Factors," *Applied Catalysis B: Environmental*, vol. 260, 2020, doi: 10.1016/j.apcatb.2019.118160.

[15] H. Zheng, "Efficient Degradation of Atrazine with Porous Sulfurized Fe<inf>2</inf>O<inf>3</inf> as Catalyst for Peroxymonosulfate Activation," *Applied Catalysis B: Environmental*, vol. 259, 2019, doi: 10.1016/j.apcatb.2019.118056.

[16] F. S. A. Khan, "A Comprehensive Review on Magnetic Carbon Nanotubes and Carbon Nanotube-Based Buckypaper for Removal of Heavy Metals and Dyes," *Journal of Hazardous Materials*, vol. 413, 2021, doi: 10.1016/j.jhazmat.2021.125375.

[17] X. Yang, "Effect of Organic Matter on Phosphorus Adsorption and Desorption in a Black Soil from Northeast China," *Soil and Tillage Research*, vol. 187, pp. 85-91, 2019, doi: 10.1016/j.still.2018.11.016.

[18] T. Liu, "Two-Dimensional MXene Incorporated Graphene Oxide Composite Membrane with Enhanced Water Purification Performance," *Journal of Membrane Science*, vol. 593, 2020, doi: 10.1016/j.memsci.2019.117431.

[19] S. Wang, "Development of CuO Coated Ceramic Hollow Fiber Membrane for Peroxymonosulfate Activation: A Highly Efficient Singlet Oxygen-Dominated Oxidation Process for Bisphenol A Degradation," *Applied Catalysis B: Environmental*, vol. 256, 2019, doi: 10.1016/j.apcatb.2019.117783.

[20] S. Chen, "Effects of Water Matrices on the Degradation of Naproxen by Reactive Radicals in the UV/Peracetic Acid Process," *Water Research*, vol. 150, pp. 153-161, 2019, doi: 10.1016/j.watres.2018.11.044.