The response of the vegetative qualities of the water source and the methods of adding nano-proline and brassinolide to rosemary Rosmarinus officinalis L.

H. R. A.Al-Dujaili 1*, Kh. A. S.Al-Hamdani 2
1Department of Biology, College of Education, University of Samarra, Iraq;
2Department of Crop Science Faculty of Agriculture, University of Samarra
*Corresponding author's email: qaha8025@gmail.com
Email addresses of coauthors: Khalid.a.s@uosamarra.edu.iq

Abstract

This study was conducted during the growth season - 2023-2024 in the plastic house of the Department of Horticulture and Garden Engineering of the Faculty of Agriculture - Samarra University/Salah Al-Din Governorate, to study the response of vegetative qualities to the source of irrigation water and the methods of adding nano-proline and Brassinolide to rosemary Rosmarinus officinalis L. The study included three factors, and the factors of the study were as follows: The first factor (water source) : river water, symbol W0, well water, symbol W1. The paper was sprayed, and it was added with two dates1/10, 22/10, and at a rate of two sprays, and the period between one spray and another was twenty-one days. The second factor was represented by nanoprolin with three levels of comparison treatment (water only) (p0) and nanoprolin with a concentration of 250 mg.L-1 (P1) and 500 mg.L-1 (P2). The third factor is represented by Brassinolide with three levels of comparison treatment (water only) (BL0) and Brassinolide with a concentration of 0.5 mg.L-1 (BL1) and 1 mg.L-1 (BL2 (

The experiment was designed according to the design of the randomized complete blocks (R.C.B.D) Randomized Complete Blocks Design with three replicators. Each replicator contains (18) experimental units of experimental unit area (30×30) cm2 and the distance between experimental units (40) cm2. The total number of experimental units is (54) experimental units and each experimental unit contains a quarter of seedlings. The results showed that the treatment of well water W1 was superior in most of the studied vegetative qualities. The treatment of nano proline P2 was morally superior in each of the increase in plant height, stem diameter, number of leaves, number of branches, percentage of dry matter, total chlorophyll content (7.83, 27.69, 9.33, 456, 1.028, 14.22) in succession, while the treatment of brasenolide (BL2) was superior in the average increase in plant height, stem diameter, number of leaves, arm, percentage of dry matter, chlorophyll content, and chlorophyll content in succession, The two-way and three-way interactions of the research factors also showed significant differences for all studied traits .

*Reissued for technical reasons.

Keywords: rosemary, irrigation water source, foliar spray, nanoproline, brassinolide .

Introduction

The mountain belongs to the oral family Labiatae, which is attributed to the form of the oral coronation and is called Lamiacaea, which is related to the months of Lamium [12]. The rosemary is a dense and evergreen herbaceous woody plant that branches vertically into swapped branches, andranges with the length of the plant from 1.5-2 meters, its leaves are green from the top and white from the bottom covered with short and dense

ISSN 2072-3857

filaments, and it is also characterized by the absence of the middle sweat and rice from the bottom surface of the leaf, its shape is similar to needles so that it is long and narrow and its length ranged from 4-2 cm and width from 5-2mm , [2]. The plants grow in warm areas, so the Mediterranean region and Asia were the original homes it, and this plant has a high ability to withstand drought and lack of water for long periods [25] and because of the importance of rosemary as it has become widely used in the world, some countries are interested in its production and the most important oil-producing countries are the United States, Spain and Morocco [11 .[

Dry and semi-arid areas lack sources of irrigation water with low salts and good quality, and for the sake of the spatial use of groundwater in agriculture without affecting agricultural production, some substances with a growth-stimulating effect will work directly or indirectly in order to improve the growth of plants and increase their ability to resist deviation in environmental factors that cause stress on those plants, such as amino acids, which are important compounds that enter into plant growth, [1.[

Leaf spraying, which is defined as the spraying of nutrients and their solutions needed by the plant on the vegetative total at an appropriate time and in a specific concentration so that the plant can absorb them through the gaps on the surface of the leaves or through the walls of cells and their membranes to participate in the biological processes of the plant and be affected in its vegetative and qualitative indicators [20.[

Nanotechnology is one of the approaches and mechanisms of modern and prominent scientific research because of the possibility of these materials interacting with biomolecular targets in a more revolutionary and effective way because of their small sizes and rapid spread rate. Nanotechnology is 1 in a billion meters, which means that it is equal to a part of a billion (10), and it also has an impact on a large number of topics, especially medicine, science and agriculture [3.[

Proline acid foliar spraying prevents the decomposition of chlorophyll and thus balances CO2 and water loss through transpiration, increasing the area of the paper [17], as [18] stressed that leaf spraying with proline leads to an increase in the process of photosynthesis by controlling the opening and closing of stoma. It also has a significant and important role in increasing the number of plant leaves and the content of these leaves from all. This is due to its role in stimulating the formation of chlorophyll pigments, as well as an important role in maintaining the enzymatic activity of green plastids [16], [5] found when spraying chamomile plant (Matricaia chamomilla L.)With the amino acids prolene and arginine in concentrations of (0,50 and100) mg.L-1 The amino acid prolene is superior to the concentration of (100) mg.L-1 in the height of the plant, the number of branches of the plant and the total number of leaves compared to the comparison factor .

[9] observed when treating Hibiscus sabdariffa L.) With a mixture of amino acids, prolene and arginine in concentrations of (0, 0.5, 1.0 , 1.5 and 2.0) g. L-1 and for two seasons, the concentration exceeds 2.0 g L-1 in each of the plant height, stem diameter, leaf area, wet and dry weight of the plant, single plant seed yield, chlorophyll content in leaves and oil percentage, while the concentration exceeds 1.5 g. L-1 in the leaf content of nitrogen, phosphorus and potassium elements compared to the comparison treatment. In the

ISSN 2072-3857

second season, the concentration exceeds 1.5 g L-1 in the plant height, leaf area, single plant seed yield, leaf content of N P K elements and fixed oil content, while the concentration exceeds 2.0 g L-1 with the qualities of the stem diameter, wet and dry weight of the plant and chlorophyll content in leaves compared to the comparison treatment.

Plant growth organizations have been known to control physiological and biochemical processes through primary and secondary metabolic processes. They are non-food organic compounds that are manufactured naturally or artificially that cause a change in plant growth and development. They are either stimulants or growth inhibitors and are currently widely used to control (stimulate or delay) maturation and aging processes in plants [26], and one of these organizations is prasenolide, where it was found to reduce heat and stress and significantly enhance the rate of absorption of carbon dioxide, photosynthesis and the cessation of the use of water . Prasenostroids have a preventive and therapeutic role to reduce the harmful effect caused by biological pressures such as salinity, drought, cold, heat, organic pollutants, herbicides, heavy metals and biotic pressures of pathogens [14.[

Among the forearms [6], in astudy conducted on the coriander plant Coriandrum sativum L. That the effect of spraying with the growth regulator Prasinolide A gave a significant increase in Turkish- 2 mg 1 liter - for both the height of the plant and the percentage of chlorophyll, as indicated by [7], in a study conducted to find out the effect of brassinolide on the bazoon eye plant Catharanthus roseus L. Spraying with a concentration of 0.020 mg.L -1 as it gave a moral superiority in plant height, number of leaves, number of branches and dry weight 19.63 plant poison -1 50.50 plant leaves -1 9.18 plant branches-1 16.65 g plant -1 sequentially compared to non-spraying treatment .

In a study conducted by [4], on the effect of spraying with brassinolide growth regulator on the peppermint plant Mentha piperita L. At a concentration of 0.010 mg.L-1 a It gave a moral superiority in the paper area, the number of leaves, the dry weight of the vegetative sum, and the dry weight of the root. The following values reached 7857.8 cm 2 plants -1, 524.38 g plant leaves 1-, 240.50 g plant -1, 7.04 g plant sequentially, and the same treatment gave a significant increase in the mineral content of both phosphorus and nitrogen by 2.015%, 0.350% sequentially compared to the non-spray treatment.

Material and Methods

The experiment was conducted in the plastic greenhouse belonging to the Department of Horticulture and Landscape Engineering, College of Agriculture, Samarra University, for the season 2023-2024, in response to Rosmarinus officinalis L. For the source of irrigation water and for the spraying of different types, Nanoprolin and Brassinolide, and to know the effect of them on the vegetative and vegetative rows of the plant, the study agents were added by spraying on the vegetative total and two types of the first materials Nanoprolin 100% and the second Brassinolide with watering the plant with two sources of irrigation water (river water, well water) and knowing the extent of their impact on the vegetative qualities of the rosemary plant. The factors of the study were as follows :

ISSN 2072-3857

The first factor (water source): water of the river and its symbol is W0, water of the well and its symbol is W1

Factor II(nanoproline): with three levels (500, 250, 0) mg.L-1and its symbol is (P2,P1, P0) in succession, which is a 100% pure type.

Factor III (Brassinolide): With three levels (1, 0.5, 0) mg. L-1 and its symbol (BL0, BL1, BL2) in succession.

The experiment was carried out as a working experiment according to the design of the (R.C.B.D) Randomized Complete Blocks Design in three repetitions. Each iterative contains (18) experimental units, the area of the experimental unit is (40×40) cm2, and the distance between the experimental units is (40) cm2. The total number of experimental units is (54) experimental units and each experimental unit contains a quarter. After collecting the data for the studied qualities, the averages were compared according to the L.S.D test at the level of 5% probability. The data were analyzed statistically using the (Genstate) program [23}

Table 1/ Some physical and chemical characteristics of the soil used in the experiment

Unit	Value	Capacity	
.....	Mixture	Soil texture	
%	92	Sand	soil separates
	42.80	Alluvial	
	26.28	Mud	
	7. 6	Power of Hydrogen (PH)	
$Ds.m^{-1}$	2.05	Electrical Conductivity (EC)	
$mg.kg^{-1}$	2.2	Organic matter	
$mg.kg^{-1}$	0.15	Nitrogen N	
$mg.kg^{-1}$	24.53	Phosphorus P	
$mg.kg^{-1}$	10.60	Potassium (K+)	
$MmoL.L^{-1}$	16.81	Magnesium Mg	

***The soil was analyzed in the laboratories of the Department of Environment and Water at the Ministry of Science and Technology.**

ISSN 2072-3857

Table 2/ Chemical Analysis of Water Samples (River Water_Well Water)

	River water analysis	Saline well water analysis	Credits
PH	**7.2**	**9.7**	
Ec	**0.18**	**3.43**	$Ds.m^{-1}$
HCO_3	**101**	**105**	$mg.L^{-1}$
SO4	**1.29**	**5.42**	$mg.L^{-1}$
P	**0.2**	**1.25**	$mg.L^{-1}$
K	**0.89**	**1.67**	$mg.L^{-1}$
CA	**0.32**	**1.45**	$mg.L^{-1}$
na	**4.97**	**12.37**	$mg.L^{-1}$
Mg	**2.12**	**6.42**	$mg.L^{-1}$
CL	**1.42**	**2.21**	$mg.L^{-1}$

*

Water samples were analyzed in the laboratories of the Department of Environment and Water at the Ministry of Science and Technology

Studied characteristics :

-1 Plant height: The average height of plants for each transaction was extracted at the end of the experiment after measuring their height using a measuring tape starting from the soil's surface to the top of the growing plants.

-2Stem diameter (mm): The stem diameter of the plants was measured for each experimental unit by the electronic service device (vernier) and the average stem diameter was extracted for each transaction.

-3Number of lateral branches (plant branch -1) Branches number/plan: The number of branches connected to the main leg was calculated at the end of the experiment from the first branch near the surface of the soil to the top and then the average number of main branches was extracted for each transaction.

-4Number of leaves (leaf-1)Leaves number/ plan: The total number of leaves of plants at the end of the experiment was calculated by calculating the total number of leaves in each plant .

.5 Percentage of dry matter in leaves :(%)

The percentage of dry matter was calculated according to [8] according to the following equation- :

dry matter = □((dry weight)/(wet weight)) x 100

.6Total chlorophyll content of leaves (mg g-1): The total chlorophyll tincture in the leaves was estimated. By taking 0.5 g of fresh leaves and grinding it with 10 ml of acetone (80%), measured with a Spectro-photometer.

Results and Discussion

Plant Height (cm) and Leg Diameter (mm(

The results of Table (3) indicate that there are significant differences in the rate of plant height and stem diameter as a result of the influence of the irrigation water source, as the

ISSN 2072-3857

well water treatment gave the highest average plant height of 16.37 cm and the stem diameter of 1.13 mm, while the river water treatment gave the lowest average plant height of 11.48 cm and the stem diameter of 0.76 mm. As for the effect of the treatment of spraying with nano-propylene (P) , the treatment of spraying P2 with a concentration of 500 mg.L-1 had a moral superiority, as it gave the highest rate of plant height of 14.22 cm and stem diameter of 1.03 compared to the comparison treatment, which gave the lowest rate of plant height of 13.61 cm and stem diameter of 0.78 mm. As for the effect of spraying with brassinolide growth regulator (BL), the treatment of BL1 with a concentration of 0.5 mg.L-1 had a moral superiority, as it gave the highest rate of plant height of 14.67 cm and stem diameter of 1.03 mm compared to the comparison treatment, which gave the lowest rate of plant height of 12.67 cm, while the treatment of BL1 gave the lowest rate of stem diameter of 0.93 mm.

Regarding the effect of the Interactions between the irrigation water source and W×P, the results of Table 3 indicated the superiority of the treatment (W1P2), which recorded the highest value of 16.56 cm, while the treatment W1P1 recorded the highest stem diameter rate of 1.23 mm compared to other overlap coefficients. As for the overlap between the irrigation water source and the brassinolide (W×BL), the treatment(W1BL1), which recorded the highest value of the plant height of 17.67 cm, while the treatment gave W1BL2 gave the highest average stem diameter of 1.20 mm, while the transaction (W0BL0) gave the lowest average for the two traits of 10.33 cm and 0.56 mm respectively. As for the overlap between nano proline and brassinolide (P×BL), the transaction (P2BL1) gave the highest value of the plant height of 16.00 cm and the transaction P1BL2 gave the highest value of the stem diameter of 1.22 mm, while the transaction (P2BL0) gave the lowest value of the plant height of 11.67 cm and the transaction P0BL0 gave the lowest average leg diameter of 0.71 mm.

As for the effect of the triple overlap between the source of irrigation water, nano proline, and brasenolide (W×P×BL), the treatment (W1P2BL1) was superior to the height of the plant, which gave the highest value of 19.33 cm, and the treatment of W1P1BL2 for the stem diameter recorded the highest value of 1.50 mm. In comparison, the treatment (W0P0BL0) gave the lowest value of the plant height of 8.67 cm and the stem diameter of 0.41 mm respectively.

ISSN 2072-3857

Table 3/ The effect of the source of irrigation water and the concentrations of nano proline and brasenolide and Interactions between them in the plant height characteristic of rosemary plant.

Irrigation Water	Proline Nanoparticles	Prasenolide concentrations			W×P
		BL_0	BL_1	BL_2	
W_0	P_0	8.67	10.67	13.33	10.89
	p_1	11.67	11.67	11.67	11.67
	P_2	10.67	12.67	12.33	12.44
W_1	P_0	17. 67	17. 67	13.67	16.33
	p_1	14.67	16.00	18.00	16.22
	P_2	12.67	19.33	17. 67	16.56
Water Source Rate (W)					
W×BL	W_0	10.33	11.67	12.44	11.48
	W_1	15.00	17. 67	16.44	16.37
Nanoproline rate (p)					
p× BL	P_0	13.17	14.17	13.50	13.61
	p_1	13.17	13.83	14.83	13.94
	P_2	11.67	16.00	15.00	14.22
Brassinolide Modifier(BL)		12.67	14.67	14.44	

L.S.D % 5

7×P×BL	×BL	7×BL	7×P	L		7
2.63	1.87	1.50	1.50	1.08	1.08	0.88

ISSN 2072-3857

Table 4 / The effect of irrigation water source, nano proline concentrations and brassinolide growth regulator and Interactions between them in the stem diameter (mm) of rosemary

Irrigation Water	Proline Nanoparticles p	Prasenolide concentrations			W×P
		BL_0	BL_1	BL_2	
W_0	P_0	0.41	0.58	0.68	0.56
	p_1	0.55	0.92	0.94	0.80
	P_2	0.74	1.05	1.05	0.92
W_1	P_0	1.00	0.95	1.07	1.01
	p_1	1.14	1.06	1.50	1.23
	P_2	1.37	0.99	1.04	1.14
Water Source Rate (W)					
W×BL	W_0	0.57	0.85	0.86	0.76
	W_1	1.17	1.00	1.20	1.13
Nanoproline rate (p)					
P×BL	P_0	0.71	0.77	0.88	0.78
	p_1	0.85	0.99	1.22	1.09
	P_2	1.06	1.02	1.01	1.03
Brassinolide Modifier(BL)		1.03	0.93	1.03	

L.S.D % 5

W×P×BL	×BL	W×BL	W×P	L		W
0.22	0.15	0.13	0.13	0.09	0.09	0.07

ISSN 2072-3857

Number of branches (plant branch -1:(

The results of Table (5) showed that there are significant differences in the rate of the number of branches as a result of the impact of the irrigation water source, as it gave the treatment of well water the highest average of 9.59 branches.plant-1, while the river water treatment gave an average of 6.81 branches.1--- As for the effect of the treatment of nano-propylene spraying (P), the treatment of P2 spraying with a concentration of 500 mgL-1 was morally superior, giving the highest rate of 9.33 branches.Nabat-1 compared to the comparison treatment, which gave a minimum average of 7.39 branches.Plant-1 and the same table indicate the effect of spraying with a brassinolide growth regulator (BL). The treatment BL2 with a concentration of 1 mg.L-1 was morally superior by giving it the highest rate of 8.50 branches.plant-1, compared to the comparison coefficient which gave the lowest average of 7.94 branches.Plant-1.

As the values of the Interactions between them the irrigation water source and the nanoproline W×P, the results of Table (5) indicated the superiority of the treatment (W1P0), which recorded the highest value of 10.44 branches.Plant-1 compared to other interference coefficients, as for the overlap between the irrigation water source and the brassinolide (W×BL), the treatment(W1BL0) was superior, which recorded the highest value of 9.78 branches.plant-1, while the treatment (W0BL0) gave the lowest rate of 6.11 Ra.plant-1, as shown by the results of the interaction between nanoproline and prasenolide (P×BL) outweighing the treatment of (P2BL2) which gave the highest value of 10.83 Ra.plant-1, while the transaction (P0BL0) gave the lowest value of6.76 branches.Plant-1, and the results of the table below show the effect of triple interference between the irrigation water source, nano proline and brassinolide (W× P×BL), the treatment (W0P2BL2) was superior, which gave the highest value of 11.00 branches.plant-1, while the transaction (W0 P 0 BL0) gave the lowest value of 4.00 branches.Plant-1

.

ISSN 2072-3857

Table5 / The effect of irrigation water source, nano proline concentrations and brassinolide growth regulator and Interactions between them in the number of branches (branch plant1-) of rosemary

Irrigation Water	Proline Nanoparticles p	Prasenolide concentrations (mg.L^{-1})			W×P
		BL0	BL1	BL2	
W0	P0	4.00	4.67	4.33	4.33
	p1	6.67	8.00	7.00	7.22
	P2	7.67	8.00	11:00	8.89
W1	P0	9.33	11.67	10.33	10.44
	p1	10.00	8.00	7.67	8.56
	P2	10.00	8.67	10.67	9.78
Water Source Rate (W)					
W×BL	W0	6.11	6.89	7. 44	6.81
	W1	9.78	9.44	9.56	9.59
Nanoproline rate (p)					
P×BL	P0	6.67	8.17	7:33	7.39
	p1	8.33	8.00	7:33	7.89
	P2	8.83	8.33	10.83	9.33
Brassinolide Modifier(BL)		7.94	8.17	8 50	

L.S.D % 5

W×P×BL	P×BL	W×BL	W×P	BL	P	W
3.40	2.40	1.96	1.96	1.39	1.39	1.13

Number of leaves (leaf1 (-

The values of Table (6) indicated that there are significant differences in the rate of the number of leaves as a result of the impact of the irrigation water source, as the well water treatment gave the highest average of 474 leaves.plant-1, while the river water treatment gave the lowest average of 319 leaves.Plant-1. As for the effect of the treatment of spraying with nano-propylene (P), the treatment of spraying P2 with a concentration of 500 mg L-1 was morally superior, giving the highest rate of 456 sheets.Nabat-1 compared to the comparison treatment, which gave the lowest average of 343 leaves.Plant-1, as indicated by the data of the table below on the effect of spraying with brasenolide growth regulator (BL), the treatment BL2 with a concentration of 1 mg.L-1 was significantly superior, giving

ISSN 2072-3857

the highest rate of 447 sheets.Nabat-1 compared to the treatment of BL1 which gave the lowest average of 363 leaves.Plant-1.

The same table showed the effect of the bilateral overlap between the irrigation water source and the nanoproline W×P. The results indicated the superiority of the treatment (W1P2), which recorded the highest value of 557 sheets.Plant-1 Compared to other interference coefficients, as for the overlap between the irrigation water source and the brassinolide (W×BL), the treatment(W1BL2) was superior, which recorded the highest value of 520 sheets.plant-1, while the transaction (W0BL1) gave the lowest rate of 290 leaves.plant-1, the overlap between nanoproline and prasinolide(P×BL) outperformed the treatment (P2BL2) which gave the highest value of 506 sheets.plant-1, while the transaction (P0BL0) gave the lowest value of 290 sheets.Plant-1, the effect of the triple interference between the irrigation water source, the nanoproline and the brassinolide (W×P×BL) outperformed the treatment (W1P2BL0) which gave the highest value of 591 sheets.plant-1, while the transaction (W0 P 0 BL0) gave the lowest value of 258 leaves.Plant-1

Table 6 / The effect of irrigation water source, nanoproline concentrations and brassinolide growth regulator and the Interactions between them in the number of leaves(leaf plant1-) of rosemary

Irrigation Water	roline anoparticles p	Prasenolide concentrations (mg.Liter-1)			W×P
		BL_0	BL_1	BL_2	
W_0	P_0	258	268	261	262
	p_1	296	324	400	340
	P_2	321	278	461	354
W_1	P_0	322	382	564	423
	p_1	489	391	446	442
	P_2	591	531	550	557
Water Source Rate (W)					
W×BL	W_0	**292**	290	374	319
	W_1	468	435	520	474
Nanoproline rate (p)					
P×BL	P_0	290	325	413	343
	p_1	393	358	423	391
	P_2	456	405	506	456
Brassinolide Modifier(BL)		380	363	447	

L.S.D % 5

W×P×BL	P×BL	W×BL	W×P	BL	P	W
195.9	138.5	113.1	113.1	80.0	80.0	65.3

ISSN 2072-3857

Percentage of dry matter(%)

Table No. (7) shows that there are significant differences in the percentage of dry matter as a result of the impact of the irrigation water source, as it is noted that the treatment of river water exceeded the highest average of 27.49%, while the treatment of well water gave the lowest average of 52.% . As for the spraying with nano-propylene (P) , the treatment of spraying P2 with a concentration of 500 mg L-1 was superior, giving the highest rate of 27.69% compared to the comparison treatment, which gave the lowest rate of 25.38%. As for the effect of spraying with growth promoters brasinolide (BL), the treatment BL1 with a concentration of 0.5 mg L-1 was morally superior, giving the highest rate of 33.75% compared to the treatment BL2, which gave the lowest rate of 22.89%.

The table showed that the overlap between the irrigation water source and the W×P nanoparticle was higher than the treatment(W1P2), which recorded the highest value of 33.05% compared to other overlap coefficients. As for the overlap between the irrigation water source and the prasinolide (W×BL), the treatment(W0BL1), which recorded the highest value of 35.70% , was superior, while the transaction (W1BL2) gave the lowest rate of 21.45%. As for the overlap between the nanoparticle and the prasinolide (BL×P), it was superior to the transaction (P2BL1), which gave the highest value of 34.13%, while the transaction (P0BL0) gave the lowest value of 20.22%.

The table below shows the effect of the triple overlap between the source of irrigation water, nanoproline, and brassinolide (W×P×BL). The transaction outperformed (W0P2BL1), which gave the highest value of 40.86%, while the transaction (W0P1BL2) gave the lowest value of 18.14%.

Table7 / The effect of irrigation water source, nano proline concentrations and brassinolide growth regulator and the Interactions between them on the percentage of dry matter (g plant1-)of rosemary

Irrigation Water	Proline Nanoparticles p	Prasenolide concentrations (mg.Liter-1)			W×P
		BL_0	BL_1	BL_2	
W_0	P_0	20.62	38.86	26.81	28.76
	p_1	20.50	27.39	18.14	22.01
	P_2	30.26	40.86	28.02	33.05
W_1	P_0	19.81	27.78	18.42	22.00
	p_1	28.75	40.23	27.41	32.13

ISSN 2072-3857

	P_2	21.09	27.40	18.53	22.34
Water Source Rate (W)					
W×BL	**W_0**	23.79	35.70	24.32	27.94
	W1	23.22	31.80	21.45	25.49
Nanoproline rate (p)					
P×BL	**P_0**	20.22	33.32	22.62	25.38
	p_1	24.63	33.81	22.77	27.07
	P_2	25.68	34.13	23.27	27.69
Brassinolide Modifier(BL)		23.51	23.51	33.75	

L.S.D % 5

W×P×BL	**×BL**	**W×BL**	**W×P**	**L**		**W**
7.53	5.32	4.35	4.35	3.07	3.07	2.51

Total leaf chlorophyll content (mg. g soft weight 1(-

The results shown in Table (8) indicate that there is a significant effect among the irrigation water source in the character of the total chlorophyll content of the leaves, if the treatment of the well water is morally superior to the treatment of the river water and gave the highest average of 7.90 mg. g soft weight-1, while the river water treatment gave an average of 7.15 mg. g soft weight -1 Treatment with 500 mg L-1 nanoproline gave a moral superiority of 7.83 mg.g soft weight -1 compared to a P0 treatment that gave the lowest rate of 7.13 mg.g soft weight -1, and with regard to the effect of spraying with prasinolide growth regulator (BL), the treatment BL2 with a concentration of 1 mg.L -1 was significantly superior, giving the highest rate of 9.59 mg.g soft weight -1 compared to BL1 treatment which gave the lowest rate of 6.44 mg. g soft weight -1

The bilateral overlap between the irrigation water source and the nanoproline W×P had a significant superiority. The results of Table (8) indicated the superiority of the treatment (W1P0), which recorded the highest value of 8..14 mg.g soft weight -1. Compared to other interference coefficients, for the interference between the irrigation water source and the bracinolide (W×BL), the treatment(W1BL2) was superior, with the highest value of 9.86 mg.g soft weight -1, while the treatment (W0BL1) gave the lowest rate of 5.91 mg.g soft weight -1, but the overlap between nanoproline and prasenolide(P×BL) was superior to (P0BL2), which gave the highest value of 9.73 mg.g soft weight -1, while the transaction (P0BL0) gave the lowest value of 4.99 mg. g soft weight -1.

The Interactions between them the irrigation water source, the nanoprolene and the prasenolide (W×P×BL) shows a significant effect. The treatment(W1P0BL2) was superior, which gave the highest value

of 10.40 mg.g soft weight 1-, while the transaction (W0P0BL0) gave the lowest value of 3.94 mg. g soft weight -1 .

Table 8 / The effect of irrigation water source, nanoproline concentrations and brassinolide growth regulator and the Interactions between them in the total chlorophyll content of the leaves (mg.g soft weight -1) of rosemary

rigation Water	Proline Nanoparticles p	rasenolide concentrations (mg.Liter-1)			W×P
		BL_0	BL_1	BL_2	
W_0	P_0	3.94	5.34	9.06	6.11
	p_1	5.63	7.30	9.64	7.52
	P_2	9.10	5.08	9.28	7.82
W_1	P_0	6.04	7.98	10.40	8.14
	p_1	8.68	5.34	9.16	7.73
	P_2	5.84	7.63	10.02	7.83
Water Source Rate (W)					
W×BL	W_0	6.22	5.91	9.33	7.15
	W_1	6.85	6.98	9.86	7.90
Nanoproline rate (p)					
P×BL	P_0	4.99	6.66	9.73	7.13
	p_1	7.15	6.32	9.40	7.62
	P_2	7.47	6.36	9.65	7.83
Brassinolide Modifier(BL)		6.54	6.44	9.59	

L.S.D % 5

×P×BL	×BL	×BL	×P	L		
3.41	2.41	1.97	1.97	1.39	1.39	1.14

Discussion

The results of tables (3), (4), (5), (6), (7), and(8) showed that the source of irrigation water caused a significant increase in the qualities (plant height, stem diameter, number of branches, number of leaves, percentage of dry matter, and total chlorophyll). This increase is due to several reasons, including the varying amount of the two sources of elements, as the plants irrigated with well water excelled in this characteristic because of the stimulating effect of these ions by their presence in larger quantities than in river water, which contributes to encouraging root growth and thus encourages vegetative growth. This result is consistent with what [22], and the

ISSN 2072-3857

increase in the number of branches due to the increase in nitrogen, iron, and magnesium in the water of the well table (2), as nitrogen has a catalytic role for the activity of lateral shoots through the direct impact on the vital construction of growth organizations that contribute to breaking the top sovereignty or the reason for the increase may be attributed to the important role of iron and magnesium in the process of building chlorophyll, which in turn has contributed to the increase in the number of branches [13.[

The amino acid spray also achieved nano proline at a concentration of 500mg.L-1Moral differences and a noticeable increase in all vegetative qualities of the plant. The results of all tables showed a moral superiority in the vegetative growth qualities of the plant when adding nanoparticles with the above concentration. The reason for this may be due to the positive role in regulating the osmotic effort, then increasing plant growth and supporting cell elongation and supporting the opening of stoma and photosynthesis [19]. Proline increases the efficiency of water and nutrient absorption. Proline also plays key roles in the formation of chlorophyll, photosynthesis, respiratory electron transport chains, and protection against D-oxidation, as well as protein metabolism, carbohydrates and cellular house. [10[

The results of the above tables indicate that there are significant differences in the growth regulator of brassinolide in the characteristics of vegetative growth, and the reason for the increase may be attributed to the role of the growth regulator of brassinolide, which plays different roles in the growth and development of plants, as it works to regulate various physiological processes in plants, such as expansion, inflation, phalanx cleavage, and tissue differentiation with the development of the main roots. This effects are represented by the effectiveness of Brassin activity [21] and [28], and the increase in the number of branches from the overlap of proline and prasenolide agents is attributed to the flow of mineral elements along with growth regulators in the tissues of treated plants and the production of axillary shoots, which led to an increase in the number of branches [24], and the results of the study showed the effect of the Bracenolide regulator in increasing the percentage of total chlorophyll in the leaves. The reason may be due to its role in inhibiting the chlorophyll enzyme responsible for depleting chlorophyll, which led to an increase in chlorophyll in the leaves and thus an increase in plant photosynthesis processes [27]. The increase in the number of growths of rosemary and brassinolide may be due to the increase in the absorption of nutrients and minerals, as well as the increase in the growth regulators of the treated plants, which leads to the stimulation and production of buds, which are more than the number of growths. This result is consistent with [15[

ISSN 2072-3857

References

[1]

AbdEl-Mageed, T.A., W.M. Semida and M.H. AbdEl-Wahed 2016. Effect of mulching on plant water status, soil salinety and yield of squash under summer-falldeficit irrigation in salt affected soil. Agricutural Water Management. 173

[2] Abu Kabdeh , Iman Bashir (2021) . Encyclopedia of Herbal Medicine / Rosemary . PART

[3] Al Ameri. Alaa Talib Salem (2021). "The partial diagnosis of bacteria causing mild rot in the governorates of Karbala and Babil and their resistance using some biological agents and nanocomposites" Master Thesis, University of Karbala, Iraq .

[4] Al-Azzawi , Muhammad Ghaib Fares (2018). The effect of spraying Brassinolide and Salicylic acid on the growth and production of some phenols for the peppermint plant Mentha Piperia L. Master thesis . Faculty of Agriculture . University of Tikrit . Iraq.

[5] Al-Dujji, Issam Hussein Ali , Mahdi , Ner Naama and Saleh , Iqbal Ismail.(2013) Chamomile plant response Matricaria chamomilla L. For the distances of cultivation and spraying with the amino acids prolene and arginine and their impact on growth, the syphilis quotient, its content of volatile oil and its quality. Al-Basra J. of Agricultural Sciences, 26 (1): 34-54 .

[6] Al-Saadi, Abbas Jassim Hassan and Waheed Nasser Hussein (2016). The relationship between water stress, selenium and prasenolide in some vegetative growth indicators and the elemental content of Coriander Coriandrumsativum L. Ibn Al-Haytham J. of Pure and Applied Sciences 29 (2) 376 -386.

[7] Al-Salhi, Hausen Hussein Abdul Karim (2017). The effect of growth regulator Brassinolide and mineral fertilizer on some vegetative growth qualities and the active substance of C atharanthus roseus L. Master's thesis, Faculty of Agriculture, University of Tikrit . Iraq.

[8] Al-Samarrai, Sattar Abdul Khalifa (2014) . Effect of picking and nitrogen fertilization periods on physiological qualities , quotient, volatile oil and active substance in basil plant (Ocumim basilica L.) Master Thesis_Faculty of Agriculture _ Department of Field Crops_University of Tikrit .

[9] Amira, K., G. Atteya and Heba M. A. (2018). Influence of Seaweed Extract and Amino Acids on Growth, Productivity and Chemical Constituents of Hibiscus sabdariffa L. Plants. Bioscience Res, 15(2):772-791.

[10] Bajguz, A., Chmur, M., & Gruszka, D. (2020). Comprehensive overview of the brassinosteroid biosynthesis pathways: substrates, products, inhibitors, and connections. Frontiers in plant sci.,(11, p.1034.(

[11] Baker, B. P., & Grant, J. A. (2018). Rosemary & Rosemary Oil Profile.

[12] Begum, A., Sandhya, S., Vinod, K. R., Reddy, S., & Banji, D. (2013). Anin-depth review on the medicinal flora Rosmarinus officinalis (Lamiaceae). Acta

scientiarum polonorum Technologia alimentaria, 12(1), 61-74.

[13] El-Hariri, D.M., Hassanein, M.S. and El-Sweify, A.H. 2004. Evaluation of Same Flax Varieties, Straw Yield, Yield Components and Technological Characters. Agricultural Research, 75, 697-715.

[14] Fabregas, N., Lozano-Elena, F., Blasco-Escamez, D., Tohge, T.,Martínez-Andujar, C., Albacete, A.,Cano-Delgado, A. I. (2018). Overexpression of the vascular brassinosteroid receptor BRL3 confers drought resistance without penalizing plant growth. Nature communications, 9(1) 1-13.

[15] Fariduddin,Q.; Ahmad, A. and Hayat S.,(2003). Photosynthetic response of Vigna radiata to pre-sowing seed treatment with 28-homobrassinolide. Photosynthetica. 41(2) 307-310.

[16] Ghafoor, R., Akram, N. A., Rashid, M., Ashraf, M., Iqbal, M, and Lixin,Z.,(2019), Exogenously applied proline induced changes in key anatomical features and physio-biochemical attributes in water stressed oat (Avena sativa L.) plants, Physiology and Molecular Biology of Plants, 25, (5), 1121-1135.

[17] Hayat, S., Hayat, Q., Alyemeni, M. N., Wani, A. S., Pichtel, J., and Ahmad, A.,(2012),"Role of proline under changing environments: a review", Plant signaling & behavior, 7 (11) 1456-1466.

[18] Ibrahim M., Z. Nabeel (2014), The Effect of " Spraying with Proline and Arginine on the Growth and Result of Eggplant in Protected Agriculture" , Master Thesis , College of Education for Pure Sciences, Diyala University, Iraq.

[19] Kalteh, M., Alipour, Z. T., Ashraf, S., Marashi Aliabadi, M., and Falah Nosratabadi, A., (2014), Effect of silica nanoparticles on basil (Ocimum basilicum) under salinity stress, J. of Chemical Health Risks, 4 (3.(

[20] Karthikeyan, A., J. Vanathi, S. Babu, and C. Ravikumar. - 2020 *. Studies on the effect of foliar application of organic and inorganic nutrients on the phenotypic enhancement of black gram cv. Vamban6. Plant Archives 20(2):1161-1164.

[21] Lin, W.-H. (2020). Designed Manipulation of the Brassinosteroid Signal to Enhance Crop Yield. Front. Plant Sci. 11, pp.

[22] Munns, R. 2002. Comparative Physiology of Salt and Water Stress. Plant, Cell & Environment, 25, 239-250.

[23] Narrator Khazaa Mahmoud and Khalafallah Abdulaziz Mohammed (2000), Designing and Analyzing Agricultural Experiments. " Ministry of Higher Education Scientific Research Iraq.

[24] Pallardy , S. G. 2008. Physiology of woody plants. Plant hormones and other signaling molecules. 3 rd Ed. Academic Press an imprint of Elsevier. .377

[25] Peter, K. V. (Ed.). (2006). Handbook of herbs and spices: volume 3.Woodhead publishing.

[26] Rademacher, W. (2015). Plant growth regulators: backgrounds and uses in plant production. J. of plant growth regulation, 34(4): 845-872.

[27] Swamy, K. N., Rao, S. S. R. (2011). Effect of brassinosteroids on the performance of coleus (Coleus forskohlii).

J. of herbs, spices medicinal plants, 17(1) 12-20.

[28] Wang, Q., Yu, F., Xie, Q. (2020). Balancing growth and adaptation to stress: Crosstalk between brassinosteroid and abscisic acid signaling. Plant, Cell Environment, 43(10) 2325-2335.

ISSN 2072-3857