International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 2s, 2025
https://www.theaspd.com/ijes.php

Effect of Soaking with increasing concentrations of glutamic acid on some phenotypic traits and yield of flax plant Linium Usitatssimum

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Abstract
The experiment was applied in the botanical garden for science department/collage of Basic Education AL-Mustansiriya University in the winter season for the year 2023-2024 to study the effect of soaking periods by increasing concentrations of glutamic acid on the phenotypic characteristics and yield of flax where it was plant in experimental units of (27) units a cope with the design of randomized complete blocks (R.C.B.D) the experimental transactions where are as follow: Soaking periods (8.16.24) hours while the concentrations of glutamic acid were (0,100,200) mg.L^{-1} to study the following traits ((plant height, number of branches, number of Capsules weight of 1000 seeds, percentage of oil , oil yield)). The results showed clear significant differences for the studied characteristic at a soaking period of 24 hours, it showed highest results compared to the control transactions. The percentage of increase for each characteristic as follows (59.4%, 117.8%,71.9%) percentage of oil 100.5%, oil yield 163% except for the weight of 1000 seeds, which was exceeded by period of 16 hours was increase rate about (58. 4 %) As for the factors of seeds with glutamic acid , It showed the highest average of the studied features when the seeds soaking with concentrations of 200 mg. L^{-1}. The rate of increasing percentage was clear according to the order of characters (37.6% , 97.3% , 96.1%, 87.6%, 142.7%,95%) compared to soaking with distilled water . However , when studying the interactions between the soaking period and glutamic concentrations , no appear any difference on the studied characteristics except for the percentage for the percentage for the oil 402% over the rest of factors .
Key words : Flax , amino acids , soaking periods , morphological , oil yield .

INTRODUCTION :-

Flax is an annual her baceous plant from the linaceae family that has been of great importance since the earliest civilizations, as it played role in daily life , medicine and religious specially among the Egyptians [1] The plant distinguished by containing high rate percentage of protein , the seed content is estimated according to previous studies about (30 – 30%) in addition to the rate of oil is very high in one seed almost (45 -35%) The importance of the protein present varies according to the amino acids of which it is composed because it contains more than one type of proteins , most of which are suitable for human use, [2]The oils found in flax a high rate from linolenic acid , which is edible because it contains a high percentage of omega [3]suffering from strokes , heart diseases and Cancer also it has been used as a topical treatment such as medical vapors, [4]As a result of the decline in its production in few years ago It leads to thinking by scientists to increase production .One of the methods is soaking before planting in order to soften the outer layer of the seed , leading to growth stimulation and acceleration germination .[5] It also been shows that some amino acids have an effect on the plant , including glutamic acid ,which is composed of ketoglutrate in the krebs cycle , which is the basic for some glutamic acids such as , arginine and pro line which contribute to making protein. [6,7]considered a neutral growth regulator for the cell cytoplasm also have a great role in production of chlorophyll and carbohydrate synthesis .[8] Also plays great rolein balancing nutrients in the cells of plant tissues , as it works to in crease their absorption . [9]Also the mino contributes to improving physiological characteristics ot the plant and increasing Its oil components [10]Also works to active the synthesis of prolione which help the plant for water stress tolerance that is exposed[11] .

"MATERIALS AND WORKING METHODS"

The experiment was applied in the botanical garden at the department of sciences , college of Basic Education ,Al-Mustansiriya University for agricultural season 2023-2024 after preparing and cleaning the soil and adding the nessary fertilizers before plating flax seeds were soaked for different periods with

increasing concentrations of glutamic acid at a rate of (8,16,24) hours with concentrations (0,100,200) mg.l of amino acid . It used randomized complete block design (R.C.B.D) used with three replicates for each factor where the final number was (27) experimental units with an area (1*1) m^2 for each unit . The planting was taken care of the plants and remove the bushes , and germination took place after about (5-7) days of planting . Three random samples where taken from experimental unit to study the following **characteristics :-**

1. Plants height : It is measured from the soil surface to the highest peak in plant .
2. The number of branches:- The branches are calculated for three samples of the maturity stage .
3. Number of capsules in each branch.
4. Weight of 1000 seeds .
5. Percentage of extracted oil %[sample weight before washing – after washing / sample weight before washing]*100
6. Oil yield : oil percentage *seed yield (kg) .

The result are then analysis by using the Gestate program and the averages are compared to select the lowest at the significant level of (0.05) Glutamic acid was prepared by adding (1)g from acid powder to (1000m.l) from distilled water and mix it well. Then ,100ml of the prepared solution was taken and supplemented to 1000 ml with distilled water to obtain a concentration of (100 $mg.l^{-1}$) . Then , 200 ml of the prepared solution and supplemented to (1000 ml) of distilled water to obtain a concentration of 200$mg.l^{-1}$ from glutamic acid.

DISCUSSION OF RESULTS

1. Plant height : cm

The result of table (1) regarding the effect of the experimental factors on plant height that recorded clear significant differences about a plant height depending on the soaking duration . The highest altitude was given at a soaking period (24hours) which gave a hright of (88.0) cm compared to the shortest duration , which gave (55.22) with a clear increase rate about (59.4%) .

The differences were also significant when the concentrations of soaking glutamic acid differed , where the highest rise was recorded where soaking with concentration of(200 $mg.l^{-1}$) give (87.4cm) compared to distilled water soaking so it gave (63.5 cm) with a clear increase in the effect of amino acids almost (37.6%).

These results were consistent in (12) , which recorded the effect of soaking with amino acids for wheat plant.

The reason for this was due to the increase in division in plant cells , tissue growth and photosynthesis activation, which led to increase plant height .

However the overlap between the two factors not show any significant differences in means at the level of error (0.05)

Table no(1) indicates the effect of soaking periods and glutamic acid Plant height flax plant

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	43.1	57.1	65.6	55.2
16	73.1	56.3	97.1	75.5
24	74.2	94.2	99.6	88.0
Lsd	24.57			14.19*
Average	63.5	67.9	87.4	
Lsd	14.19*			

2.Number of branches / plant

During studying the effect of the experiment on the number of main secondary branches, It was shown in table no (2) There are significant differences in the number of branches when soaking flax seeds before planting .

Show the heighest average number of branches was recorded during the soaking for (24 hours) was recorded as (24.4) branches / plant , while lowest number of branches recorded when soaking for 8 hours about recoded as as11.2 branches /plant with increase rate about 117.08% of a significant differences

when treating with increasing concentration of glutamic acid, where the heighest average number of branches was recorded of a concentrations of (200 mg.l^{-1}) .
Which gave 24.3 branches / plant compared to the factor with distilled water only , which gave 12.3 branches /plant an increase of approximately (97-3%) .
The reason for the increase in the treatment with glutamic acid is due to the effect of amino acids that increase seed germination and root formation that obserb nutrients in the soil and increasing the number of leave [13]as interaction between the soaking and glutamic acid factors , no significant differences were shown in the calculation average.
Table no (2) shows the effect of soaking duration and glutamic acid concentrations on the number of flax branches, branch/plant

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	5.0	11.0	17.67	11.22
16	16.33	20.33	26.67	21.11
24	15.67	23.0	28.67	24.44
Lsd	2.83			1.63*
Average	12.33	18.11	24.33	
Lsd	1.63*			

3.Number of capsules

Table number (3) shows the effect of soaking periods on the number of capsules on flax plant , where the highest number of capsules when soaking the seeds for 24 hours which gave 21.7 capsules while the lowest average when soaking for 8 hours which gave 12.6 capsules with an increase rate of approximately 71.9% .It was also affected when the seeds were treated with glutamic acid before planting , it was applied at increasing concentrations, giving the heighest number of capsules when soaking at a concentration of 200 mg.l^{-1} which recorded 23.1 capsules, compared to soaking with distilled water, which gave the lowest average number of capsules , 11.7, with clear increase rate of approximately (96.1%),.
The increase in the number of capsules when soaking the seeds for 24 hours which gave 21.7 capsules while the lowest average number when soaking for 8 hours which gave 12.6 capsules with an increase rate of approximately 71.9%.
It was also affected when the seeds were treated with glutamic acid before planting , it was applied at increasing concentrations ,giving the heighest number of capsules when soaking at a concentration of 200mg.l which recorded 23.1 capsules , compared to soaking with distilled water ,which gave the lowest average number of capsules ,11.7 ,with clear increase rate of approximately (96.1%) , the increase in the number of capsules when soaking with glutamic acid due to the fact that soaking with amino acids increases the permeability of membranes , and increases the absorption of nutrients , and activates the enzymes oxidase , phosphatase and phospholipase [14] when studying the effect of interaction between the number of soaking hours and glutamic acid concentrations on the number of capsules per plant , on significant differences appear at the error level of 0.05 per plant.
Table No (3) shows the effect of soaking periods and glutamic acid concentrations on the number of Capsules branches of the flax plant.

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	7.33	12.00	18.67	12.67
16	14.67	19.33	23.33	19.11
24	13.33	24.67	27.33	21.78
Lsd	3.40			1.96*
Average	11.78	18.67	23.11	
Lsd	1.96*			

4.Weight of 1000 seeds g

Table No (4) showed a significant effect of soaking periods on the weight of 1000 seeds from the flax plant where the heighest weight was recorded when soaking for (16) hours, the Weight was (16.8 g) while

the lowest number was given when soaking for only (8 hours), (10. 69) with increasing percentage (58-4%) , also the effect of soaking was shown with increasing concentrations of glutamic acid on the weight of 1000 seeds of the mentioned plant where the heighest weight was given at a concentration of 200 mg/L^{-1} (18-9) g , while soaking with distilled water the lowest weight for 1000 seeds which gave (10.6)g with an increase Average about 87.6% .

An increase in the number of capsules led to an increase of weight of 1000 seeds due to an increase of activity of enzyme and increase the process of photosynthesis in the plant [15] As for the interaction between the soaking time factor and the soaking with concentrations of glutamic acid no clear significant differences.

Table No (4) shows the effect of soaking periods and glutamic acid concentrations on of theWeight of 1000 seeds g flax plant.

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	6.19	10.49	15.22	10.63
16	13.41	16.86	20.33	16.87
24	10.60	12.73	21.16	14.83
Lsd	2.05			1.18*
Average	10.07	13.36	18.90	
Lsd	1.18*			

5. Oil percentage :

when studying the percentage of oil in flax seeds. Table No (5) showed a significant effect of soaking periods on the mentioned trait, as it showed the heighest percentage of oil at a soaking period o f(24) hours, giving (15.9%) while soaking for 8 hours, which is the minimum period studied record the lowest oil percentage (7.9) with an increase rate of (100.5%) also, significant differences were recorded when studying the effect of glutamic acid on the percentage of oil, where the heighest percentage was recorded at 200 mg/L which gave (18.2%)g while soaking in with distilled water which recorded
(7-5%) with a high increase rate of about (142.7%) when studying the interaction between soaking period and glutamic acid concentrations, significant differences were shown where as interaction was recorded between the soaking period of (24) hours at a concentration of (200 mg/L^{-1}) with high rate of oil compared to control Samples, an increase of approximately 40.2%.

the reason of this increase belog to soaking the seeds in mino acid leads to plant growth and its impact on many vital and metabolic processes of the plant, including protein building and the formation of oils and carbohydrates. [16]

Table No 5 shows the effect of soaking periods and glutamic acid on the Oil percentage of the plant

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	4.59	8.37	10.92	7.96
16	8.82	16.89	20.84	15.51
24	9.19	15.62	23.08	15.96
Lsd	2.61*			1.51*
Average	7.53	13.63	18.28	
Lsd	1.51*			

6. Oil yield

Table (6) showed significant differences in oil Yield when soaking seeds before planting. where the highest average oil yield recorded when soaking seeds for (24 hours) before Planting (21.3 ml) of oil compared to soaking for only 8 hours which gave 8.1mL an increase about 163% also significant differences when soaking with increasing Concentration of glutamic acid, where the highest average oil yield was given at a concentration of 200 mg/l^{-1} which recorded (21.7ml), compared to soaking with distilled water ,which recorded the lowest oil yield (11.1 mL) an in crease to (95%) as for the .

Interaction between soaking duration and glumatic Concentrations no significant differences were found in the average oil yield .

Table No 6 shows the effect of soaking periods and glutamic acid on the oil yield of the plant

Duration of soaking	Glutamic Acid (mg L^{-1})			Average
	0	100	200	
8	4.53	7.42	12.36	8.10
16	13.89	18.18	25.33	19.13
24	15.00	21.38	27.54	21.31
Lsd	2.89			1.66*
Average	11.14	15.66	21.74	
Lsd	1.66*			

CONCLUSIONS:

The experiment showed the effect of soaking periods with increasing concentrations of glutamic acid some phenotypic and yield characteristics of the flax plant.

This experiment showed that soaking has a significant effect on plant before planting whenever the longer the soaking period.

The better the plant Charactenstic.

This is because soaking Softens the plant germination Layer which leads to allow's for increased permeability of the germination and to increase absorption of nutrients and elements from the soil.

It also speeds up the germination rate of the plant and the formation of the root - In addition, adding glutamic acid to soaking at increasing concentrations and activated the plant growth and speed up photosynthesis processes and activate enzymes that control plant growth and protein synthesis and vegetable oils.

However when studying the interaction between soaking hours and glutamic acid concentrations.

No significant differences were found for the plant.

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