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Effect Of Fertilization Methods And Types Of Irrigation Water On Germanium Plant Growth

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Abstract:

A factorial experiment was carried out in one of the private nurseries to study the effect of fertilization method and type of water irrigation on vegetative and flowering growths of two classes of the geranium plant. Three factors were used in this experiment, the first factor includes the classes of the plant (white and red flowers) while the second factor was used three different methods of fertilization (leaves spraying fertilization, soil fertilization, water fertilization), the third factor included using four types of irrigation water (tap water magnetic treated water with the power of 500 gauss, salted water, and raw water). The treatments were replicated three times at a factorial experiment by using full randomization design (CRD) by used two pots for every replicated, the least significant difference (L.S.D) at 0,05 level applied in data analyses .result shared no significant difference between plant classes in vegetative growth specification (high of plant leaf area) while there is a significant difference in all studying flower growth while the leaf fertilization, leaf irrigation and leaf magnetically treated irrigation treatment was significantly superior on all treat studying (result also showed that the fertilization with irrigation water and salty water at least effect compare with others treatment all studied.

Keyword: Geranium, fertilization methods, magnetically treated water types of irrigation water.

Introduction:

Germanium plant (pelargonium grandiflorum L.) belongs to Geraniaceae family, it's every green herbal plant, the native land is south Africa and superior in high growth (abo zaid 2000) also, the plant has () high 20 – 40 cm .also, germanium is a branched plant, the stems and branches has covered by smooth hair and preferred planting in wet, shaded places (board,2001).In addition, the plant either be stand-alone or purlins, also it has fleshy supplies branches in differences in color and shapes depend on class and varieties, most of them have a rounded shape and serrated edge tends to redness (Al Thabaa et al ,2004), (Abo Zaid ,2002).In general, flowers can be single or in inflorescence, it has a big volume and almost appear over the year. (Richard,2004), In fact, the germanium plant has considered as a high commercial value and mostly used for decorating the balcony, windows and sinks

(Hajah,2020), also distinguished in medical and pharmaceutical importance, so leaves powder has used to produce the human body from stinging insect bites besides, using plant leaves to the treatment of rheumatic diseases (Elona,2010), also it has used for treat diarrhea, ulcers and strengthening the human immune system (Bertin,2001).

Mineral fertilization has been played a big role in increasing agricultural production especially in poor soil of several feed elements that has plant needs them. It's necessary to take advantage of all the available elements for all plant by following the best fertilization methods especially it combined with water irrigation type (Auda & Simsim,2011).

Materials and methods

This research was conducted in one of the private nurseries for the period of march to august 2020 to study the effect of differences in fertilization methods and water type on plant vegetative and of flowering on two glasses of germanium which has red and Waite flower compound big flower.

Seeds were cultivation on 8/3/2020 in cork plate which full up in agricultural (peat moss) (table 1), after 40 days from seeding when seeds germinated and appeared in 3-4 perfect leaves it was separated and planted in plastic pots within 24 cm diameters size by one plant in one pot, the pots were full up in soil media (river sand and peat moss) in 1:2 rate (Kadim ,2011), (Kadim, et al,2020). After 15 days seedling was treated by spraying compound fertilizer until initiative leaves get wet by using a manual sprayer in the early morning in three times by one month between a last and another treatment besides addition soil and irrigation fertilizer in the same time, this experiment was designed by using random complete design (CRD) in thee replications for every treatment, every replicate was included two pots, finally, the results analyzed by used the least significant differences (LSD) at 5% probability level (Almohamady,2000).

The first factor was related to germanium planting type, while the second factor was using three methods of fertilization (leaf spraying, magnetically treatment water in the power of 500 Kaus and salty water which milted sodium chloride in it at a concentration of 3 desmans and row water gets from nearly channel of the nursery).

Table 1 peat moss physical and chemical properties

Met media	Mgo 5%	K_2O %	P_2O_2 %	N.P.K 24-14-12	E.C	PH	Ammonium	Nitration N
175 ml	28	240	140	1000 mg/kg	4.2	6:00	50 gm/kg	70 gm.kg

Treat studying was include:

1st: vegetative treatments: it was included: -

1 – plant high (cm): - it was measured by using a metric ruler in a time of full flowering from the soil to the up of the plant.

2 -leaf area (cm^2):- measured when the plant reaches the full flowering in 2.8 – 2020 by using Plano meter in an average of 3 leaves from every plant of every pot in one replicate in the random selection and calculate the leaf area (Al.maamori – 2009)

3 -flowering treats full: it was measured after the plant flowering specifically in med of July until 30th and it was included: -

1 – number of flowers in inflorescences (plant-1)

2 – number of inflorescences (plant-1)

3 inflorescences diameter (cm)

4 – length of flowers pedicel (cm)

Results and discussion

Vegetative growth indicators.

The result showed in tab.(2) there are no significant differences between the classes in high leaf plant treatment so there are no significant effects in this treat, the white class has registered an average of 46 – 81 cm while and the red class vegetative achieved (46.61) cm .As for fertilization methods, it was registered a significant difference, leaf fertilization achieved a significant difference compared with fertilization by water it was (44.67) cm. Also, water type has a significant effect on this treat methods, the magnitude and treatment of irrigation water changed superior in all treatment, achieved a higher average, it was (60.28) cm compared to the salty water it was registered(33.67) cm.

The result in table (2) showed a significant differences in plant high as a result of overlap of class and fertilization method ,(red class and leaf fertilization)has a significant responded by registered a high value (48.33)cm . (red class, fertilization method with irrigation water) registered a low value of (43.83)cm. There is a significant increasing because of the class and type of water overlap as registered the white class and magnetically treated water high value (60.78) cm that it superiority of all overlap treatments , expect the overlap of the (red class and magnetically treated water) while the red class and salty water treatment achieved a lower value in high leaf plant as registered a (32.67) cm. The result in table (2) also showed a significant increase in high of plant a occurred by an overlap between all of the treatments , so the overlapping treatment (red class leaf fertilization and magnetically treated water irrigation) achieved a significant effect of (63.3) cm, while the overlapping treatment (red class, leaf fertilization, salty water irrigation) achieved lower average in this treatment as registered (32.00) cm.

Table (2) effect of fertilization and water type on plant height (cm) for two classes of Geranium

class	Fertilization method	Water type				Class x fertilization method
		Tap water	Salty water	Salty water	Row water	
Wait class	Leafs	52.67	62.33	36.33	42.00	48.33
	Soils	51.33	60.67	34.33	40.00	46.58
	Water	50.67	59.33	32.67	39.33	45.50
Red class	**Leafs**	54.67	63.33	32.00	37.00	64.75
	Soils	52.00	59.33	34.00	39.67	46.25
	Water	48.67	56.67	32.67	37.33	43.83
4.667 – 0.05 L.S.D.						2.334
Class X water type						Class
Wait class		51.56	60.78	34.44	30.44	64.81
Red class		51.78	59.78	32.89	38.00	45.61
4.667= L.S.D.						N.S
Fertilization method X Water type						Fertilization methods
Leaf		53.67	62.83	34.17	39.50	47.54
Soil		51.67	60.10	34.07	39.83	46.42
water		49.67	58.00	32.67	38.33	44.67
3.300 - 0.05 – L.S.D.						1.650
Water type		51.67	60.28	33.67	39.22	
0.05 L.S.D.		1.905				

The result indicates in the table (3) there are no significant differences between classes in leaf area treatment, so there is no effect of research treatment, the white class stood (41.63) cm^2 and (40.94) cm2 for the red class. In addition, the fertilization method was registered a significant difference in leaf area, so the leaf fertilization superior to the other fertilization methods as achieved a high value (42.83) cm^2 compare with water fertilization that it amounted to(39.90) cm^2 , also the type of water irrigation has a significant effect by

using the magnetically treated water irrigation method, it was superior on all treatments as achieved (48.92) cm^2 compare with salty water irrigation that is registered (34.37) cm^2.

The result showed there is a significant effect in the treatment because of the overlap between class and fertilization methods. So, the overlapping treatment (white class and leaf fertilization) achieved a significant increase in plant leaf area by registered (43.24) cm^2 in the same time the overlapping treatment between (red class fertilization method and irrigation water type) registered a lower value of (39.53) cm^2. this treatment has achieved a significant response because the overlap of plant class and water irrigation types, so the overlap of (red class and magnetically treated water) it registered a high value achieved (49.03) cm^2 so it was superior on all treatments except overlap of (white class and magnetically treated water), while registered a lower value with (red class and salty water) it was (33.84) cm^2.

Fertilization methods and water type overlap has a significant effect in (leaf fertilization and irrigation by magnetically treated water) so achieved a significant effect by registered a high value it was achieved (50.76) cm^2 compare with fertilization and irrigation water, salty water) overlap treatment it was got a lower value of about (34.04) cm^2. Also, the result showed a significant increase in leaf area that results by triple overlap (red class, leaf fertilization and magnetic irrigation water treated) so it was pointed to a significantly high value (50.90- 50.61)cm^2 sequentially, while the overlap of (red class leaf fertilization and salty water irrigation) registered a lower value as (33.28) cm^2 .

Table (3) effect of fertilization and water type on leaf aria (cm^2) for two classes of geranium

class	Fertilization method	Water type				Class x fertilization method
		Tap water	Magnetically water	Salty water	Row water	
Wait class	Leaves	46.23	50.61	35.92	40.21	43.24
	Soils	43.37	49.04	34.80	38.29	41.38
	Water	43.66	46.79	33.99	36.63	40.27
Red class	**Leaves**	45.21	50.90	33.28	40.29	42.42
	Soils	43.19	49.89	34.15	36.40	40.91
	Water	42.26	46.30	34.10	35.46	39.53
3.542– 0.05 L.S.D.						1.771
Class X water type						Class
Wait class		44.42	48.82	34.90	38.38	41.63
Red class		43.55	49.03	33.84	37.38	40.95

2.045– 0.05 L.S.D.					N.S
Fertilization method X Water type					Fertilization methods
Leaf	45.72	50.76	34.60	40.25	42.83
Soil	43.28	49.47	34.48	37.34	41.14
water	42.96	46.55	34.04	36.05	39.90
2.505 - 0.05 – L.S.D.					1.252
Water type	43.99	48.92	34.37	37.88	
0.05 L.S.D.	1.446				

Flowering growth indicators

Results in table (4) shows the significant differences between the two classes In flowering inflorescence, the research treatment was a significant affected in flowering growth indicators, the wait class reached (2.056) inflorescence and superior on the red class that it reached an average of (1.833) inflorescence, besides the fertilization method was getting a significant difference, so the leaf fertilization achieved a significant superior compare with irrigation water method, it was registered high value (2.125). Inflorescence without no significant affected differences with soil fertilization method in the same time , fertilization with irrigation water registered a lower value in this treatment (1.792) inflorescence.

There was a significant effect for water tap treatment so, the magnetically treated water has superior on all treatments by registered a high value it was (2.944) inflorescence compare with salty water irrigation treatment that it was registered (1.056) inflorescence. As well the overlap of class and fertilization had significant increasing inflorescence too , the treatment of (white class and leaves fertilization registered a high value it was reached (2.417) inflorescence , while the overlap of (red class and water fertilization method) registered a lower value it was (1.667) inflorescence. In addition, there was a significant response (white class and mantic water treated irrigation) that had registered (3.00) inflorescence, while the treatment of (red class and irrigation by salty water registered (1.00) inflorescence. The overlap of fertilization method and water type had a significant effect in (leaves fertilization and irrigation by magnetically treated water) it had superior by registered a high value (3.33) inflorescence compare with overlap of (soil fertilization and salty water irrigation) it got (1.00) inflorescence for both treatments.

Also the result in table (3) showed a significant increase in the number of inflorescences related to tri overlap of experiment treatments, the (white for class, leaf fertilization and magnetically treated water) got a high significant value (3.667) inflorescence , while the lower value it was (1:00) inflorescence that it was achieved by a number of experiment treatments it appeared in the table (3).

Table (4) effect of fertilization method and irrigation water type on number of inflorescences for two classes of Germanium

Class	Fertilization method	Water type				Class x fertilization method
		Tap water	Magnetically water	Salty water	Row water	
Wait class	leaves	3.000	3.667	1.333	1.667	2.417
	Soils	2.333	2.667	1.000	1.333	1.883
	Water	2.333	2.667	1.000	1.917	1.917
Red class	**leaves**	2.000	3.000	1.000	1.333	1.833
	Soils	2.000	3.333	1.000	1.667	2.000
	Water	2.333	2.333	1.000	1.000	1.667
0.798 – 0.05 L.S.D.						0.399
Class X water type						Class
Wait class		2.556	3.000	1.111	1.556	2.056
Red class		2.111	2.889	1.000	1.333	1.833
0.461 – 0.05 L.S.D.						0.230
Fertilization method X Water type						Fertilization methods
Leaf		2.500	3.333	1.167	1.500	2.125
Soil		2.167	3.000	1.000	2.333	1.917
water		2.333	2.500	1.000	1.333	1.792
0.564 - 0.05 – L.S.D.						0.282
Water type		2.333	2.944	1.056	1.444	
0.05 L.S.D.		0.326				

Results in the table (5) showed significant differences between the two classes in the number of flowers in one plant. The experiment treatments had significant effected in flowers number , so the red class reached (16.17) flowers and superior on the white class which is registered (12.42) flowers also there where a significant differences in this

treatments , in addition the leaf fertilization achieved a significant superior compare with irrigation water fertilization which it registered a high value (15.00) flowers , while the water fertilization registered (13.58) flowers, besides the type of irrigation water has been a significant effected by registered high value of magnetically treated water irrigation achieved (17.50) flower compare with salty water irrigation which is registered (11.06) flowers, on the other side the class and fertilization overlap treatment had a significant effected in the red class with leaves fertilization method by registered (16.83) flowers as a high value , while the overlap of (white class fertilization and irrigation water type) which registered a lower value (11. 667) flowers.

The overlap of class and water irrigation type pointed to a significant response, so the overlap of (red class and irrigation by magnetically treated water) achieved a high average (20.67) flowers while the lower average has achieved in the overlap of (white for class with salty water irrigation) it was got (9.44) flower .Also, the overlap of fertilization method and water type has significant effect accrued in (fertilization with irrigation water and irrigation by magnetically treated water) it was achieved a significant superior by registered (18.50)flower as a higher number of flowers compare with (irrigation water fertilization a salty water irrigation) which got (10.50)flower.

Also, the results in a table (5) showed a significantly superior number of flowers in inflorescence magnetically water treated because of tri- overlap (red class, leaf fertilization and magnetically treated water) overlap got the highest average reached (21.33) flower, while the lowest average achieved in the overlap of (white for class, fertilization with irrigation water and salty water irrigation) it was registered (8.67) flower.

Table (5) effect of fertilization method and irrigation water type on number offlowersinflorescence^{-1} in for two classes of germanium

class	Fertilization method	Water type				Class x fertilization method
		Tap water	Magnetically water	Salty water	Row water	
Wait class	leaves	14.33	15.67	10.00	12.67	13.17
	Soils	13.67	14.33	9.67	12.00	12.42
	Water	12.67	13.00	8.67	12.33	11.67
Red class	**leaves**	17.00	21.33	13.33	15.67	16.83
	Soils	17.33	20.33	12.33	14.67	16.17
	Water	16.00	20.67	12.67	14.56	16.17
1.668 – 0.05 L.S.D.						0.834

Class X water type					Class
Wait class	13.56	14.33	9.44	12.33	12.44
Red class	16.78	12.67	14.56	12.42	16.17
1.668 – 0.05 L.S.D.					0.834
Fertilization method X Water type					Fertilization methods
Leaf	15.67	18.50	11.67	14.17	15.00
Soil	15.50	17.33	11.00	13.33	14.29
water	14.33	16.67	10.50	12.83	13.58
2.043 - 0.05 – L.S.D.					1.021
Water type	15.17	17.50	11.06	13.44	
0.05 L.S.D.	1.180				

Results in the table (6) showed a significant increase in flower diameter, so the experiment factors affected these treatments, the red class achieved (12.19)cm as superior on the wait class which is registered (9.89) cm, also the fertilization method affected in flowers number by leaf fertilization method which reached (11.45) cm. while the irrigation treatments caused to a significant effect by used magnetically treated water which it registered a superior in all treatments by achieved (12.94) cm as a higher value of a number of flowers compared with irrigation by salty water which is registered (9.28) flower. On the other side, the overlap of class and fertilization method treatment has significantly affected in (red class and leaves fertilization) which it registered a high diameter as (12.83) cm, while the overlap of (wait class with water type irrigation) registered (9.25) cm as lower value.

Plant class and fertilization method have been a significant effect appeared in (red class with leaf fertilization) treatment which registered a high diameter (12.83) cm, while the (wait class with water type irrigation) overlap registered (9.25) cm as a lower value of flower diameter. In addition, the overlap of plant class with water type caused a significant effect, so the (red class with magnetically treated water irrigation) it was registered a high diameter (14.33) cm. On another side, lower flower diameter was registered in (wait class with salty irrigation water) at (8.44)cm while the fertilization and water type overlap was pointing to significant effect in (leaf fertilization with magnetically treated water irrigation) which registered a high value reached (13.67) cm, compare with soil fertilization and salty water irrigation which got (9.00) cm as a lower value of flower diameter for both overlap treatments .Also, results pointed a significant superior in diameter of inflorescence that caused by tri-overlap, the (red class, leaves fertilization and irrigation by magnetically treated water) it got (15.67)cm registered as a high average in flower diameter. while the

lowest average showed in (white class, soil fertilization and salty water irrigation) by registered (8.33) cm for both treatments.

Table (6) effect of fertilization method and irrigation water type on diameter of flowers (cm) for two classes of Germanium

class	Fertilization method	Water type				Class x fertilization method
		Tap water	Magnetically water	Salty water	Row water	
Wait class	leaves	10.67	11.67	8.67	9.00	10.00
	Soils	11.00	12.67	8.33	9.67	10.42
	Water	9.00	10.33	8.33	9.33	9.25
Red class	**leaves**	13.67	15.67	11.00	11.00	12.83
	Soils	14.00	14.00	9.67	11.33	12.25
	Water	12.67	13.33	9.67	10.33	11.50
1.886 – 0.05 L.S.D.						0.943
Class X water type						Class
Wait class		10.22	11.56	8.44	9.33	9.89
Red class		13.44	14.33	10.11	10.89	12.19
1.089 – 0.05 L.S.D.						0.544
Fertilization method X Water type						Fertilization methods
Leaf		12.17	13.67	9.83	10.00	11.42
Soil		12.50	13.33	9.00	10.50	11.33
water		10.83	11.83	9.00	9.83	10.37
1.333 - 0.05 – L.S.D.						0.667
Water type		11.83	12.94	9.28	10.11	
0.05 L.S.D.		0.770				

Results in table (7) clearly shows a significant increase in the length of flowers pedicel, the experimental treatment was had significantly affected this treatment, so the red class was superior on a wet class by reached (16.92)cm and (15.31)cm for white class, also the fertilization method affected on pedicel length amounted (16.92)cm and showed the only superiority on fertilization with irrigation water which it stood (14.92) cm, irrigation by different methods was significant affecting in this treatment by magnetically treated water showed the superiority of all treatments by achieved the highest average stood (19.39) cm compared with the treatment of salty water irrigation which got (13.11) cm.

Table (7) also shows the effect of overlap between class and fertilization method by registered significant differences in (red class with leaf fertilization) achieved the highest amount stood(17.67)cm, while the overlap of (wait class and irrigation by salty water) registered lowest amount stood (14.00) cm. plant class ad water irrigation type caused a significant increase in (red class with magnetically treated water irrigation) achieved the highest amount in this treatment stood (20.50)cm while the lowest amount registered in (white class with salty water irrigation) amounted (12.89) cm .

In addition, fertilization method and water irrigation type overlap achieved the significant effect in (leaf fertilization with irrigation by magnetically treated water) treatment by registered highest amount stood (20.50) cm compare with (fertilization by irrigation water with salty irrigation water) which stood (12.50) cm, also the results showed a significant difference in length of flower pedicel in tri-overlap treatment (red class with leaf fertilization and magnetically treated water) got the highest average stood (21.33) cm while the lowest amount registered in (white class with irrigation by salty water) stood (12.33) cm .

Table (7) effect of fertilization method and irrigation water type on length of flower pedicel (cm) for two classes of germanium

class	Fertilization method	Water type				Class x fertilization method
		Tap water	Magnetically water	Salty water	Row water	
Wait class	leaves	16.67	19.67	13.67	14.67	16.17
	Soils	16.00	20.00	12.67	14.33	15.75
	Water	14.33	15.67	12.33	13.67	14.00
Red class	**leaves**	18.67	21.33	14.33	16.33	17.67
	Soils	18.33	20.00	13.00	15.00	16.58
	Water	17.00	19.67	12.67	14.00	15.83

2.084 – 0.05 L.S.D.					1.042
Class X water type					Class
White class	15.67	18.44	12.89	14.22	15.31
Red class	18.00	20.33	13.33	15.11	16.69
1.203 – 0.05 L.S.D.					0.602
Fertilization method X Water type					Fertilization methods
Leaf	17.67	20.50	14.00	15.50	16.92
Soil	17.17	20.00	12.83	14.67	16.17
water	15.67	17.67	12.50	13.83	14.92
1.473 - 0.05 – L.S.D.					0.737
Water type	16.83	19.39	13.11	14.67	
0.05 L.S.D.	0.851				

Desiccation

Depending on results in tables (4-7) in this research the significant differences between plant classes related to genetic varieties for both classes, in research experiment carried out by (al-Sahoky and Dawood,2020) found the reason of leaves spraying superior related to fertilization used efficiency to avoid losing it in washing, evaporation or deposition and get plant opportunity to benefit from most spraying fertilization throw direct absorbed by plant leaves tomato which distributed on leaves and brunches besides reducing the fertilizer transfer from leaves to other plant parts, on opposite of, fertilization with irrigation water may be the reasons lost a high amount of fertilizer by deposition with excessive water for plant needs, in addition to the difficulty of conveyed fertilizer quantities to the plant (Alsayrafi, 2010)

As for superior irrigation with magnetically treated water in vegetative and flowering the reason attributed to magnetically water treated to change water physical properties it leads to reduce the density and viscosity, and surface tension, osmotic potential and improve the permeability of cell membrane by reducing of water molecules together to be arranged in one way and be more power to break through the cells wall it also increases stimulation of hormones that stimulate the growth interaction which related to metabolism operation (Dhawai and Alkha 2009) besides magnetically works on break down the water hydrogen ponds which facilitates absorption and becomes a good carrier of nutrients (lower,2005). on the contrary, this decline in vegetative and flowering growth is the result of salty water

irrigation may be attributed to direct negative effect through the osmotic effects which cause osmotic pressure increasing for soil solution as resulting from increased dissolved salts in agriculture media which leads to absorptions deficit and plants water supply (Diacano and Montemurro,2015), as plant membranes work to prevent or repelling ions entry by increasing the water salty or media growing in it, as well as its effect though ionic toxicity caused by the dissolved salts that affect in the harmonic and nutrition balance for plant (Nachshon. 2018).

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