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## EFFECT OF WATER TYPES ON SOME GROWTH PARAMETERS OF WHEAT, BROAD BEAN, BLACK PEPPER AND GARLIC PLANTS UNDER AL BAHA KSA ENVIRONMENTAL CONDITIONS.

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### ABSTRACT

Effect of water types on some growth parameters of wheat and broad bean plants was investigated at Al Baha KSA. Wheat plant irrigated with sole Zamzam or Zamzam combined with either treated-water or tap-water gave pronounced increases in percentage of seed germination, shoot length, and shoot fresh and dry weight. Variation in growth parameters within water treatments on broad bean was negligible. However, percentage of flowering broad bean plants irrigated with Zamzam was considerable high compared with other water treatments. In another experiment, It was found that black pepper germination and some plant growth parameters, were increased significantly when the plants irrigated with zamzam or zamzam water combined with tap water than the plants irrigated with sole tap water. Whereas, differences in the percentage of germination or plant growth parameters were insignificant in terms of garlic plants when subjected to any of water treatments under study.

### INTRODUCTION

It is established that water is one of the essential factor for planting. Several investigations have been focused mainly on the effects of water regime or drainage water on growth and subsequently yield of the plants (Sutcliffe, 1979). As far as literature review concern, a very few, if any research work investigated the influence of Zamzam water on seed germination and growth of the plants.

However, effect of Zamzam water on treatment of some human diseases is undertaken (Hamed et al 2009).

It is well known that Zamzam water existed from old time at Makkah in KSA since Prophet Abraham, and used for drinking. The amount of Zamzam water to consume by people visiting Makkah for Umra and Hajj is increasingly high. A considerable amount of Zamzam water goes into sewages. Therefore, the aim of this research work was to investigate the effect of zamzam water singly or in combination with either treated or tap water on percentage of seed germination and some plant growth parameter of wheat and broad bean. Both wheat and broad bean are the oldest crops as maintained in the Holly Quran "Surah Yussof part -12 and Surah Al-Baqarah part 2 ". These crops were used for human and animals diet and belong to different plant families. In previous work conducted by Hamed *et al* (2009) they found that using eight plant extracts to control skin disease in human caused by *Microsporium gallinae*. It was found that the most effective plants were black pepper and garlic. Herefore, it is suggest to irrigated both plants with sole zamzam water, zamzam water combined with tap water or sole tap water (control) in the present investigation.

## MATERIALS AND METHODS

This investigation has been carried out at faculty of community At – Baha KSA during 1428 H growing season. The experiment was design to investigate the effect of water type on percentage of seed germination and some growth parameters of wheat (cereal) and broad bean (legume). Sterilized soil (Potting soil) was placed in black plastic bags (10 cm in diameter) four seeds of wheat (*Triticum vulgare* L.) c.v. commercial or broad bean (*Vicia faba* L.) c.v. Spain were sown in each bag. Ten replicates were used for each treatment. The plants were irrigated every 48 hours intervals. The water treatments were:

- 1- Zamzam water.
- 2- Treated water.
- 3- Tap-water.
- 4- Zamzam + treated water.
- 5- Zamzam + tap water.
- 6- Treated water + tap-water.
- 7- Zamzam + treated + tap-water.

Percentage of seed germination, some plant growth parameters were recorded i.e. shoot length (cm), shoot fresh weight (g) and shoot dry weight (g) as well as percentage of flowering for broad bean after two months of sowing Physical, chemical and bacteriological analyses are listed in Appendix 1 and 2.

**Appendix (1): Physical and chemical examination of Zamzam, Treated, and tap water in Makka (KSA).**

PHYSICAL EXAM	GUDE LINE	MEAN Zamzam water	MEAN Treated water	MEAN Tap water
Odor	UNOBJECTIONABLE	normal	Unobjective	-----
Taste	UNOBJECTIONABLE	normal	Unobjective	-----
Colour	15 UNIT	normal	Normal	<15
Turbidity	UNIT	Not turbidty	Not turbidty	43.83
Sedemints		Not sedmints	Not sedmints	
pH	6.5 ----- 8.5	6.97	5.42	5.48
Conductivity NS/CM	2500 Ms/cm	1597	219	1531.5
Chemical analysis	GUDE LINE QALUZ	MEAN	MEAN	MEAN
Total hardness	UP TO 500	360.33	20	42
Total alkalinity	500 p.p.m	29.83	19.67	38.32
Calcium	200 p.p.m	112.17	4.62	12.45
Magnesium	150 p.p.m	22.45	2.26	33.45
Potasium	20 p.p.m	38.83	0.00	015
Sodium	200 p.p.m	53	0.00	5.9
Iron	0.3 p.p.m	0.0015	0.02	0.77
Copper	1.0 p.p.m	24.32	0.05	0.079
Chlorides	250 p.p.m	175.01	9.88	167.58
Florides	0.8 p.p.m	0.82	0.00	0.37
Nitrate	44 p.p.m	97.9	0.18	1.20
Nitrite	0.1 p.p.m	0.279	0.004	0.005
Sulphat	400 p.p.m	270.42	0.00	2.12
Ammonia	0.05 p.p.m	0.0013	0.002	0.10
Zinc	15 p.p.m	0.13	0.003	0.703
Lead	0.05 p.p.m	0.002	0.006	0.022
Manganese	0.3 p.p.m	<0.07	<0.07	<0.07
Cadmium	0.01 p.p.m	<0.025	<0.025	<0.025
Chromium	0.5 p.p.m	<0.13	<0.13	<0.13
Bicarbonates	450 p.p.m	388	46.67	61.76
Suspended solids	0.25 p.p.m	0.233	0.03	37.67
Total dissolved solids(T.D.S)	1500 p.p.m	781	7.33	56.5

**Appendix (2): Bacteriological Report of water specimens**

Species	Treated water	Tap water	Zamzam water
Escherichia coli	No growth	No growth	No growth
Shigella	No growth	No growth	No growth
Salmonella	No growth	No growth	No growth
Vibrio cholera	No growth	No growth	No growth
Pseudomonas	No growth	No growth	No growth
Staphylococcus	No growth	No growth	No growth
Coliform	No growth	No growth	No growth

In separate experiment, commercial black pepper (*Pipper nigrum*) seeds and garlic (*Allium sativum*) bulbule were sown in sterilized soil in black plastic bags (4 seeds per bag). The plants were irrigated every two days intervals and the water treatments were

- 1-Zamzam water
- 2-Zamzam water +tap water
- 3-tap water (control)

Five replicates were used for each treatment. Percentage of germination and some plant growth parameters were recorded at the end of the experiment.

## RESULTS AND DISCUSSION

### Results

- 1- Wheat: Germination of wheat seeds was more rapid than broad bean seeds about 10 days earlier. Percentage of wheat seeds germination varied significantly ( $P=0.05$ ) among the treatment under the study. Plant irrigated with Zamzam performed the highest percentage of seed germination (87.5%), followed by the plants irrigated with mixture of tap and treated water (80.5%), as illustrated in Fig. (1).

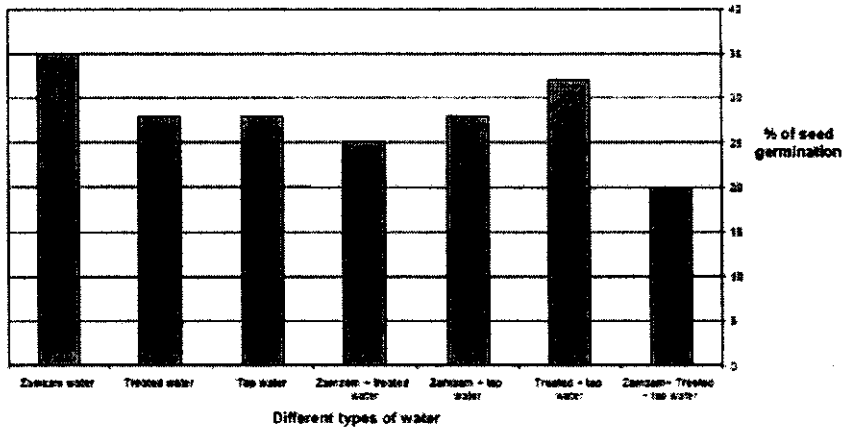


Fig (1): percentage of seed germination of wheat irrigated with different types of water

In terms of plant growth parameters, shoot length differed insignificantly ( $P=0.5$ ) within the treatments. The highest shoot length was found in the plants irrigated with mixture of Zamzam and treated water (17.39 cm) followed by plants irrigated with sole Zamzam water (17.32 cm), then the plants irrigated with mixture of Zamzam and tap water (16.24 cm), respectively as shown in Table (1).

Table (1): Effect of different types of water on shoot length (cm) of wheat plants.

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam+ treated +Tap water
shoot length(cm)	17.22	17.02	16.24	17.39	17.24	15.51	15.38

LSD at 5% N. S.

In terms of shoot fresh wheat, a high significant difference was detected among the treatments. The highest value was found in the plants irrigated with Zamzam water (4.12 g) followed by the plants irrigated with mixture of Zamzam and tap (3.60 g) and that irrigated with mixture of Zamzam and treated water (3.49 g). Nevertheless, the lowest value of shoot fresh weight was detected in the plants irrigated with either treated water (2.23 g) or tap water (2.58 g) Table (2).

**Table (2) Effect of different types of water on shoot fresh weight (g) of wheat plants.**

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam+ treated +Tap water
shoot fresh weight	4.12	2.23	2.58	3.49	3.60	3.43	3.60

LSD at 5% 0.04

The highest shoot dry weight was found in the plants irrigated with Zamzam water (1.93 g), followed by plants irrigated by mixture of Zamzam and treated water (1.25 g). Whereas, the lowest value was recorded in plants irrigated with tap water (0.62 g), Table (3).

**Table (3) Effect of different types of water on shoot dry weight (g) of wheat plants.**

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam+ treated +Tap water
shoot dry weight (g)	1.93	0.70	0.62	1.25	0.90	0.84	0.92

LSD at 5% = 0.08

2- Broad bean: Data illustrated in (Fig. 2) demonstrated percentage of faba bean seed germination. No significant differences among the treatments under study were found. In regards to growth parameters of broad bean, a significant differences ( $P=0.5$ ) among the treatments in shoot length was found,

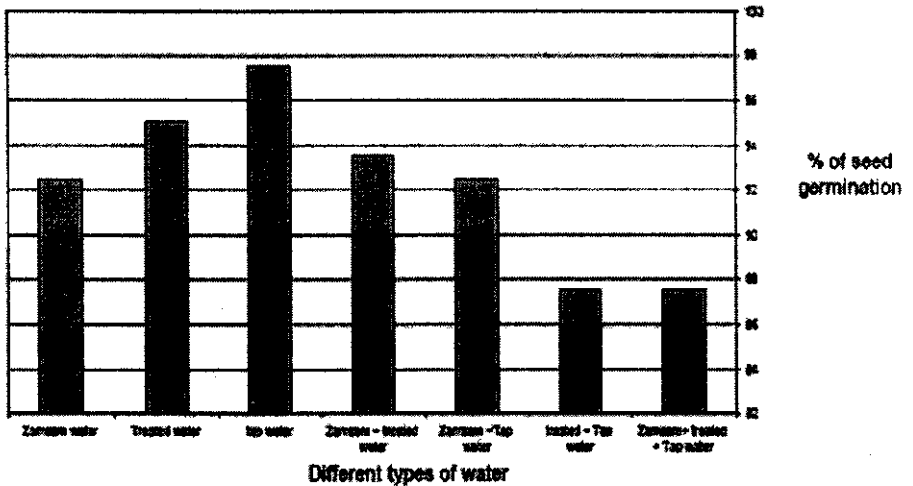


Fig (2): percentage of seed germination of broad bean watered with different types of water

(Table, 4). However, the highest shoot length was recorded in the plants watered with tap water (25.40 cm), followed by the plants watered with treated water (24.80 cm) then the plants watered with mixture of Zamzam and treated water (24.70 cm). No significant differences were found among the treatments in terms of shoot fresh weight,

Table (4): Effect of different types of water on shoot length (cm) of broad bean plants.

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam+ treated +Tap water
shoot length (cm)	22.60	24.80	25.40	24.70	23.60	20.90	19.90

L SD at 5% 5.16

(Table -5). However, the highest value was detected in the plants irrigated with tap water (31.38 g) followed by the plants irrigated with mixture of Zamzam and tap water (30.66 g) and the plants irrigated with Zamzam and treated water (30.31 g). Concerning shoot dry weight

**Table (5) Effect of different types of water on shoot fresh weight (g) of broad bean.**

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam + treated + Tap water
shoot fresh weight (g)	27.43	28.67	31.38	30.31	30.66	30.33	30.57

LSD at 5% N.S

(Table -6), the highest value was recorded in the plants irrigated with tap water (5.98 g), followed by plants irrigated with Zamzam (4.89 g). Data illustrated in (Fig. 3) demonstrated percentage of flowering in broad bean plants. The highest percentage of flowering was shown in the plants irrigated with either Zamzam or mixture of Zamzam and treated water (35.0 %). followed by the plants irrigated with treated and tap water (30.0 %).

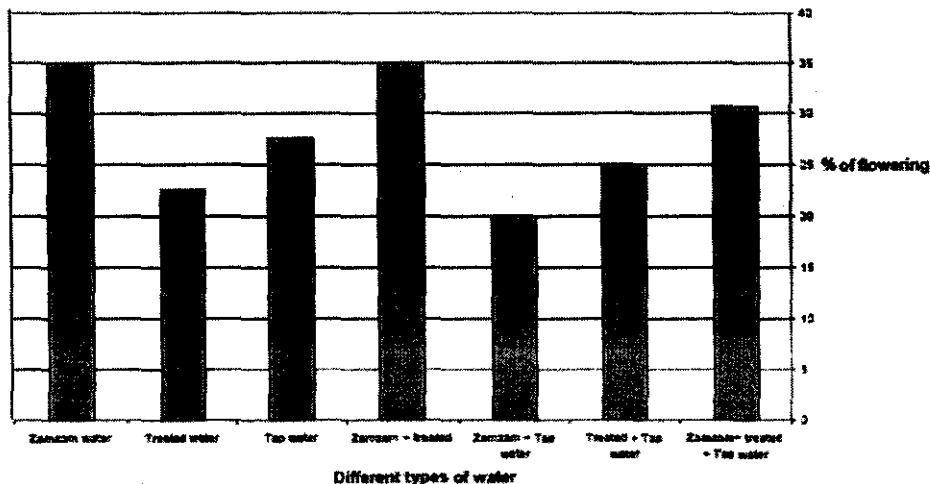
**Table (6): Effect of different types of water on shoot dry weight (g) of broad bean.**

Water type	Zamzam water	Treated water	Tap water	Zamzam + treated water	Zamzam + Tap water	Treated + Tap water	Zamzam+ treated + Tap water
shoot dry weight(g)	3.89	3.96	5.98	4.24	3.98	4.45	4.02

LSD 5% N.S

Percentage of black pepper and garlic were tabulated in table (7). A significant increase ( $P \leq 0.5$ ) in the percentage of germination of black pepper seeds irrigated with either zamzam water or zamzam water combined with tap water than that irrigated with sole tap water (control). However, differences among water treatments under study in the percentage of germination of garlic were insignificant.





**Fig (3):** Effect of different types of water on flowering % of broad bean plants

**Table (7):** Effect of type of water on plant growth parameters of garlic plant.

Water type	shoot length (cm)	root length (cm)	shoot fresh weight (g.)	root fresh weight (g.)	shoot dry weight (g.)	root dry weight (g.)
Zam zam water	14.25	8	1.7	3.5	0.27	1.76
Zam zam+ tap water	10.00	5	0.4	2.3	0.14	0.80
Tap water	9.25	5	0.4	2.3	0.11	1.52
L.S.D at 5%	N.S	N.S	N.S	0.2	0.01	N.S

In terms of plants growth parameters, a remarkable increases in both shoot and root length and fresh weight of black pepper irrigated with zamzam (sole or combined with tap water) than the plants irrigated with sole tap water was found in table (8).

**Table (8): effect of type of water on plant growth parameters of pepper.**

Water type	shoot length (cm)	root length (cm)	shoot fresh weight (g.)	root fresh weight (g.)	shoot dry weight (g.)	root dry weight (g.)
Zam zam	11.25	7.50	0.97	0.27	0.10	0.10
Zam zam +tap water	10.50	6.25	0.47	0.12	0.04	0.18
Tap water	4.00	1.75	0.17	0.05	0.01	0.10
L.S.D at 5%	0.1	0.1	0.001	0.01	N.S	N.S

Nevertheless, no obvious effect of any water treatments under study was shown on plant growth parameters of garlic was detected table (7).

### Discussion

The obtained results clearly demonstrated that wheat plants irrigated with sole Zamzam water or Zamzam combined with either treated or tap water gave high percentage of seed germination and an obvious increase in plant growth parameters. On the other hand, broad bean -unlike wheat irrigated with Zamzam water did not improve plant growth parameter compared with other types of water. However, flowering percentage status was improved in broad bean treated with Zamzam water. It is known that tap water- in general - affects all aspects of plants physiological process. These including seed germination, leaf expansion, maintenance of leaf area, stomata status, photosynthetic rate and flowering as well as grain production (Day and legg, 1983). The variations between water treatments with Zamzam and often water types on wheat plant growth may be attributed to the physical and chemical analysis of the water used. It is well established that the mineral elements essentials for the successful development of wheat and /or broad bean are not very different from those of any other plant (Peat, 1983). However, most of the detailed work on minerals metabolism has been restricted to a few of the micronutrients and heavy elements. Thus the dramatic reduction in meristem activity following some mineral deficiency were reported by Slack and Whittington (1964) and found to be associated with reduction in cell division and extension, probably caused by

abnormalities of cell wall synthesis and growth rather than by interference with mitosis parse. Accordingly, the chemical analysis of the water used. Appendix (1) demonstrated that Zamzam water contained a considerable amounts of elements than that found in treated or tap water i.e. total hardness, calcium, magnesium , potassium , copper , chlorides, nitrate , bicarbonate , and total dissolved solids (T.D.S). Whereas, iron, ammonium, and lead were exist in Zamzam water with less amount than that in tap and treated water. These elements contents in Zamzam water may be responsible partly to the increase in plant growth of wheat compared with tap/or treated water.

Also, the physical analysis of water used indicated that zamzam water is not sediment unlike tap water. Moreover, the most striking differences were conductivity. The conductivity of zamzam water was 5 and 3 fold of that in treated and tap water respectively. On the other hand, the biological analysis of the water types used(Appendix-2)revealed that no differences among treated,tap or Zamzam water ,in terms of growth of the bacteria (*Escherichia coli*, *Shigella Salmonella*, *Vibrio cholera*, *Pseudomonas*, *Staphylococcus* and Coliform) was detected. Therefore the impact of bacteria on seed germination, seedling damping –off, root –rot or wilt diseases of the plants as well as plant growth parameters was negligible.

The reason (s) why wheat plants were more affected by Zamzam water than broad bean plants in this investigation - is not known. Nevertheless, differences between legume (Broad bean) and cereal (wheat) in growth habits and their response to water treatment are more likely to explain partially- such differences occur. However, flowering percentage increased in broad bean plants treated with Zamzam water. These increases in flowering can attribute to forming grain and subsequently increase the total yield of crop (Alvino et al, 1982).Finally, according to the present investigation one can speculate about get benefits from the huge amounts of Zamzam water to be use in different aspect of agriculture especially in water culture technique, tissue culture droplet irrigation or sprinkler system irrigation in green house.

In the present investigation, It was found that black pepper and/or garlic showed an increases in percentage of germination and some plant growth parameters when subjected to zamzam or zamzam plus tap water over the control (tap water). meantime, the previous

work by Hamed *et al* (2009) found that eight plant extracts showed an inhibitory effects on *Microsporium gallinae* fungal growth (the causal organism of skin disease in human). Moreover, The most effective plant extracts were black pepper and garlic. Therefore, combined such finding , it can be speculate about using water zamzam which improved plant growth and subsequently their contents of such plants (black pepper or garlic) and used their extracts in controlling skin fungal disease in human caused by *Microsporium gallinae*.

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## تأثير أنواع مختلفة من المياه علي خصائص النمو في نباتات القمح و الفول البلدي والفلفل والثوم تحت ظروف منطقة الباحة بالسعودية

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تم دراسة تأثير أنواع المياه علي خصائص النمو في نباتات القمح و الفول البلدي تحت ظروف منطقة الباحة بالسعودية . أظهرت النتائج أن نباتات القمح التي رويت بماء زمزم فقط أو خليط من ماء زمزم مع الماء المحلاة أو ماء الصنبور أعطت زيادة ملحوظة في نسبة إنبات الحبوب وأطوال المجموع الخضري و الوزن الطازج والجاف للمجموع الخضري. الاختلافات بين المعاملات المائية علي نمو الفول البلدي كانت غير معنوية. ولكن أظهرت النباتات التي رويت بماء زمزم زيادة في نسبة التزهير مقارنة بالنباتات التي رويت بالمعاملات المائية الأخرى.

في تجربة أخرى أظهرت النتائج أن الري بماء زمزم فقط او ماء زمزم مع ماء الصنبور اعطى زياده معنوية في نسبة الانبات وكذلك بعض خواص النمو في نبات الفلفل الأسود عن الري بماء الصنبور فقط. بينما لم يؤثر الري بأي معاملة تحت الدراسة على نسبة إنبات وخواص النمو لنبات الثوم .