

## **Study Of The Effect Of Soaking Periods And Seed Rate Per Unit Area On Some Characteristics Of Barley Culture (*Hordeum Vulgare L*)**

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### **Abstract**

The research was carried out in one of the laboratories of the Agricultural Technical College / Mosul to study the effect of the soaking time and seed rate per unit area for the production of green fodder from local germinated barley, and the research included two factors, the first factor is the soaking time with four levels (0, 6, 12, 24) hours. The second factor is the rate of seeds per unit area and has four levels (1, 2, 3, 4) kg / m<sup>2</sup>. The research was carried out using a complete random design (CRD) and with three replications, and the results showed that: The amount of seeds per unit area had no significant effect on plant height, and the increase in soaking time for barley seeds was accompanied by a gradual significant increase in all the studied characters, and the interaction between the quantity of seeds (1) kg / m<sup>2</sup> and the soaking period (24) hours the highest height for plants, the interaction between the quantity of seeds (4) kg / m<sup>2</sup> and the time of soaking was (12) hours, the highest wet weight for the vegetative and root groups, the interaction between the quantity of seeds (4) kg / m<sup>2</sup> and the soaking time (24) hours was achieved with the highest dry weight of the vegetative and root groups.

**Key words:** barley culture, amount of seed per unit area, soaking time for barley seeds .

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### **Introduction**

Barley (*Hordeum vulgare L*) is one of the most important major cereal crops grown in order to obtain the green fodder provided to farm animals, as well as it is grown to obtain seeds that enter into animal nutrition (Al-Fakhry, 1981). The process of growing barley and obtaining from it green fodder with high nutritional value and rich in carbohydrates and protein is one of the most important reasons for the success of the ideal development of livestock, as this process provides green fodder throughout the year, and does not require large areas for the purpose of producing fodder compared to the traditional cultivation of fodder crops (Al -Bahadili, 1989), , And that the green fodder obtained from cultured barley is of good color and palatable taste by farm animals, in addition to the amount of fodder produced, as the production of (6-10) kg of green fodder from germinated barley requires (1) kg of barley seeds (Al-Ajmi et al, , 2009). Both Kamal and Ghaly,( 2002) indicated that the use of (200, 250, 300) g / m of barley seeds to produce green fodder from the culture had no significant effect on plant height, and confirmed Mosallam, (2008). The high quantities of

seeds per unit area give a high yield of green fodder compared to the low quantities of seeds. The reason for this may be attributed to competition between plants for different growth components (water, light, CO<sub>2</sub>, and nutrients). Elshookie et al., (1993) confirmed that they obtained a significant increase in the green and dry yield of germinated barley when the seed rates differ per unit area, both Sneath and Felicity, (2003) added when using them for three quantities of seeds per square meter (2.5, 5 and 7.5) kg / m<sup>2</sup> of barley seeds, The high quantity of seeds, 7.5 kg / m<sup>2</sup>, was significantly higher than the two quantities (2.5 and 5) kg / m<sup>2</sup> in the dry weight of the barley culture.

Al-Zubaidi et al., (2014) stated in his study of green fodder production from germinated barley that the barley seeds were soaked in water for 24 hours before placing them in the germination trays. The aim of the research is to study the difference in the soaking time of seeds and the seeding rate per unit area in the production of green fodder from barley culture.

### **materials and methods**

The research was carried out in one of the laboratories of the Agricultural Technical College / Department of Plant Production Techniques on 12/16/2019 to study the effect of the soaking time and seed rate in the area unit for green fodder production from local germinated barley. The research included the following factor : The first factor is the duration of soaking in four levels (0 , 6 , 12 , 24) hours. The second factor is the seed rate per unit area and has four levels, which are (1, 2, 3, 4) kg / m<sup>2</sup>. The seeds were washed with water and sterilized with (sodium hypochlorate) to control the absence of mold. Barley seeds were distributed in plastic trays containing holes with diameters of (3) mm in its base distributed regularly for the purpose of draining the excess water during the watering process. They are placed on shelves equipped with fluorescent lighting two count per shelf , as for the watering process every four hours , The complete random design (CRD) in the planning and implementation of the research with three replications, and after the completion of emergence after 14 days, the following characteristics were studied: plant height, fresh weight of the shoot, fresh weight of the root group, dry weight of the shoot, , dry weight of the root group. The data were analyzed statistically by computer and by the SAS system, and the multi-range Duncan test was used to compare the averages so that the averages that differed from each other were distinguished significantly by different alphabets.

### **Results and discussion**

#### **Plant Height (cm):**

Statistical analysis data presented in Table (1) indicate that the difference in the quantities of seeds per unit area did not have any significant effect on plant height of the barley culture, and this result coincided with the findings of (Kamal and Ghaly, 2002), as for the difference in the soaking time of germinated barley seeds before planting, the results of the statistical analysis show that there is a gradual increase in the height of the plant with an increase in the time of soaking, and this increase reached a significant level when soaking for a period of 24 hours, as the height of the plant reached 18,5 cm, and this result coincided with what was obtained (Al-Zubaidi et al., 2014). As for the interaction between the two factors, the results show that the (24) hour soaking time for all quantities of seeds per

square meter achieved a significant increase in plant height, and that the highest plant height reached (19) cm when the interaction between the quantity of seeds 1 kg / m<sup>2</sup> and a period of (24) hours soaking before Cultivation, we conclude from this that the factor of the duration of soaking in water before planting is more important than the factor of the quantity of seeds per unit area in the characteristic of plant height.

**Table (1) the effect of soaking time and seed quantity / m<sup>2</sup> and interaction between them on the characteristic of Plant height**

	1kg/m <sup>2</sup>	2kg/m <sup>2</sup>	3kg/m <sup>2</sup>	4kg/m <sup>2</sup>	Effect of soaking time
control	15.000 EF	15.333 EF	15.667 D-F	16.000 C-F	15.5000 B
6 hour	16.833 A-F	14.333 F	16.333 B-F	18.000 A-D	16.3750 B
12 hour	16.333 B-F	18.500 A-C	18.333 A-C	17.333 A-E	17.6250 B
24 hour	19.000 A	18.667 AB	18.000 A-D	18.333 A-C	18.5000 A
Effect of seed quantity	16.7917 A	16.7083 A	17.0833 A	17.4167 A	

**Values followed by the same letter do not differ significantly from each other at a probability level of 5%.**

**Wet weight of shoots (g / m<sup>2</sup>) :**

The statistical analysis data presented in table (2) show that the increase in the seed rate per unit area was accompanied by a significant increase in the wet weight of the shoots, as the treatment (4) kg / m<sup>2</sup> achieved the highest weight and reached (2109) g / m<sup>2</sup>, and this is identical to what was mentioned ( Snow and Ghaly, 2008), as for the effect of soaking time on the wet weight of the shoots, the statistical analysis data show that the increase in soaking time was accompanied by a gradual significant increase in this characteristic, as the period of (24) hours achieved the highest wet weight of the shoots, as it reached (2389.6) g. , this result coincided with what was reached by (Al-Zubaidi et al., 2014). As for the effect of the interaction between the two factors , the quantity of seeds (4) kg / m<sup>2</sup> and the soaking time (12) hours were achieved with the highest wet weight of the shoots, and thus it was significantly superior to the rest of the interactions. the weight was (3305.5) g / m<sup>2</sup>., while the minimum weight was achieved when the interaction between the quantity of seeds (1) kg / m<sup>2</sup>., with the comparison treatment (without soaking), which reached (555) g / m<sup>2</sup>. This confirms that the soaking factor is one of the important factors in the barley culture production process.

**Table (2) the effect of soaking time and seed quantity / m<sup>2</sup> and interaction between them on the characteristic Wet weight of shoots (g / m<sup>2</sup>)**

	1kg/m <sup>2</sup>	2kg/m <sup>2</sup>	3kg/m <sup>2</sup>	4kg/m <sup>2</sup>	Effect of soaking time
control	555.00 G	586.96 G	683.24 FG	688.20 FG	628.4 C

6 hour	878.15 FG	1003.9 EG	1221.0 DG	1536.7 CF	1159.9 B
12 hour	1793.2 CE	1795.7 CE	1963.4 CD	3305.5 A	2214.4 A
24 hour	2047.3 CD	2170.6 BC	2434.6 BC	2905.7 AB	2389.6 A
Effect of seed quantity	1318.3 B	1389.3 B	1575.5 AB	2109.0 A	

**Values followed by the same letter do not differ significantly from each other at a probability level of 5%.**

**Wet weight of root (g / m<sup>2</sup>):**

The data in Table (3) show that the increase in the quantity of seeds per unit area was accompanied by a gradual increase in the wet weight of the root total. This increase reached a significant extent when the quantity of seeds reached (4) kg / m<sup>2</sup>. as the weight reached (6864,2) g / m<sup>2</sup>, The reason for this is due to the increase in the number of plants per unit area, and this result was similar to what was obtained (Hamad, 1986). As for the difference in the soaking time, the results of the statistical analysis show that the soaking time is (12) hours for germinated barley seeds achieved a significant increase in this characteristic. Which did not differ significantly with the period (24) hours, and this result was similar to what he obtained (Al-Zubaidi et al., 2014), as for the results of the interaction between the two factors, the data indicate that the quantity of seeds (4) kg / m<sup>2</sup>. interaction with the soaking period (12) hours achieved the highest wet weight of the root total and thus significantly exceeded all the interactions in this characteristic, while the lowest wet weight of the root total was achieved when the quantity of seeds (1) kg / m<sup>2</sup> with the comparison treatment.

**Table (3) the effect of soaking time and seed quantity / m<sup>2</sup> and interaction between them on the characteristic Wet weight of root (g / m<sup>2</sup>)**

	1kg/m <sup>2</sup>	2kg/m <sup>2</sup>	3kg/m <sup>2</sup>	4kg/m <sup>2</sup>	Effect of soaking time
control	1918.8 D	1963.2 D	2192.6 D	2274.0 D	2087.3 C
6 hour	3431.3 CD	4042.6 C	4841.8 C	4866.9 C	4295.7 B
12 hour	7042.5 B	7417.0 B	7703.4 B	11763.7 A	8481.6 A
24 hour	7962.4 B	8184.4 B	8253.2 B	8552.1 B	8238.0 A
Effect of seed quantity	5088.2 B	5401.7 B	5747.7 B	6864.2 A	

**Values followed by the same letter do not differ significantly from each other at a probability level of 5%.**

**Dry weight of shoots (g / m<sup>2</sup>):**

The statistical analysis data presented in Table (4) show that the increase in the quantity of seeds per unit area achieved an increase in the dry weight of the vegetative total, and this increase reached the limit of significance when the quantity (4) kg / m<sup>2</sup>, as it reached (266.4) g / m<sup>2</sup>. This result coincided with the findings of (Morgan and Haire, 1992). As for the soaking time of germinated barley seeds, the period of (24) hours (which did not differ significantly from the period of (12) hours) achieved a significant superiority in the dry weight of the shoots over the rest of the treatments. Which indicates the importance of soaking the seeds for the production of cultivated barley (Al-Zubaidi et al., 2014), and the data indicate that the interaction between the quantity of seeds (4) kg / m<sup>2</sup> and a period of (24) hours soaking with water to produce the germinated barley achieved the highest dry weight of the vegetative total, as it reached ( 458.8) g / m<sup>2</sup>, while the lowest weight was achieved when interaction seed quantity (1) kg / m<sup>2</sup> with the comparison treatment.

**Table (4) the effect of soaking time and seed quantity / m<sup>2</sup> and interaction between them on the characteristic Dry weight of shoots (g / m<sup>2</sup>)**

	1kg/m <sup>2</sup>	2kg/m <sup>2</sup>	3kg/m <sup>2</sup>	4kg/m <sup>2</sup>	Effect of soaking time
control	17.24 C	49.35 C	54.24 C	61.64 C	45.63 C
6 hour	69.04 C	69.04 C	101.15 B	160.35 BC	99.90 B
12 hour	175.15 B	187.44 B	189.95 B	384.80 AB	234.33 A
24 hour	202.24 B	207.20 B	246.64 B	458.8 A	278.73 A
Effect of seed quantity	115.88 B	128.24 B	148.00 B	266.40 A	

**Values followed by the same letter do not differ significantly from each other at a probability level of 5%.**

**Dry weight of root (g / m<sup>2</sup>):**

The results of the statistical analysis presented in Table (5) indicate that the increase in the quantity of seeds per unit area achieved an increase in the dry weight of the root total, and that this increase reached a significant level at the quantity (4) kg / m<sup>2</sup> compared to the rest of the treatments, as the weight reached (1931, 99) g / m<sup>2</sup>, and this result is in agreement with the findings (Sneath and Felicity, 2003). The increase in the soaking time was accompanied by a gradual significant increase in the dry weight of the root mass (Elsahookie et al., 1993). The results of the interaction indicate that the highest dry weight of the root group was achieved when the interaction between the quantity of seeds (4) kg / m<sup>2</sup> and the soaking time (24) hours for barley seeds. The culture medium, when the weight was (3167.2) g / m<sup>2</sup>, while the minimum dry weight of the root group was (678.35) g / m<sup>2</sup> when the amount of seeds interaction (1) kg / m<sup>2</sup> with the comparison treatment (without soaking).

**Table (5) the effect of soaking time and seed quantity / m<sup>2</sup> and interaction between them on the characteristic Dry weight of root (g / m<sup>2</sup>)**

	1kg/m <sup>2</sup>	2kg/m <sup>2</sup>	3kg/m <sup>2</sup>	4kg/m <sup>2</sup>	Effect of soaking time
control	678.35 F	757.24 F	767.15 F	816.44 F	754.8 D
6 hour	1386.24 E	1487.40 E	1514.55 E	1514.55 E	1475.70 C
12 hour	1667.44DE	1692.15DE	1990.60CE	2229.8 BD	1894.99 B
24 hour	2294.0 BC	2543.15BC	2609.7 B	3167.20 A	2653.49 A
Effect of seed quantity	1506.49 B	1619.86 B	1720.50 B	1931.99 A	

**Values followed by the same letter do not differ significantly from each other at a probability level of 5%.**

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