



# RESPONSE OF *PANICUM MAXIMUM* CV SEEDS TO TREATMENT WITH MALT EXTRACT AND DIFFERENT SOAKING PERIODS AND THEIR EFFECT ON GROWTH AND GERMINATION CHARACTERISTICS

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## Abstract:

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The laboratory experiment was conducted in the laboratory of the Department of Plant Protection / College of Agriculture / Al-Muthanna University for the year 2023/2024. To study the effect of barley extract (*Hordeum vulgare* L.) and the periods of soaking seeds in it. The experimental design was used according to the completely randomized design (CRD). The experiment included two factors, the first factor was the effect of three concentrations of the extract (8, 16, 32) % with the comparison treatment with distilled water (C0, C1, C2, C3) respectively, and the second factor was the time of soaking the seeds in the extract, which was for three periods (1, 2, 3) hours (T1, T2, T3 respectively) and with three replicates. The results of the experiment showed a clear difference in the response of the Bonicam seeds to the difference in concentrations, as the extracted concentration C4 had a significant effect on the germination percentage trait, giving an average of 46.30, while the concentration C2 was superior in the root length, plant height and number of leaves traits, giving the highest averages of 2.798, 46.6, 7.72 respectively, while the concentration C3 was superior in the germination speed trait, giving an average of 3.23. As for the soaking periods, the T3 treatment (three hours soaking) was superior in the germination percentage trait and root length trait, as it recorded the highest averages of 51.77 and 2.653, while the T2 treatment was superior in the number of leaves and germination speed trait, as it gave the highest averages of 7.28 and 2.67. Finally, the T1 treatment (one hour soaking) was superior in the plant height trait, as it recorded an average of 43.9. The interaction between the two factors, extract concentration and steeping periods, showed a different response between the treatments, according to what was shown from the effect of the factors when their effects were individual.

**Keywords:** panicum maximum; soaking periods; malt extract

## INTRODUCTION

*Panicum panicum* is a forage crop with the scientific name *Panicum maximum* cv. It belongs to the Poaceae family and includes several species, the best of which is the maximum production Daur, 2016. The nutritional value of forage crops is one of the most important characteristics of the suitable forage plant to meet the needs of animals for dry and green fodder. Therefore, *Panicum antidotale*, L. is one of the new fodder sources, which is considered one of the most important pillars on which the development of the animal production sector depends, and the use of varieties with high yield and good quality is one of the most important priorities of plant breeders. Ali et al., 2014. The diversity of different species also gives a greater opportunity to meet the needs of animals, especially during times of fodder scarcity (Arshadullah et al., 2011).

Iraq is characterized by environmental diversity, which allows the cultivation of different plant species. However, this diversity has been limited to the cultivation of specific fodder species such as barley, white corn, and oats as grass

crops, and clover and berseem as leguminous crops. However, the presence of a perennial grass crop with high productivity and excellent fodder quality may be sufficient to reduce the gap between production and consumption of green fodder from perennial fodder crops *Panicum maximum* L. (Al-Ghalbi, 1988). It is considered one of the crops that tolerate a wide range of harsh environmental conditions. These characteristics are closely related to the degree of palatability and consumption by animals and the rates of digestion of nutrients, Nawaz et al. 2014. Therefore, estimating the nutritional value of forage plants is of great importance in terms of testing the ability of the plant to provide farm animals with the various nutrients they need (Jank 2004). Knowing the best way to grow a particular crop as well as the area needed by that crop increases production by reducing competition for growth requirements as well as the ease of serving that crop (Josefa 2017).

In recent years, the use of manufactured and naturally extracted organic nutrients has spread to add them to different types of plants due to their positive effect on humans, animals and plants and they do not cause any pollutants because they contain amino acids and organic compounds. They are added in low concentrations by spraying them on the plant or adding them with irrigation water to the soil in order to nourish the plant, accelerate growth and improve production, as well as to improve soil properties. It was also found that plant extracts play a stimulating role for the plant by stimulating growth and speeding up germination. The Bonicam is characterized by its ability to adapt to harsh climatic conditions, drought, high salinity, frost, and Ruiz et al. 2016. Many comparative studies have shown that the extent to which crop productivity and others are affected by salinity in Bonicam depends strongly on the genotype, Kutawa et al. 2017. Al-Jawari (2002) stated that the behavior of extracts is similar to the action of gibberellin because it contains the biosynthetic initiator of gibberellin, which stimulates the increase in the speed of germination and helps in cell division and elongation, which leads to increase the size of the vegetative group and improve the flowering and yield characteristics. This was confirmed when Khalil and Elias (2011) soaked the seeds and sprayed the bean plants with licorice extract at a concentration of 5 g/L, which led to a significant increase in the percentage of seed germination, plant length, leaf area, chlorophyll content in the leaves, dry weight of the plant and speed of flowering. Khalil et al. (2011) found that soaking seeds and spraying seedlings of three types of vegetable crops (tomato, eggplant and pepper) with plant extracts at a concentration of 5 g/L led to a significant increase in seedling length and fresh and dry weight of seedlings. Ibrahim (2012) indicated that adding plant extracts at a concentration of 3 g/L by spraying on plants or adding to the soil led to a significant increase in the vegetative growth characteristics of potatoes.

The practical importance of this study comes as it is a continuation of many studies to evaluate the nutritional value of the Bonicam plant and determine the effect of some plant extracts at different concentrations and the salt stress suffered by large areas of land in dry and semi-dry climates and the effect of these extracts on the growth and germination of this plant, so this research was implemented.

## **2 - Materials and methods of work**

### **2-1 Cultivation of barley crop (germination)**

Barley seeds of the Aba 265 variety were germinated in plastic boxes where it took two weeks and the barley grains were sprayed with water every day. (2007 FAO), and after the plants reached the seedling stage where the height of the barley became three leaves, they were removed from the box and dried and then ground until they became powder. (The germinated barley was chosen as a fodder crop due to its nutritional and economic importance, as it was observed that the animals' demand for feeding increased.

### **2-2 Drying of germinated barley**

The barley seedlings were cleaned, the unwanted materials were removed, and the seedlings were placed under the sun for several days until they reached complete dryness, i.e. when the weight was stable

### **2-3 Method of preparing the extract:**

According to the method of Haborne 1984 to prepare the extract, (20) g of germinated barley roots were taken after grinding the plant well and soaked in (200) ml of distilled water for 24 hours and mixed with an electric mixer, then filtered through three layers of gauze to separate the solid suspensions. After that, the filtrate was taken and three concentrations of it were prepared in addition to the comparison treatment.

### **2-4. Treated seeds**

The seeds of the Bonicam were prepared and cleaned of impurities and foreign seeds mixed with them.

### **2-5 Cultivation**

The seeds of the Bonicam were planted after filling the pots with dimensions of 60 cm in diameter and 19 cm in height with soil at a rate of 3 seeds in each pot to give the plant a chance to form shoots according to the prepared concentrations while maintaining equal dimensions and one depth, then the irrigation process was carried out.

### **2-6 Preparation of the concentrations used**

- 1- Distilled water only 100% as a comparison treatment, symbolized by C0
- 2- Barley extract concentration 8% and distilled water concentration 92%, symbolized by C1
- 3- Barley extract concentration 16% and distilled water concentration 84%, symbolized by C2
- 4- Barley extract concentration 32% and distilled water concentration 68%, symbolized by C3

The Bonicam crop were sorted and soaked in these concentrations at different intervals as follows:

- T1 was soaked for one hour
- T2 was soaked for two hours
- T3 was soaked for three hours
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Table (1) Tools and materials used

No.	Name of the material
1	panicum maximum cv
2	budhur alshaeir
3	Water
4	Baker
5	conical flask
6	Suppression
7	glass spoon
8	ethanol alcohol 70%
9	drying oven
10	filter paper
11	sensitive scale
12	Gas chromatography mass
13	Barely

Treating the seeds with concentrations and soaking periods according to the experimental factors on 2/15/2023. After that, the pots were prepared, filled with sand and peat moss, and seeded according to the treatments to be ready for transferring the plants.

### 2-7 Active ingredients in barley extract

Downloading of active compounds: Laboratory tests were conducted on the active ingredients in the plant extract used in the Department of Environment and Water of the Ministry of Science and Technology in GC-MS Gas chromatography mass spectrometry. Many active compounds were shown, some of which are 2, 3-pentanedione, Butane,2-methyl, and Trimethyl-1-nonene - 2,4,6.

### 2-8 Characteristics studied

- 1- Germination percentage = number of germinated seeds / total number of seeds \* 100
- 2- Germination speed = total number of germinated seeds on that day \* day number / total number of germinated seeds
- 3- Root stage was measured from the growth area to the end
- 4- Stem height was measured from the exit area to the end of the stem
- 5- Number of plant leaves

## 3- Results and Discussion

### 3-1 Germination Percentage%

The results of the statistical analysis showed that there are clear differences between the soaking periods and their effect on seed germination, as treatment T3 significantly outperformed the rest of the treatments. This may be because increasing the soaking period allowed the plant hormones to take their sufficient time, as the cytokinin hormone increased the permeability of the seed membrane, and thus there may be sufficient time for the gibberellin hormone to work inside the seeds, which contributes to iron germination and limited reason, 2015. It also appears from the experimental data that the different concentrations of barley extract significantly affected the germination percentage, as the C4 concentration significantly outperformed by giving the highest average of 46.30 over the comparison trait and the C2 concentration, which gave averages of 30.20 and 33.13, while there was no significant difference with the C3 concentration, which recorded an average of 44.10. This is due to the increase in the concentrations of the stimulating plant hormones. For growth compared to inhibitory hormones, it led to an increase in germination (Saleh, 1991). The results also showed a significant interaction between the experimental factors, as the combination (C4 X T3) gave the highest average of 62.15, while the combination (C2 X T1) gave the lowest average of 24.60, for the same reasons that affected the factors individually.

Table (2) Effect of barley extract and soaking periods on germination percentage of Bonicam seeds

Concentrations	Soaking treatments			
	T1	T2	T3	Average
C1	23.86	23.16	43.57	30.20
C2	24.60	26.89	47.92	33.13
C3	31.52	47.34	53.45	44.10
C4	32.22	44.52	62.15	46.30
Average	28.05	35.48	51.77	
LSD	C 2.56	T 1.41	3.17	

### 3-2 Germination speed

The results showed that the different concentrations with which the seeds of Leponica were treated had a significant effect on the germination speed of the seeds, while the soaking periods did not show any significant effect, as the concentration C3 gave the highest average of 3.23 without a significant difference with the concentration C2, which recorded an average of 3.12. This may be due to the increase in the concentrations of plant hormones that stimulate growth compared to the inhibitory hormones, which led to an increase in germination (Saleh, 1991).

Table (3) Effect of barley extract and soaking periods on the germination speed of the seeds of the Bonicam

Concentrations	Soaking treatments			Average
	T1	T2	T3	
C1	1.22	1.46	1.41	1.36
C2	1.95	3.70	3.71	3.12
C3	2.95	3.56	3.17	3.23
C4	1.70	1.97	1.93	1.87
Average	1.96	2.67	2.55	
LSD	C 0.68	N.S	N.S	

### 3-3 Root length cm2

The results of the statistical analysis showed that there is a difference between the longest roots according to the different soaking periods through the superiority of the T3 soaking treatment, which gave it the highest average of 2.653, while the T1 treatment recorded the lowest average of 1.674, as it was observed that the root length decreased with the increase in the soaking period. We can explain the reason for this by the generation of toxic chemicals, and these materials have affected due to their absorption by the roots, which directly affected the work of plant hormones, which was reflected in cell division and thus affected the growth and elongation of the root. The results also showed a significant effect of the concentrations on this trait, as the C2 concentration recorded the highest average of 2.798, significantly superior to the rest of the concentrations of the experiment, as the C1 concentration recorded the lowest average of 1.429 without a significant difference with the C4 concentration. This may be due to the response of the plant parts to the different growth regulators and their concentrations on their content of internal hormones or to the activity of auxin activity 2002, Hartmann As for the interaction between the two factors, the combination (C2 X T1) was superior, as it gave the highest average of 2.733, while the combination (C1 X T2) recorded the lowest average of 0.690. It seems that the soaking periods did not show any effect during this combination.

Table (4) Effect of barley extract and soaking periods on the root length characteristic of the plant for germination of the seeds of the Bonicam

Concentrations	Soaking treatments			Average
	T1	T2	T3	
C1	1.380	0.690	2.217	1.429
C2	2.733	2.327	3.333	2.798
C3	1.333	2.390	3.510	2.411
C4	1.250	1.990	1.553	1.598
Average	1.674	1.849	2.653	
LSD	C 0.20	T 0.12	TC 0.26	

### 4-3 Plant height cm2

The results showed significant differences between the soaking periods, as treatment T1 was significantly superior by giving the highest average of 43.9 with a slight difference from soaking treatment T3, which recorded an average of 43.2, while soaking treatment T2 recorded the lowest average of 39.2. This may be attributed to the fact that the extract contains toxic chemicals that have been absorbed over time by the stem, affecting cell division and elongation, and thus reducing stem growth and elongation (Biaassm et al. 2021). Significant differences were also observed between the different concentrations, as concentration C2 was significantly superior by giving the highest average of 46.6 cm, while concentration C4 gave the lowest average of 37.0 cm. The reason for the superiority of concentration C2 by 8% may be due to the presence of active compounds such as alkaloids, glycosides, and tannins in high concentrations, which limit cell division and elongation, and thus Reducing the growth of the ruwaisha (Al-Taie, 2012), and the results showed the presence of a significant interaction between the two factors, as the two combinations (C2 X T3) and (C2 X T1) gave the highest averages of 51.3 for each of them for the same as what was mentioned for the factors individually.

Table (5) Effect of barley extract and soaking periods on the height of the plant for the seeds of the Bonicam

Concentrations	Soaking treatments			Average
	T1	T2	T3	
C1	44.4	40.9	37.8	41.0
C2	51.3	37.3	51.3	46.6
C3	44.3	42.7	43.7	43.6
C4	35.6	35.4	40.0	37.0
Average	43.9	39.2	43.2	
LSD	C 0.5	T 0.85	1.05	

### 3-5 Number of leaves

The results of the statistical analysis showed that the T2 soaking period (two hours) was significantly superior, as it gave the highest average of 7.28 without a significant difference with the T1 soaking treatment (one hour), which recorded an average of 6.69, while the T3 soaking treatment recorded the lowest average of 6.11. This is attributed to the fact that the difference in soaking periods greatly affected the work of plant hormones, and thus was reflected in

plant growth, especially vegetative growth, which showed a clear difference in the number of leaves for the different treatments (Khalil et al. 2006). The results also showed that there are differences in the effect of the different concentrations on the number of leaves, as the C2 concentration recorded the highest average of 7.72, while the C3 concentration gave the lowest average of 5.93. This is due to, and perhaps depends on, the extent of the response of the seeds to the different concentrations of barley extract. It was also noted that there was a significant overlap between the experimental factors, as the combination (C3 X T3) recorded the highest average of 7.41 without significant difference with some combinations for other concentrations, while the combination (C3 X T1) gave the lowest average of 3.33, and perhaps the reason is due to the difference and response of different media to the concentrations of barley extract. In addition, there are many factors that affect the vegetative germination process, and among these factors is the agricultural medium, as it affects the rooting process and then its effect is on the vegetative side, including the leaves of the plant.

Table (6) Effect of barley extract and soaking periods on the number of leaves of the seeds of the Bonicam

Concentrations	Soaking treatments			Average
	T1	T2	T3	
C1	7.04	7.34	5.55	6.64
C2	9.19	9.15	4.82	7.72
C3	3.33	7.04	7.41	5.93
C4	7.18	5.60	6.67	6.48
Average	6.69	7.28	6.11	
LSD	C 0.9 0	T 0.83	TC 1.51	

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