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The Effect of Dill and Black Caraway Plant Extracts and their Mixture on the Germination of Squash Seeds Cucurbita Pepo L

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Abstract

The experiment was carried out at the College of Agriculture / University of Diyala during the spring season 2021-2022 to study the effectiveness of plant extracts of Dill (Anthum graveoleus L.), and Black caraway(Nigella sativa L.), and their mixture, on the germination characteristics of zucchini squash seeds.

The results showed a significant effect of plant extracts on the germination period, as the plants treated A2 and A3 excelled with the best germination period of 6.33 and 6.08 days, respectively. The plant extracts affected the percentage of germination, as the plants treated A2 and A3 excelled with the best percentage of germination of 68.0 and 63. 8%, respectively, and the plant extracts affected the speed of germination, as the plants outperformed the treatments A1, A2, A3, and A6, as the speed of germination for the treatments reached 6.6, 6.6, 6.7, 6.3, and 6.6 days/seed, respectively, and the plant extracts affected the uniformity of germination. The plants treated A3 excelled with the best germination uniformity of (0.38 seeds/day), and the duration of soaking the seeds had a significant effect as well. The plants treated B2 excelled with the best germination duration, which amounted to 5.79 days. The duration of soaking the seeds also had a significant effect, as the plants treated B2 excelled. The best germination percentage reached (51.3%) on the plants treated B1 and B3, as the percentage for each of them respectively reached 48.6 and 45.13. The duration of soaking the seeds had a significant effect as well, as the plants treated B2 excelled with the best germination speed of 7.11 days/seed, while the speed decreased. Germination in treatment B1 and B3, as the germination speed for each of them, respectively, was 6.4 and 6.0 days / seed. The duration of seed soaking also had a significant effect, as the B2 treated plants excelled with the best germination uniformity of (0.29 seeds/day).

Keywords: accelerating germination, zucchini squash, plant extracts, soaking seeds, uniformity of germination

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تأثير مستخلصات نبات الحبة الحلوة و الحبة السوداء وخليطهما على إنبات بذور الكوسا Cucurbita pepo L

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المستخلص

نفذت التجربة في كلية الزراعة / جامعة ديالى خلال الموسم الربيعي 2021-2022 لدراسة فعالية المستخلصات النباتية لنبات الحبة الحلوة (Anthum Graveoleus L.) الحبة السوداء(Nigella sativa L.) وخليطهما. ، على خصائص إنبات بذور القرع الكوسة.

أظهرت النتائج تأثيراً معنوياً للمستخلصات النباتية على فترة الإنبات، إذ تفوقت النباتات المعاملة A2 وA3 بأفضل فترة إنبات بلغت 6.33 و6.08 يوم على التوالي. أثرت المستخلصات النباتية على نسبة الإنبات حيث تفوقت النباتات المعاملة A2 و A3 بأفضل نسبة إنبات 68.0 و 63.8% على التوالي، كما أثرت المستخلصات النباتية على سرعة الإنبات حيث تفوقت النباتات على المعاملات A1 و A2 و A3 و A6 حيث بلغت سرعة الإنبات للمعاملات 6.6 و 6.6 و 6.7 و 6.3 و 6.6 يوم/ بذرة على التوالي، كما أثرت المستخلصات النباتية

انتساب الباحثين

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معلومات البحث

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على تجانس الإنبات. تميزت النباتات المعاملة بـ A3 بأفضل تجانس إنبات بلغ (0.38 بذرة/يوم)، كما كان لمدة نقع البذور تأثير معنوي أيضاً. تفوقت النباتات المعاملة بـ B2 بأفضل مدة إنبات بلغت 5.79 يوم. كما كان لمدة نقع البذور تأثير كبير حيث تفوقت النباتات المعاملة بـ B2. بلغت أفضل نسبة إنبات (51.3%) على النباتات المعاملة B1 وB3 حيث بلغت النسبة لكل منهما على التوالي 48.6 و45.13. وكان لمدة نقع البذور تأثير معنوي أيضاً، حيث تفوقت النباتات المعاملة بـ B2 بأفضل سرعة إنبات بلغت 7.11 يوم/ بذرة، بينما انخفضت السرعة. إنبات المعاملة B1 و B3 حيث بلغت سرعة الإنبات لكل منهما على التوالي 6.4 و 6.0 يوم/ بذرة. كما كان لمدة نقع البذور تأثير معنوي حيث تفوقت النباتات المعاملة بـ B2 بأفضل انتظام إنبات بلغ (0.29 بذرة/يوم).

الكلمات المفتاحية: تسريع الإنبات، قرع الكوسا، المستخلصات النباتية، مدة نقع البذور،تجانس الإنبات

Introduction

Cucurbita pepo L. (Summer Squash) is one of the important vegetable crops of the Cucurbitaceae family and one of the crops grown in Iraq due to the high nutritional value of its fresh fruits as well as the use of its seeds in nutrition, which are characterized by their high content of oils 46%, proteins 34% and carbohydrates 10% and fiber 2.8% [1], in addition to its use for medicinal purposes Preparing seeds and preparing them for planting is one of the priorities of reducing production costs, increasing the yield, and improving its quality. Even if the optimal conditions for production are created through the use of improved varieties, good soil for cultivation, and modern agricultural technologies, this will not compensate for the use of highly viable seeds with a high rate and speed of germination, in addition to High homogeneity in vigor and growth of seedlings [2]

Some seeds of vegetable crops are slow to germinate for various reasons, including the hardness of the seed coats or the presence of substances on the surface of the seed that prevent water from penetrating their membranes, or because of the dormant state that some types of seeds go through, and the hardness of the seed coat and the presence of some substances that prevent germination on the surface of the seed. [3] This exposes it to many risks resulting from unsuitable conditions during its germination, such as rotting due to moisture and soil fungi. In previous years different treatments were used to stimulate and accelerate germination [4]. And the hydrotreatment, that is, soaking the seeds in water [5] or with growth regulators and organic solvents [6]But the modern trend in agriculture is the use of environmentally friendly materials and the avoidance of everything that would pollute the agricultural environment such as chemical fertilizers, pesticides, fungicides, and industrial growth regulators within what is now known as sustainable agricultural development or recycling of agricultural waste, to maintain a clean environment that guarantees human safety and health, [7] Among the environmentally friendly materials are plant extracts that can be used to soak the seeds in order to accelerate germination and obtain homogenous plants with vigorous growth [5]. All seed inspection operations focus on the germination rate and seed purity, so this information is recorded on the packages. However, it is necessary to measure the germination rate, duration of germination, and germination speed of the seeds in the field before planting them to ensure obtaining homogeneous, strong-growing plants [5]. As well as to determine the amount of seeds planted in the field to ensure obtaining the required seedlings [8].

The mixture of Dill, and Black caraway extract showed significant superiority in seedling height, stem diameter, number of leaves, number of nodes, and root length in pepper seedlings treated with these plant extracts [9]

[10] reported that soaking + spraying treatments with plant extracts (Dill and Black caraway, and fenugreek) showed significant differences in the vegetative growth characteristics of eggplant (plant length, number of branches, number of leaves, leaf area, and fresh weight compared to the soaking treatment or the spraying treatment only).

[11] also reported that soaking eggplant seeds in Dill and Black caraway extracts led to significant increases in the rate, duration, and speed of germination compared to the treatment of soaking in distilled water.

From the above, and in view of the nutritional and economic importance of the zucchini crop, and for the purpose of increasing the production of plants per unit area, which in turn requires the production of homogeneous and strong-growing plants, as well as to ensure that no seeds are wasted while planting them in the soil, and in view of the long period required for the seeds of this crop to germinate, especially in the cold season. Winter and to ensure that the seeds do not rot, which is caused by soil fungi, which cause the loss of a large amount of them in addition to delaying the germination process.

Plant extracts can be defined as concentrated preparations, with a liquid, solid or viscous consistency. As a rule, they are obtained by maceration (i.e. extraction to equilibrium with water or alcohol) or filtration (i.e. extraction to exhaustion with water or alcohol).

This study was conducted to determine the stimulating effect of plant extracts, to ensure that the planted seeds do not rot, and to increase the rate and speed of germination, thus producing homogeneous, strong, homogeneous seedlings of zucchini using natural plant extracts of in Dill and Black caraway.

Materials and working methods-:

The experiment was carried out in the College of Agriculture / University of Diyala during the spring season 2021-2022 to study the effectiveness of plant extracts of in Dill and Black caraway seeds and mixing them and on the germination characteristics of zucchini squash seeds after soaking zucchini squash seeds in these extracts with different soaking times. Below is the chemical content of in Dill and Black caraway.

Black caraway:

Contains (100 gm) dried black cumin seeds: Nigellone (4.01 gm), Gotathione (3.17 gm), Thymoquinene (2.22 gm), Dithymoquinene (1.89 gm), Hydrothymoquinene (1.71 gm), Thimole (3.06 gm), (Cyamene 4.78 gm), Dicstrene (20.13 gm), Superene (3.55 gm), Lignene (2.96 gm), Fiber (14.63 gm), Starch (10.11 gm) as well as various amino acids, proteins, vitamins, soluble minerals and sugars (Al-Rubaie, 2009)

Dill:

The sweet bean contains a volatile oil ranging from (2-6%) of the dry weight of the seeds, which in turn includes two substances of great importance, anthol (60%) of the volatile oil, which kills and reduces the activity of a large group of soil fungi. Fenchone (20%) of this oil and other materials are Phellandrene, Limonene, and

Comphene, which constitute the remaining (20%) (Chopra et al., 1984), and it also contains proteins and resins, in addition to the presence of albumin, gel, calcium, iron, and phosphorus. Sulfur and coumarin (Rasan, 1994)

Study factors:

A) Plant extracts:

1- Aqueous extract of Dill seeds at a concentration of 5%, prepared by adding 0.050 mg of seed powder to 100 ml of distilled water and its symbol is A1.

2- The aqueous extract of Dill seeds with a concentration of 7.5%, which was prepared by adding 0.075 mg of seed powder to 100 ml of distilled water, with the symbol A2.

3-The aqueous extract of a mixture of Black caraway and Dill (mix) at a concentration of 5%, which was prepared by adding 0.050 mg of powdered seeds each of Black caraway and Dill to 100 ml of distilled water, with the symbol A3.

4- The aqueous extract of a mixture of Black caraway and Dill (mix) with a concentration of 7.5%, which was prepared by adding 0.075 mg of powdered seeds each of Black caraway and Dill to 100 ml of distilled water, and its symbol is A4.

5- The aqueous extract of Black caraway seeds at a concentration of 5%, prepared by adding 0.050 mg of the seed powder to 100 ml of distilled water, with the symbol A5.

6- The aqueous extract of Black caraway seeds with a concentration of 7.5%, which was prepared by adding 0.075 mg of the seed powder to 100 ml of distilled water, and its symbol is A6.

b) Duration of soaking:

- Soak the seeds in plant extracts:

- Soak the seeds for 6 hours and their symbol is B1.

- Soak the seeds for 12 hours and their symbol is B2.

-Soak the seeds for 24 hours B3.

d) Seed preparation and cultivation:

Cork dishes were prepared after adding the culture medium to it, consisting of (1 part soil: 2 parts peat moss).

On the other hand, the seeds (Turkish origin) were prepared and treated with concentrations of plant extracts for a period of soaking (6 hours, 12 hours and 24 hours). The seed preparation and treatment process was carried out in the physiology laboratory in the Department of Horticulture and Landscaping. The seeds were planted in dishes on 4/1/2022.

E) the studied traits:

1- Duration of germination (day): It is represented by the number of days required for seed germination, as germinated seeds were counted every day starting from the fifth day after planting when the first sign appeared until germination completely stopped on the tenth day after planting.

2- Percentage of germination: This was done using the following equation:

Germination percentage % = (number of germinated seeds / total number of seeds) x 100

3- Speed of seed germination (day/seed): This was calculated through the following equation:

Germination speed = sum of (number of seeds germinated each day x day number) / total number of germinated seeds at the end of the germination period

4-Uniformity of germination (seed / day): It is one of the important characteristics of the seedlings. Whenever the seedlings are homogeneous in their growth, (that is, they germinated almost at the same time), they are similar in height, thickness, and strength of growth, and they are all ready for planting in the permanent field without leaving any of them. Seedlings not suitable for planting at the specified time. And according to the homogeneity of germination according to the equation:

Germination homogeneity = the total number of germinated seeds at the end of the germination period / the number of days from the beginning of planting the seeds to the cessation of germination

Results and discussion-:

The results in Table (1) show that there is a significant effect of the concentrations of plant extracts on the germination period, as the A2 and A3 treatment plants excelled with the best germination period of 6.33 and 6.08 days, respectively, while the lowest germination period was in the treatment A1, A4 and A6, if each of them respectively reached 4.33 and 4 .08 and 4.27 days, and there were no significant differences between them. As for the A5 treatment, it gave a germination period of 5.36 days, which was between the highest and lowest value treatments. Treatment B3 had the lowest germination period of 4.55 days, while treatment B2 gave the average value between the highest value and the lowest value among the treatments. Through the results of the same table, we notice a significant effect of the interaction between the treatment of concentrations and the duration of soaking the seeds, as the plants of the treatments A3B1, A3B2, A2B2, A6B2, and A2B3 were distinguished by the best germination period of 6.75. And 6.66, 6.58, 6.58, and 6.00 days, respectively, while there were no significant differences between them and the treatment A4B2, as it reached 5.58 days, and followed it in superiority over the rest of the other treatments, the transactions A2B1 and A5B2, as it amounted to 5.08 and 5.33, respectively, while all transactions excelled over the treatment A4B1, where the germination period reached 2.9 days. as shown in Table (1).

Table (1): Effect of concentrations in plant extracts and duration of soaking seeds and their interactions on germination duration

			A concentrations of plant extracts					
			A1	A2	A3	A4	A5	A6
			4.33 c	6.08 a	6.33 a	4.08 c	5.36 b	4.27 c
B Duration of soaking seeds	B1	4.88 b	4.25 c	5.08 b	6.75 a	2.91 de	6.66 a	3.66 cd
	B2	5.79 a	4.58 bc	6.58 a	6.66 a	5.58 ab	5.33 b	6.00 a
	B3	4.55 c	4.16 c	6.58 a	5.58 ab	3.75 cd	4.08 c	3.16 d

*Note: There are no significant differences between values followed by the same letter according to Duncan's multinomial test

The results in Table (2) show that there is a significant effect of the concentrations of plant extracts on the percentage of germination, as the plants treated A2 and A3 excelled with the best percentage of germination, reaching 68.0 and 63.8%, respectively. The table also shows that there are no significant differences between treatments A1 and A6, while the percentage decreased. For germination to 34.7% in squash plants. The duration of soaking the seeds also had a significant effect, as the plants treated with B2 had the best percentage of germination, which amounted to 51.3%, over the plants treated with B1 and B3, as the percentage for each of them reached 48.6 and 45.1, respectively. In the results of the table above, we note the presence of a significant effect of the interaction between the treatment concentrations. With plant extracts and the duration of soaking the seeds, the plants of treatments A3B1 and A2B3 were characterized by the best percentage of germination, reaching (75.0 and 70.8%), while the intervention treatment gave the lowest percentage of germination, 29.1%. From the interaction table, we note that there are no significant differences between treatments A2B2, A3B2, and A3B3, as the percentage reached For each of them, respectively, 66.6, 66.6, and 62.5. There were also no significant differences between the other treatments. as shown in Table (2).

Table (2): Effect of concentrations in plant extracts and duration of soaking seeds and their interactions on the percentage of germination

			A concentrations of plant extracts					
			A6	A6	A6	A6	A6	A6
			38.8 bc	63.8 a	68.0 a	34.7 c	47.2 b	37.5 bc
B Duration of soaking seeds	B1	48.6 b	50.00 c	54.16 c	75.00 a	25.00 h	54.16 g	33.33 f
	B2	51.3 a	33.33 f	66.66 b	66.66 b	41.66 d	50.00 c	50.00 c
	B3	45.13 c	33.33 f	70.83 a	62.50 b	37.50 e	37.50 e	29.16 g

Note: There are no significant differences between values followed by the same letter according to Duncan's multinomial test.

The results in Table (3) show that there is a significant effect of the concentrations in the plant extracts on the germination speed, as the plants outperformed the treatments A1, A2, A3, and A6, where the germination speed was 6.6, 6.6, 6.7, 6.3, and 6.6 days / seed, respectively, over the treatment A5 and A4 The germination speed for them reached 6.3 and 6.3 days / seed, and the duration of soaking the seeds had a significant effect as well, as the B2 treated plants excelled with the best germination speed of 7.11 days / seed, while the germination speed decreased in treatment B1 and B3, as the germination speed for each of them, respectively, was 6.4 and 6.4. 6.0 days / seed.

Through the results of the table above, we notice that there is a significant effect of the interaction between the treatment of concentrations with plant extracts and the duration of soaking the seeds, if the plants of the treatment A6B1 and A5B1 were characterized by the best germination speed of 7.9 and 7.7 days / seed, and the lowest germination speed appeared in the plants of the overlap treatment A5B3, as it amounted to 4.9 days / seed). Also from the overlap table, there were no significant differences between the treatments A4B2, A3B2, A2B2, A1B2, A1B3, A2B3, and A6B1, with the superiority of these treatments over the other treatments. as shown in Table (3).

Table (3): Effect of concentrations of plant extracts, duration of soaking seeds and their interactions on germination speed

			A concentrations of plant extracts					
			A6	A6	A6	A6	A6	A6
			6.67 a	6.60 a	6.75 a	6.31 b	6.37 b	6.62 a
B Duration of	B1	6.48 b	5.94 cd	6.11 c	6.85 bc	5.72 cd	7.77 a	6.50 bc
	B2	7.11	6.66	7.08	7.17	7.38	6.43	7.92

soaking seeds		a	bc	b	b	b	c	a
	B3	6.07 c	7.41 b	6.60 bc	6.22 c	5.83 cd	4.91 e	5.44 d

Note: There are no significant differences between values followed by the same letter according to Duncan's multinomial test .

The results in Table (4) show that there is a significant effect of the concentrations of plant extracts on the uniformity of germination, as the plants treated A3 excelled with the best uniformity of germination (0.38 seeds/day), followed by treatment A2, where the percentage of uniformity in germination reached 0.35 seeds/day, while the percentage of homogeneity decreased. The germination rate reached 0.26, and the duration of seed soaking also had a significant effect, as the plants treated with B2 outperformed the best germination uniformity of (0.29 seeds/day) over the two treatments B1 and B3.

From the results of the same table, we note the presence of a significant effect in the interaction between the concentrations treatment and the duration of soaking the seeds, as the A3B1 treated plants were characterized by the best germination uniformity, reaching (0.42 seeds/day), and the least germination uniformity appeared in the A4B1 treated plants, reaching (0.14 seeds/day). as shown in Table (4).

Table (4): Effect of concentrations in plant extracts, duration of soaking seeds and their interactions on germination uniformity

			A concentrations of plant extracts					
			A6	A6	A6	A6	A6	A6
			0.22 d	0.35 b	0.38 a	0.19 c	0.26 e	0.21 d
B Duration of soaking seeds	B1	0.27 b	0.28 e	0.30 d	0.42 a	0.14 k	0.30 d	0.18 i
	B2	0.29 a	0.19 h	0.38 b	0.38 b	0.23 f	0.28 e	0.28 e
	B3	0.24 c	0.18 i	0.38 b	0.35 c	0.19 h	0.21 g	j0.16

Note: There are no significant differences between values followed by the same letter according to Duncan's multinomial test.

Interpretations

The effect of plant extracts from Black caraway and Dill is due to the fact that they contain many compounds, including organic acids, aromatic acids, coumarins, flavonoids, tannins, alkaloids, glycosides, terpenoids, and steroids, which may work to increase both the speed of germination, the percentage of germination, and the duration of germination [12]. These plant extracts also encourage physiological processes, including breaking the dormancy phase [13].

The effect of plant extracts from Black caraway and Dill seed is due to the fact that they contain many compounds, including organic acids, aromatic acids, coumarins, flavonoids, tannins, alkaloids, glycosides, terpenoids, and steroids, which may work to increase both the speed of germination, the percentage of germination, and the duration of germination [3]. These plant extracts also encourage physiological processes, including breaking the dormancy phase [13]

[14] indicated that Black caraway seeds contain flavonoids, which are antioxidants that play an important role in regulating the activity of the natural hormone Indol acetic acid, which works to stimulate cell division and elongation in low concentrations, and this agrees with the opinion of [3][7] in addition to containing amino acids, various amino acids, proteins, vitamins, dissolved mineral salts, and sugars (2)

Conclusions

Using concentrations of plant extracts had a clear effect on the germination characteristics of squash seeds, and the concentration of 5% (for Black caraway and Dill) had the best effect on most traits.

Using the soaking time had a clear effect on the germination characteristics of zucchini squash seeds, and the soaking time (12 hours) had the best effect on most traits.

From the results of the interaction between the study factors, we conclude that seeds soaked in plant extract (Black caraway and Dill at a concentration of 5% for 6 hours) is the best for use under local conditions.

Recommendations

Based on the above, we recommend:

We recommend using a concentration ranging from (2.5 – 7.5%) of plant extracts to treat squash seeds.

We recommend soaking zucchini squash seeds for (6-12 hours) because it is sufficient to have a significant effect on most germination characteristics.

Conducting other studies using other plant extracts to ensure the best effect on seed germination characteristics.

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