Plant Archives Vol. 21, Supplement 1, 2021 pp. 2576-2582 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
doi link : https://doi.org/10.51470/PLANTARCHIVES.2021.v21.S1.421

THE RESPONSE OF GROWTH, YIELD AND QUALITY OF TWO SOYBEAN VARIETIES *GLYCINE MAX* (L.) TO SOWING DEPTH

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ABSTRACT

Tow field experiments were conducted at Nineveh Governorate at two locations: Baashiqa/village Omer qapchi and Al-Rashidia during the summer growing season 2019, to study the response of two soybean varieties (Lee74 and Taqa) to sowing depth (3 and 7 cm). The experiments were carried out in Randomized Complete Block Design (R.C.B.D) with three replications. The results were as following: Variety Taqa was significantly superior in field emergence Percentage, leaf area, no. of pods.plant^{-1}, wt. of 1000 seeds, seed yield, and protein percentage for both locations. Sowing depth with 3cm increased significantly the following characters i.e.: field emergence Percentage, leaf area, and no. of pods.plant-1, wt. of 1000 seeds, seed yield, and oil percentage for both locations. - Overlap between Taqa variety and sowing depth (3cm) led to significantly superior in growth, yield, and its components, i.e. field emergence Percentage, leaf area, no. of pods.plant-1, wt. of 1000 seeds, seed yield and oil percentage for both location.

***Keywords*:** Growth, yield, quality, soybean varieties, *Glycine max*, sowing depth,
Running title: The quality of two soybean varieties

Introduction

Soybeans (*Glycine max*) consider important leguminous crops and is one of the most important sources of high-quality edible protein and oil for human. The protein seed content ranges from 30-50% and the oil percentage 14-24% (soybean oil is classified as semi-dry oils). Protein contains most of the amino acids necessary for humans (Macak and Candrakova, 2013), and soybean oil contains a high proportion of unsaturated fatty acids such as oleic and linoleic acids (Al-Dulaimi and Abdullah, 2014). Soybean products used for human nutrition such as (protein, milk, and flour). (Sayed Ali, 2018), soybean flour is characterized by its low content of carbohydrates and therefore given to people with diabetes. Soybean plants are divided into three groups according to the number of days from sowing to maturity: an early group of ripening (125 -130 days), medium-ripening group (140-150 days) and late-ripening group (150-160 days) where it is possible to obtain a high seed yield when there is a compatibility between the variety, environmental conditions, and agricultural operations, as the superiority of the variety in seed yield indicates its efficiency.

The superior variety in yield of those environmental factors surrounding it in the process of photosynthesis and the transfer of its products to the seed yield (Al Jumali, 2011). Among the crop servicing processes affecting the yield of soybeans is the depth of seed cultivation in the soil (Limede *et al*., 2018). As a result of the low water and drought in the Nineveh governorate, it is necessary to follow some Technologies that conserve and water resources in the Nineveh governorate (Omar and Talal, 2020).

The depth of seed planting in the soil is considered the determining factor for germination and the number of plants per unit area, homogeneity of growth, acceleration of field emergence and to obtain strong seedlings, thus increasing plant density, covering the field in a short time and increasing the amount of yield through bush competition (Srivastava *et al*., 2006), because the soybean crop suffers from a problem of seedling emergence, which is considered one of the very sensitive stages in crop growth, especially in heavy (clay) soils that are not well-drained. As for surface cultivation, it leads to the formation of thin seedlings due to the lack of moisture present in the surface layers of the soil (Srivastava *et al*., 2006). Chalabi *et al*. (2014) found in their research of four varieties of soybeans significant differences between the varieties in the characteristic of leaf area. Al-Daoudi (2014) reported that found, there were significant differences between the two varieties by the number of pods. Plant^{-1}, the weight of 1000 seeds, the seed yield, and the percentage of protein in the seeds.

Sarhan and Jasem (2015) confirmed in their research of three varieties of soybean (Industrial 2, Giza 22, and Giza 35) that were sown for two seasons, the significant superiority of Giza 22 for the two seasons in of leaf area. Al-Hashemi (2016) found significant differences between three varieties of the soybean crop (Sinaa'ya 2, Iman, and Shaima) in the number of pods.plant^{-1}, seed yield, and the percentage of protein Kandil *et al*. (2017). indicated that there were

significant differences between the varieties in the number of pods.plant^{-1} Kareem *et al*. (2019) In their study of three varieties of soybeans (Lee74, Taqa, and Iman), found significant differences between cultivars in the number of pods.plant^{-1} and seed yield.

In an experiment conducted by EMBRAPA (2011), reported that a seeding depth of more than 5 cm reduces the percentage of germination, especially in sandy soils. Lawson *et al*. (2009) indicated when studying the effect of five planting depths on soybeans (1, 2, 4, 6, and 8 cm) that the planting depth (1-4 cm) gave the highest average characteristics of germination percentage (96.60%) and the number of pods.plant^{-1} (153.20). Aisenberg *et al*. (2014) found that sowing soybean seeds more than 3 cm deep reduces the leaf area. Limede *et al*. (2018) indicated that sowing soybean with three planting depths (2, 4, and 6 cm) the depth of 4 cm gave the highest rate of germination percentage (77.5%) and leaf area (5.26 dm2). The aim of this research is to find the best depth for seeds planting of two soybeans and its effect on some growth, yield, and quality character.

Materials and Methods

This study was conducted during the summer agricultural season 2019 and included a field experiment carried out in two sites, the first in the village of Omar Qabji in Bashiqa District, Mosul District, and the second was in the fields of a farmer in Al-Rashidia, Mosul District, The experiment were carried out in a Randomized Complete Block Design (RCBD)as by with a two-factor working experiment system and with three replications,(Al-Rawi and Khalaf Allah, 2000), The first factor is two varieties(Lee74 and Taqa) and the second factor is two depths for agriculture (3 cm and 7 cm), The plot size (2m* 2.4m) the field was irrigated according to the need of the crop using the flood irrigation method. The harvesting of the crop was carried out at the Bashiqa site on 10/25/2019 and at Al-Rashidia site on 11/1/2019. Some physical and chemical properties of the soil sites (Bashiqa and Al-Rashidia) were shown in Table 1 in the central laboratory of the College of Agriculture and Forestry at the University of Mosul, and data on the maximum and minimum temperatures and relative humidity during the crop growth period for both sites were taken from the center Meteorology for the Ministry of Agriculture (Table 2).

Table 1 : the physical and chemical characteristics of the soil of the two experiment sites.

Characteristics	Site	
	Bashiqa	Al-Rashidia
EC (ds.m^{-1})	0.2	2.2
pH	7.3	7.5
Ready Nitrogen (ppm)	58.7	156.6
Ready Phosphor (ppm)	25.0	45.0
Ready Potassium (ppm)	5.6	12.0
Organic substance (gm/kg)	20.6	25.1
Calcium carbonate (gm/kg)	315	410
Clay %	48.2	14.7
Silt %	36	64
Sand %	15.8	21.3
Soil tissue	clay	Alluvial mixture

Table 2: Maximum and minimum temperatures average and relative humidity for 2019 agricultural season of the study sites in Bashiqa and Al-Rashidia

Bashiqa Site			
Month	**Maximum Temp. %**	**Minimum Temp. %**	**Humidity %**
May	23.6	18.6	42.9
June	41.4	27.2	21.1
July	42.2	26.8	19.3
August	44	28.6	22.8
September	38.1	23.4	75.7
October	32	18.2	76.6
Al-Rashidia Site			
Month	**Maximum Temp. %**	**Minimum Temp. %**	**Humidity %**
May	35.1	17.7	45.8
June	42.1	24.6	24.3
July	42.9	24.8	25.6
August	45.1	26.1	22.4
September	39.5	20.3	48.3
October	33.6	17.1	57.1

Studied characteristics

Emergence percentage: It was calculated by calculating the number of plants (seedlings) developing for all experimental units after 20 days of planting, according to the following equation: emergence Percentage = number of seeds germinated / number of total seeds planted x 100 reported before (Bonner and Galston, 1952).

Leaf area ($cm^2.plant^{-1}$): The leaf area measured at the beginning of the formation of the pods was measured by measuring the area of the three leaflets for five leaves for five plants according to the equation (Wireman and Bailey, 1975).

$$LA = 0.624 + (0.723)\ (L.W)$$

Where, LA = leaf area (cm2)

L = leaf length (cm)

W = maximum sheet width (cm)

Then multiplied the triple leaf area by the number of leaves in the plant to calculate the total leaf area.

Number of pods.$plant^{-1}$: It was calculated by the average number of pods for ten plants chosen randomly from the middle Mersin.

Weight of 1000 seeds (gm): 1000 seeds were counted through manual counting and weighed with a sensitive scale.

Seed yield ($kg.ha^{-1}$): It was calculated by harvesting the seeds each experimental unit in addition to the yield of the ten plants that were taken to estimate the yield components and weighed with a sensitive scale, and then the weights were converted from ($kg.m^2$) to ($kg.ha^{-1}$) According to the following equation:

$$\text{Seed yield } (kg.ha^{-1}) = \frac{\text{seed weight of middle plants } (kg) \times \text{hectare area } (m^2)}{\text{The area occupied by the central plants } (m^2)}$$

Oil percentage: It was estimated by using the Soxhlet device and by using the organic solvent Petrolium ether with a boiling point of 60-80 °C (A.O.A.C., 1984).

Protein percentage: by estimating the percentage of nitrogen in the seeds using Micro Khejldal and according to (AOAC, 1980), then the percentage was multiplied by a constant coefficient of 6.25 (Khalaf and Rajbo, 2006) to get the percentage of protein in the seeds.

Statistical analysis

A statistical analysis of all results was performed on the basis of an analysis of variance of the studied traits according to global experiments by designing randomized complete Block Design with three replications (RCBD) using (statistical analysis system SAS-V9, 2002). The meanings of the transactions were compared using the Duncan multi-range test with a probability level. (5%) and (1%) (Al-Rawi and Khalaf Allah, 2000).

Results and Discussion

Emergence percentage

The results in Table (3) show the superiority of the variety Taqa and recorded the highest significant rate for the trait, which reached 57.5% and 62.8% (compared to the Lee74 variety) for the Bashiqa and Al-Rashidia sites respectively. Its response to environmental conditions is consistent with what Aniekwe and Mbah (2014) found. The planting depths had a significant effect on the characteristic of the percentage of field emergence in the two study sites, as the planting depth of 3 cm recorded a significant superiority for the characteristic, reaching 62.4% and 62.9%, compared to the planting depth of 7 cm. This impairs the seedlings' ability to continue growth (Herbek and Bitzer), 1988 (and (Modolo *et al*., 2010), and soil contains with the oxygen is low, while the amount of CO_2 is accumulated, which negatively affects seedling growth (Prado *et al*. 2002) and (Modolo *et al*., 2010) (EMBRAPA, 2011) and this is consistent with what Limede *et al*. (2018) found.

The interaction of Taqa cultivar with a planting depth of 3 cm recorded the highest significant mean rate of the characteristic for both sites, which was 64.8% and 65.5% for the two sites of Bashiqa and Arashdiyah, respectively, compared to other interactions.

Leaf area (cm^2 $Plant^{-1}$)

The results in Table (4) indicate that there is a significant difference between the varieties in the characteristic of the Leaf area for both study sites, as the variety Taqa gave the highest average for the characteristic of 6344.5 cm^2 and 5048.1 cm^2 for the sites of Bashiqa and Al-Rashidia respectively, due to the genetic variation between the varieties in the genetic and physiological traits (Sarhan and Jasim, 2015), which led to the variety exploiting the energy of its genetic and physiological capabilities with good efficiency to obtain better growth requirements than the cultivar Lee74, and this is consistent with what Chalabi and others found (2014) and Sarhan and Jasim (2015).

Significant differences were found in the characteristic of the leaf area according to the different depths of planting, where the planting depth of 3 cm gave the highest average of the characteristic, which was 6067.1 cm^2 and 4954.3 cm^2 for the sites of Bashiqa and Al-Rashidia, respectively, compared to the planting depth of 7 cm. This depth of planting (Table 4) and thus increase the shoots (including leaf area) faster, especially in the early stages of growth. This is consistent with what Zuffo *et al*. (2016) found, and Aisenberg *et al*. (2014) concluded that growing soybean seeds with a depth of more than 3 cm reduces leaf area.

The effect of the bilateral overlap between the varieties and the depths of cultivation had a significant effect on the characteristic of the leaf area for both study sites, as the overlap between the variety Taqa and the depth of cultivation 3 cm gave the high rate was reach 6576.9 cm^2 in site Baashiqa. while in site Al-Rashidia the overlap between the variety Taqa and the depth of cultivation 7 cm gave the high rate is reached5071.2 cm^2 and it did not differ significantly with the overlap of cultivar energy and planting depth of 3 cm, as well as with the overlap of cultivar Lee74 and planting depth of 3 cm.

Number of pods. $Plant^{-1}$

It is evident from Table (5) that there is a significant difference between the varieties in the characteristic of the number of pods. $Plant^{-1}$ in both sites, where the variety gave the highest significant mean rate for the trait of 253.3 and 302.3 pods .$plant^{-1}$ compared to the Lee 74 variety, which gave the lowest average for the trait of 192.0 and 285.6 pods. $Plant^{-1}$ for Bashiqa and Al-Rashidia sites respectively, with an increase of 31.8% and 5.8% for the two sites respectively, due to the genetic nature of the variety, its high energy and efficiency in exploiting the surrounding environmental conditions and using it in the photosynthesis process, as it helped increase the transfer of assimilated products from the source to the sink Consequently, it increased the number of pods in the plant (Sahuki, 2006, Shamsi & Kobraee, 2009). This finding is consistent with the findings of Al-Hashemi (2016), Kandil *et al*. (2017), and Kareem and others (2019).

The number of pods.plant^{-1} was significantly superior to the planting depth of 3 cm, reaching 232.0 and 298.7 pods.plant^{-1}, compared to the planting depth of 7 cm, which gave the lowest average for the characteristic of 213.2 and 289.2 pods.plant^{-1}, with an increase of 8.8% and 3.2% for the sites of Bashiqa and Al-Rashidia, respectively. This is due to the leaf area was significantly superior to the planting depth of 3 cm, which led to an increase in the efficiency of the photosynthesis process and the transfer of its products from the source to the sink and thus led to an increase in the number of pods.plant^{-1}. This is consistent with what Lawson *et al*. (2009), who found that the characteristic of a number of pods.plant^{-1} in deep cultivation was less compared with shallow cultivation.

The effect of the bilateral overlap between the varieties with the depths of cultivation was significant in the characteristic for both sites, as the cultivar power and planting depth of 3 cm were superior to 259.7 and 312.3 pods.plant^{-1} for Bashiqa and Al-Rashidia sites respectively compared to the overlap of the variety Lee74 and the planting depth of 3 cm, which recorded the lowest average of the characteristic amounted to 204.4 pods. The plant.plant^{-1} and 285.2 pod.plant^{-1} for the Bashiqa and Al-Rashidia sites, respectively, and the percentage of increase for Bashiqa and Al-Rashidia sites were 27.0% and 9.4% respectively.

Weight of 1000 seeds (gm)

The results presented in Table (6) indicate that there is a significant difference between the varieties in the weight of 1000 seeds and for both sites, where the variety gave the highest significant mean for the trait of 126.17 g and 91.50 g, compared to the Lee74 variety, which gave the lowest average for the trait 122.47 g and 90.75 g, with an increase rate 3.02% and 0.82% for both sites of Bashiqa and Al-Rashidia respectively, due to the fact that this characteristic is one of the high heritable characteristics (Al-Sebahi, 1985), as the variety has better genetic and physical components energy than Lee74, which was reflected positively in increasing its efficiency in converting the products of the representation process. In addition, the variety has less energy than type Lee74 (Table 6) and more leaf area (Table 5) and thus provides the largest amount of assimilated products to go to the growing seeds to increase its fullness instead of going to the division and elongation of stem cells (Al-Jumaili and Ismail, 2010) and this is in agreement with what was mentioned (Al-Daoudi, 2014) that the leaf space is the source in preparing the seeds with the products of photosynthesis and their transfer to the seeds (downstream), which increases their fullness and increases their weight (Asare *et al*., 2011). The result is consistent with what Grandpa Al-Dawoudi (2014). There were significant differences between cultivars in the weight of 1000 seeds.

The depths of cultivation had a significant effect on the characteristic in both sites, where it was significantly superior to the planting depth of 3 cm, which reached 125.5 and 91.5 gm, compared to the planting depth of 7 cm, which gave the lowest mean of the characteristic of 123.0 and 90.65 gm, with an increase of 2.01% and 1.03% for both sites Bashiqa and Al-Rashidia respectively on This is due to the superiority of the same depth of planting in the characteristic of leaf area (Table 6) and the increase in the transfer of photosynthetic products to the seeds, thus increasing the weight of the seeds. Shengu and Yacob (2017) concluded that the highest significant mean weight of 1000 seeds was when planting depth of 3.5 cm overlapped with zero treatment (no fertilizer with phosphate fertilizer).

The weight of 1000 seeds was significantly superior to the double overlap between the cultivar. And sowing depth reached with planting depth 3 cm. 126.5 and 91.8 gm for the Bashiqa and Al-Rashidia sites respectively, which did not differ significantly with the overlap variety Taqa and planting depth 7 cm as well as it did not differ significantly with the overlap of variety Lee74 and the planting depth of 7 cm compared to the overlap The cultivar Lee74, planting depth of 7 cm, gave the lowest mean characteristics of 120.40 g and 90.14 g, with an increase of 5.14% and 1.87% for both sites, respectively.

Seed yield kg.h^{-1}

The results in Table (7) showed that there were significant differences between the varieties in the quality of the seed yield and for both sites, where the variety gave the highest significant rate of 3349 kg.ha^{-1} for Bashiqa site and 3479.3 kg.ha^{-1} for Al-Rashidia site compared to Lee74, which gave the lowest average for the characteristic of 2586.6 kg.ha^{-1} and 3123.1 kg.ha^{-1}, with an increase of 29.4% and 11.4% for the two sites respectively, due to the superiority of the energy variety in the characteristic of the number of pods.plant^{-1} and the weight of 1000 seeds for both sites (Table 7 and 8), and thus led to a significant increase in the yield. This is in agreement with what was mentioned (Al-Hashemi, 2016) on (Al-Sahuki, 2002) that 78% of the variation in the yield of soybeans is related to the number of pods.plant^{-1}. This is consistent with what Al-Hashemi (2016) and Kareem *et al*. (2019) found that cultivars differ among themselves in the characteristic of seed yield.

The planting depths had a significant effect on the seed yield in both sites, where the character was significantly superior to the planting depth of 3 cm, reaching 3076.7 and 3385.7 kg.ha^{-1} for the Baashiqa and Al-Rashidia sites respectively compared to the planting depth of 7 cm, which gave the lowest average for the trait of 2858.9 kg / ha and 3216 kg.ha^{-1}. This is due to the superior characteristics of the yield components, such as the number of pods.plant^{-1} and weight of 1000 seeds at a planting depth of 3 cm, for both sites (Table 7 and 8), which led to the superiority of the seed yield at the sowing depth 3 cm. This is consistent with what Lawson *et al*. (2009) found, who indicated an increase in the seed yield when the planting depth ranges between (1-4 cm) and decreased in the case of deep sowing.

The overlap between the varieties with the planting depths gave a significant effect on the seed yield characteristic of both sites, where the character was significantly superior when the overlap between the cultivar Taqa variety and the depth of planting 3 cm, reached 3351.6 kg.ha^{-1}, and it did not differ significantly with the overlap of the cultivar. The lowest average for the characteristic was 2371.5 kg at Bashiqa site, while in Al-Rashidia site, the characteristic was significantly higher when the variety Taqa overlapped and planting depth was 3 cm, it reached 3569.7 kg.ha^{-1} compared to the overlap of the variety Lee74, and the planting depth was 7 cm, which gave the lowest average for the characteristic was 3044.7 kg.ha^{-1}, and the increase rate for the two sites of Bashiqa and Al-Rashidia was 41.3% and 17.2%, respectively.

Oil percentage (%)

The results in Table (8) indicate that the percentage of oil in the seeds was not significantly affected by the average varieties and planting depths at both sites of the experiment, and this is consistent with what Al-Daoudi (2014) and Al-Hashemi (2016) and Kareem and others (2019) found, who indicated that there were no differences. Significance among varieties in the percentage of oil in the seeds may be attributed to the fact that the character of oil percentage is governed by a number of environmental and genetic factors related to the variety.

The bilateral overlap between the varieties with the depths of cultivation had a significant effect for the trait at the Bashiqa site, where the overlap between the variety Taqa and the planting depth of 3 cm gave the high rate reach was 18.8%, which did not differ significantly with the overlap of the variety Lee74 and the planting depth of 7 cm compared to the overlap of the variety Lee74 and the planting depth of 3 cm which gave The lowest rate of the trait was 16.9%, with an increase of 11.6%, while in the Al-Rashidia site, the bilateral interaction between the varieties with the depths of cultivation did not have a significant effect on the trait due to the nature of the variety, the genetic potential and its influence on the surrounding environmental conditions, which led to its high efficiency to obtain the requirements of growth Good and their products are transferred to seeds.

Protein percentage

The results in Table (9) show that there is a significant difference between the varieties in the percentage characteristic of protein in the seeds in both sites, as the variety Taqa gave the highest significant average reach 36.5% and 33.2% for both sites compared to Lee74, which gave the lowest rate of the protein percentage It reached 35.3% and 30.9%, an increase of 3.2% and 7.5% for Bashiqa and Al-Rashidia sites respectively, This is due to the genetic variation between the varieties and their response to the surrounding environmental conditions, as most of the carbohydrates in the seed are transformed to form a protein and thus The percentage of protein increases (Al-Dulaimi, 1992) and since the Taqa variety gave the highest rate in the weight of 1000 seeds (Table 8), this indicates that its content of nutrients was higher than the variety Lee74, and thus it was positively reflected in the characteristic (Al-Daoudi, 2014). The result is consistent with what Al-Daoudi (2014) and Al-Hashemi (2016) found that there were significant differences between cultivars in the percentage characteristic of protein in the seeds.

The planting depths did not significantly affect the protein percentage characteristic of the seeds and at both experimental sites. The effect of the bilateral overlap between the varieties with the depths of cultivation was significant in the quality of protein percentage in the seeds of for both sites, Bashiqa and Al-Rashidia, where the characteristic was superior when the cultivar Taqa with a planting depth of 7 cm was 36.6% and 33.3% for the two sites of Bashiqa and Al Al-Rashidia, respectively compared to the overlap of the variety Lee74 and the planting depth of 7 cm. Which gave the lowest value of 34.8% and 30.9%, with an increase of 5.1% and 7.6% for the two signatories, respectively.

Table 3 : Effect of Varieties and sowing depth on emergence Percentage.

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	60.0 b	64.8 a	62.4 a	3 cm	60.3 b	65.5 a	62.9 a
7 cm	50.2 c	50.1 c	50.1 b	7 cm	59.7 b	60.1 b	59.9 b
Means of Varieties	55.1 b	57.5 a	**56.3**	Means of Varieties	60.0 b	62.8 a	**61.4**

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Table 4 : Effect of Varieties and sowing depth on Leaf area (cm^2/plant).

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	5557.4 c	6576.9 a	6067.1 a	3 cm	4883.5 a	5025.1 a	4954.3 a
7 cm	5478.5 c	6112.1 b	5795.3 b	7 cm	4042.1 b	5071.2 a	4556.6 b
Means of Varieties	5518.0 b	6344.5 a	**5931.2**	Means of Varieties	4462.8 b	5048.1 a	**4755.4**

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Table 5 : Effect of Varieties and sowing depth on Number of pods.$plant^{-1}$

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	204.4 c	259.7 a	232.0 a	3 cm	285.2 b	312.3 a	298.7 a
7 cm	179.6 d	246.8 b	213.2 b	7 cm	286.1 b	292.3 b	289.2 b
Means of Varieties	192.0 b	253.3 a	**222.6**	Means of Varieties	285.6 b	302.3 a	294.0

*Values followed by the same letter are not significantly different from each other with probability 5 and1 %

Table 6 : Effect of Varieties and sowing depth on Weighing 1000 seeds (gm).

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	124.5 a	126.5 a	125.5 a	3 cm	91.3 a	91. 8 a	91.5 a
7 cm	120.4 b	125.7 a	123.0 b	7 cm	90.1 b	91.1 a	90.6 b
Means of Varieties	122.4	126.1 a	124.2	Means of Varieties	90.7 b	91.5 a	91.0

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Table 7 : Effect of Varieties and sowing depth on Seed yield (kg / ha^{-1})

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	2801.8 b	3351.6 a	3076.7 a	3 cm	3201.6 c	3569.7 a	3385.7 a
7 cm	2371.5 c	3346.4 a	2858.9b	7 cm	3044.7 c	3388.9b	3216.8b
Means of Varieties	2586.6 b	3349.0 a	**2967.8**	Means of Varieties	3123.1b	3479.3 a	**3301.2**

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Table 8 : Effect of Varieties and sowing depth on the oil percentage.

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	16.9 b	18.8 a	17.8 a	3 cm	16.6 a	16.5 a	16.6 a
7 cm	17.4 ab	17.1 b	17.3 a	7 cm	14.7 a	16.0 a	15.4 a
Means of Varieties	17.1 a	18.0 a	17.5	Means of Varieties	15.6 a	16.3 a	**15.9**

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Table 9 : Effect of Varieties and sowing depth on the protein percentage.

Baashiqa location				Al-Rashidia location			
Sowing depth	Varieties		Means of sowing depth	Sowing depth	Varieties		Means of sowing depth
	Lee74	Taqa			Lee74	Taqa	
3 cm	35.8 ab	36.3 ab	36.1 a	3 cm	30.8 b	33.1 a	32.0 a
7 cm	34.8 b	36.6 a	35.7 a	7 cm	30.9 b	33.3 a	32.1 a
Means of Varieties	35.3 b	36.5 a	**35.9**	Means of Varieties	30.9 b	33.2 a	32.0

*Values followed by the same letter are not significantly different from each other with probability 5 and 1 %

Acknowledgment

The authors are very grateful to the University of Mosul / College of Agriculture & Forestry for their provided facilities, which helped to improve the quality of this work.

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