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Research Article

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Effect of Potassium Doses on Agricultural Characteristics of Camelina Sown in Winter and Summer Season

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HIGHLIGHTS

- Camelina oil is a valuable oil for human health.
- In this study, some effects of potassium fertilizer applied at different doses on camelina were investigated.
- In the spring sowing, an increase was observed in the seed yield value with the increase of the potassium dose, and it was determined that the potassium application in winter cultivation differs.

Abstract

This research carried out in Konya ecology, Arslanbey camelina [*Camelina sativa* (L.) Crantz] genotype which was planted in 2 different times as winter and summer, in the vegetation period of 2020, was determined at 6 different doses (0 kg da^{-1}, 10 kg da^{-1}, 15 kg da^{-1}, 20 kg da^{-1}, 25 kg da^{-1}, 30 kg da^{-1}) potassium sulphate fertilizer was applied to the soil and its effects on some agricultural properties were determined. Field trials of the study were established according to the Random Blocks trial design with 3 replications. As the results of the research in summer plantings, plant height 50.23-54.01 cm, number of branches per plant 5.60-8.80, number of capsules per plant 30.87-58.80, number of seeds per capsule 14.10-17.60, first capsule height 39.55-45.28 cm, seed yield per plant 0.28-1.27 grams, the number of seeds per plant 252.53-1166.13, thousand grain weight 0.78-1.12 grams, grain yield 63.76-77.75 kg da^{-1}, oil rate 22.54%-29.66%, oil yield between 14.05-22.25 kg da^{-1}. Additionally, the values obtained as a result of the winter planting of camelina; plant height 52.04-57.74 cm, number of branches per plant 8.33-11.70, number of capsules per plant 199.80-274.67, number of seeds in capsule 11.50-13.23, height of first capsule 41.01-47.17 cm, grain yield 1.24-1.65 grams per plant, number of seeds per plant 1754.43-2424.00 pieces, thousand grain weight 0.69-0.85 grams, grain yield 80.65-125.93 kg da^{-1}, oil rate 14.47-18.77%, oil yield 11.97-19.74 kg da^{-1}. It can be said that it is essential to carry out long-term different agronomic studies in different locations related to camelina, an important and alternative oil plant.

Keywords: Agronomy, *Camelina sativa*, Cultural practice, Potassium sulphate

1. Introduction

Agriculture is a very sensitive sector that is very important for the nutrition, employment and development of nations and is directly affected by natural conditions. At the same time, the protection and preservation of the soil is the sole basis for the continuity of future generations. In parallel with the rapidly

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increasing world population, meeting the increasing nutritional and energy needs will be possible by increasing the yield and quality of agricultural products.

The increase in consumption of foodstuffs has therefore led to an increase in the demand for vegetable oils. One of the foodstuffs that have an important place in human nutrition is vegetable oils. These nutrients are extremely critical for people to perform their vital activities. In addition to having high nutritional value, oils contain free fatty acids necessary for cell structure. Vegetable oils also have a distinctive feature, such as the human body's ability to dissolve fat-soluble vitamins.

Camelina [*Camelina sativa* (L.) Crantz.] is an oil plant belonging to the Cruciferae family. It has been understood that the seed bed should be prepared quite well because the thousand grain weight is between 0.7-1.6 g. It was stated that the harvest of the camelina plant should be done when the capsule is not fully cracked and when full maturation occurs. Because in this way, it has been determined that the grain yield varies between 80-130 kg da^{-1} (İncekara, 1964). In Europe, camelina is grown mostly as a spring crop on organic farms to produce oil and press cakes for animal feed. In these harvesting systems, camelina is often mixed with legumes to prevent weed competition and increase nitrogen supply (Saucke and Ackermann, 2006; Paulsen, 2007).

It is known that camelina oil is a valuable oil for human health. It is also preferred instead of fish oil because it has similar fatty acids content (Zubr, 1997). Camelina seeds are rich in oil (30–49%) and protein (24–31%). It is rich in omega 3 and omega 6 fatty acids, as well as tocopherols, phytosterols and phenolic compounds (Mondor and Hernández-Álvarez, 2022).

In a study (Tamer et al., 2016); it has been stated that the soils of Turkey are rich in potassium at a rate of more than 90%, but because of excessive rainfall and irrigation, the potassium element can move away from the root zone of the plants and therefore the application of potassium-containing fertilizers may become mandatory. In a study on sunflower, which is also an oil plant (Yağmur and Okur 2017); it has been stated that it is inevitable to give sufficient potassium fertilizer for yield and quality increase. Researcher Yenigün (2021) stated that potassium content is high in most of Turkey's soils, but there are great debates regarding the usefulness of potassium. The researcher also stated that the climate has an important effect on potassium availability, that new studies should be established in different soil conditions by using the up-to-date climatic data on potassium for each product, and that the most appropriate potassium dose should be determined in this context. Therefore, in addition to efficiency in agronomic studies, quality work is essential to ensure food safety and sustainability in agricultural terms (Harmankaya et al., 2016; Kahraman and Onder, 2018).

It is important to investigate diversified rotation systems, including lesser-known and/or underproduced plants such as cauliflower, and to identify research priorities on quality as well as various cultural practices (adaptation, planting density, fertilization, etc.) for these crops. This research was carried out to investigate the effects of six different doses of potassium fertilizer applied to camelina [*Camelina sativa* (L.) Crantz] plant, which was cultivated in both spring and autumn periods, on some yield and quality components of camelina in Konya closed basin.

2. Materials and Methods

As material, Camelina genotype "Arslanbey" obtained from the Department of Field Crops, Faculty of Agriculture, Selcuk University was used. The research was carried out by Selcuk University Faculty of Agriculture Prof. Dr. Abdülkadir AKÇİN Experiment Field in 2020, in spring (14th March 2020) and autumn (29th October 2020) separately, according to the Random Blocks Trial Design with three replications.

It was prepared in accordance with the field method where wheat was planted in the previous year. The plots are 2.0 m long and 1.05 m wide, and 7 rows were planted on each plot. The distance between the rows in the plots is 15 cm, the distance between the rows is 5 cm and the planting is designed at a depth of 0.5 cm.

Before planting, 15 kg da^{-1} DAP was applied to the soil, mixed with the soil with the help of a rake and leveled. 20 kg da^{-1} Ammonium Sulphate was applied as top fertilizer in the period when the plants had 4-6 leaves. Just before planting, 6 different doses (0 kg da^{-1}, 10 kg da^{-1}, 15 kg da^{-1}, 20 kg da^{-1}, 25 kg da^{-1}, 30 kg da^{-1}) of Potassium Sulphate fertilizer were applied to the soil.

The harvest date of the spring planting was realized as 24 June 2020. The harvest date of autumn sowing was 06 June 2021. While measurements and observations were taken for all the features discussed in the experiment, the necessary measurements and observations were not taken from these parts as 30 cm sections were removed from the beginning and end of the remaining rows as well as the first and last rows in each plot. Plant height, number of branches, number of capsules, number of seed per capsule, height of first capsule, thousand seed weight, seed yield, oil ratio and oil yield were detected (Çoban and Önder, 2014; Kahraman, 2017; Yıldırım and Önder, 2016).

The climate data of the period in which the field studies of the research were carried out were obtained from the website of the Regional Directorate of Meteorology and are given in Table 1.

During the vegetation period of the study, the total precipitation amount for 9 months was 168.4 mm, and it was approximately 132 mm less than the total precipitation for long years (300 mm). In the process of this study, the highest monthly precipitation value was determined as 51.8 mm in January, and extremely low precipitation was received in the other months of the study. Considering the total amount of precipitation recorded during the vegetation period in which this study took place, it was seen that the distribution of precipitation to months was much more irregular than the average of long years.

Table 1. Some climatic values of the months and long years in which the field works were carried out (data collected from: General Directorate of Meteorology)

Months	2020-2021 Vegetation Period					Long Terms (1929-2020)				
	Temperature (°C)					Temperature (°C)				
	Mean	Max.	Min.	Rain (mm)	Relative Humidity (%)	Mean	Max.	Min.	Rain (mm)	Relative Humidity (%)
October	16.3	28.7	3.6	13	56	12.6	31.6	-7.6	29.9	58
November	5.8	17.9	-8.1	25	78	6.5	25.2	-20.0	32.2	69
December	4.5	14.6	-7.5	12.6	88	1.6	20.0	-22.4	42.8	77
January	2.5	20.2	-11.2	51.8	85	-0.1	17.6	-25.8	37.9	76
February	2.9	20	-16.5	1.6	67	1.4	21.2	-25.0	28.5	70
March	5.2	31.3	-7.8	31.6	66	5.5	28.9	-15.8	28.7	62
April	12.1	30.2	-1.2	17.4	53	11	31.5	-8.6	31.9	58
May	19.1	33.7	1.7	2.4	38	15.8	33.4	-1.2	43.3	55
June	19.5	32.5	4.3	26	51	20.1	37.2	3.2	25.7	47
Average	9.7	26.9	- 4.7		60.8	10.4	34.4	-16.7		61
Total				181.4					330.8	

Considering the results of the analysis of the soil in which the field experiment was established; clay-loam, neutral pH, salt-free structure, medium organic matter level (2.34%), high amount of phosphorus, very rich in potassium, rich in calcium, sufficient in copper-zinc and manganese, deficient in iron content and very It was determined that it exhibited a calcareous structure.

Variance analysis was performed on the data obtained as a result of the study, using a computer-based statistical analysis program called "JUMP", and grouping was performed with the "Student's t test" at the 5% level to compare the mean values whose "F" test was significant (Çoban and Onder, 2014).

3. Results and Discussion

Results of variance analysis presented on Table to while the mean values of the investigated characteristics presented on Table 3.

Focus on the plant height values obtained in the study; In spring plantings, the shortest plant height was 50.23 cm at 30.0 kg da^{-1} potassium application dose, and the highest value was 54.01 cm at 0.0 kg da^{-1} application dose. In camelina planted in autumn, the highest plant height was determined as 57.74 cm,

Table 2. Results for analysis of variance

Plant Height		Spring Sowing		Autumn Sowing	
Source of Variance	**DF**	**MS**	**F**	**MS**	**F**
Total	**17**	8.24	-	20.87	-
Replication	**2**	20.54	-	27.27	-
Potassium Dose	**5**	7.48	1.21	13.60	0.59
Error	**10**	6.16	-	23.23	-
Number of Branch		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		4.79	-	3.13	-
Replication		1.50	-	4.66	-
Potassium Dose		3.98	0.68	5.29	3.08
Error		5.85	-	1.71	-
Number of Capsule per Plant		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		636.77	-	3141.29	-
Replication		3326.71	-	3091.18	-
Potassium Dose		268.99	0.95	1975.95	0.53
Error		282.67	-	3733.99	-
Number of Seed per Capsule		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		5.72	-	2.29	-
Replication		13.09	-	4.46	-
Potassium Dose		5.27	1.18	1.84	2.14
Error		4.47	-	2.08	-
Height of First Capsule		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		23.81	-	17.19	-
Replication		7.98	-	51.28	-
Potassium Dose		20.32	0.71	15.37	1.36
Error		28.71	-	11.29	-
Thousand Seed Weight		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		0.07	-	0.02	-
Replication		0.05	-	0.00	-
Potassium Dose		0.05	0.62	0.01	0.49
Error		0.08	-	0.00	-
Seed Yield		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	**F**
Total		867.81	-	627.12	-
Replication		6793.05	-	803.92	-
Potassium Dose		72.66	0.90	818.06	1.65
Error		80.34	-	496.28	-
Oil Ratio		**Spring Sowing**		**Autumn Sowing**	
Sources of Variation		**MS**	**F**	**MS**	**F**
Total		36.89	-	9.37	-
Replication		126.83	-	12.60	-
Potassium Dose		21.05	0.78	10.61	1.31
Error		26.82	-	8.09	-
Oil Yield		**Spring Sowing**		**Autumn Sowing**	
SV		**MS**	**F**	**MS**	
Total		106.63	-	21.89	-
Replication		668.76	-	16.55	-
Potassium Dose		25.44	0.73	29.58	1.55
Error		34.79	-	19.13	-

while the smallest plant height was determined as 52.04 cm. In this study, the highest value for plant height; It was obtained from plots where potassium was not applied. The average plant height in autumn planting (54.69 cm) was taller than the average plant height in spring planting (52.26 cm).

Previous findings for plant height value in various studies on camelina; 73.91 cm (Mason, 2009b), 95.25 cm (Mason, 2010), 47.25-51.50 cm (Sadhuram et al., 2010), 60 to 110 cm (Berti et al., 2011), 103.41-67.17 cm (Katar et al., 2012), 83.24-95.28 cm (Yıldırım and Önder, 2016).

Table 3. Mean values of the investigated characteristics

	Potassium Doses (kg/da)						
	0.0	**10.0**	**15.0**	**20.0**	**25.0**	**30.0**	**Mean**
			Plant Height (cm)				
Spring	54.01	53.01	53.19	52.75	50.35	50.23	**52.26**
Autumn	57.74	53.87	53.23	56.57	52.04	54.67	**54.69**
Mean	55.88	53.44	53.21	54.66	51.20	52.45	**53.48**
			Number of Branch per Plant (piece)				
Spring	7.73	8.20	8.80	6.60	7.60	5.60	**7.42**
Autumn	8.33	11.70	8.93	9.13	10.80	10.80	**9.95**
Mean	8.03	9.95	8.87	7.87	9.20	8.20	**8.69**
			Number of Capsule per Plant (piece)				
Spring	40.18	30.87	43.60	58.80	45.73	37.00	**42.69**
Autumn	199.80	237.20	262.27	239.27	274.67	239.93	**242.19**
Mean	119.99	134.04	152.94	149.04	160.20	138.47	**142.44**
			Number of Seed per Capsule (piece)				
Spring	15.43	14.10	17.60	17.20	15.40	15.17	**15.82**
Autumn	13.23	11.57	11.90	11.67	11.50	13.07	**12.16**
Mean	14.33	12.84	14.75	14.44	13.45	14.12	**13.99**
			Height of First Capsule (cm)				
Spring	45.28	40.12	39.55	44.13	45.17	41.10	**42.56**
Autumn	47.17	41.65	41.94	44.07	42.57	41.01	**43.07**
Mean	46.23	40.89	40.75	44.10	43.87	41.06	**42.82**
			Thousand Seed Weight (g)				
Spring	0.94	1.12	0.99	1.03	1.11	0.78	**1.00**
Autumn	0.85	0.69	0.70	0.83	0.81	0.80	**0.78**
Mean	0.90	0.91	0.85	0.96	0.96	0.79	**0.90**
			Seed Yield (kg da^{-1})				
Spring	63.96	66.76	68.10	69.68	73.22	77.75	**69.91**
Autumn	90.29	125.93	107.39	80.65	111.28	92.81	**101.39**
Mean	77.13	96.35	87.75	75.17	92.25	85.28	**85.65**
			Oil Ratio (%)				
Spring	23.29	26.05	29.66	22.54	25.76	23.33	**25.10**
Autumn	18.77	16.20	17.47	14.47	15.94	13.65	**16.08**
Mean	21.03	21.13	23.57	18.51	20.85	18.49	**20.59**
			Oil Yield (kg da^{-1})				
Spring	14.05	18.58	22.25	16.13	20.30	18.28	**18.27**
Autumn	16.91	19.74	18.83	11.97	17.58	13.09	**16.35**
Mean	15.48	19.16	20.54	14.05	18.94	15.69	**17.31**

The average values of the number of branches in the plant, the minimum number of branches was obtained from the plots with 5.60 pieces/plant and the most potassium applied, while the maximum number of branches was obtained from the plots with 8.80 pieces/plant and 15 kg da-1 of potassium. Considering the autumn plantings, plant height values in camelina; It varied between 8.33 per plant (0.00 kg da^{-1}) and 11.70 per plant (10.0 kg da^{-1}).

Findings of the other studies in which the number of branches in the camelina plant were determined are as follows: 2.20-12.83 units/plant (Karahoca and Kırıcı, 2005); while it was determined as 9.81 units/plant (Katar et al., 2012), it was determined that 1.00-3.60 units/plant in summer plantings and 7.15-16.75 units/plant in winter plantings (Koç, 2014) in Konya ecology.

Result of the research showed that, when the average values determined for the number of capsules in the plant are examined; it was determined in the range of 30.87 units/plant (10.0 kg da^{-1}) – 58.80 units/plant (20.0 kg da^{-1}) in spring plantings. As a result of the study, the number of capsules in camelina planted in autumn was determined as 199.80 pieces/plant and the lowest value at 0.00 kg da^{-1} dose, while the highest value was determined at 274.67 pieces/plant and 25.0 kg da^{-1} potassium application dose. In the research, a significant increase was observed in the average value of the number of capsules per plant compared to spring planting in camelina planted in autumn (autumn average: 242.19 units/plant; spring average: 42.69 units/plant).

Relative studies carried out, the number of capsules in the camelina plant; in Konya ecological conditions, it was determined in the range of 40.15-94.75 units/plant in summer plantings, 264.20-465.80 units/plant in winter plantings (Koç, 2014), and 75.33-117.17 units/plant in summer plantings (Yıldırım and Önder, 2016) in Konya ecology.

The average values determined for the number of seeds in the capsule of the camelina plant; It ranged between 14.10 pieces/capsule and 17.60 pieces/capsule in spring planting. If sown in autumn, the said value was determined in the range of 11.50 – 13.23 pieces/capsule. In this study, the highest value in autumn planting in terms of the number of seeds in the capsule; emerged from plots that were not treated with potassium.

Investigated values of the number of seeds in the capsule in various studies with the camelina plant; 11.4-12.8 pcs/capsule Sadhuram et al. (2010), 8-15 pcs/capsule Berti et al. (2011), in Konya ecology; it was determined in the range of 10.28-13.73 units/capsule (Koç, 2014), 13.83-16.67 units/capsule (Yıldırım and Önder, 2016).

When the average values obtained for the first capsule height in the camelina are examined; In the spring plantings, the lowest result was obtained with a value of 39.55 cm and 15.0 kg da^{-1} application, while the highest first pod height value was found in the control group with a value of 45.28 cm. The first capsule height of camelina planted in autumn was found to be between 41.01 cm (30.0 kg da^{-1}) – 47.17 cm (0.00 kg da^{-1}) values. Considering these results, the highest first capsule height value for both spring and autumn plantings; appeared in plots not treated with potassium.

The first capsule height is an important parameter for machine harvesting. In other studies, conducted in Konya ecology; It was determined between 50.67-83.67 cm (Çoban and Önder, 2014), 71.00-80.09 cm Yıldırım and Önder (2016), and it is seen that the findings of the studies on the subject over-lap.

Considering the average values for the thousand seed weight determined in this study; the lowest value was determined at 0.78 g and 30.0 kg da^{-1} application dose, and the highest value 1.12 g was determined at 10.0 kg da^{-1} dose. When the findings are evaluated; it is quite remarkable that the highest potassium application dose leads to the lowest thousand seed weight.

The weight of a thousand seeds in camelina planted in autumn; 0.69 g value was determined at 10.0 kg da^{-1} application, and the highest value was determined with 0.85 g value at 0.00 kg da^{-1} dose. When the autumn plantings are examined; the highest thousand seed weights occurred in the plots without potassium application and the application dose of 10.0 kg da^{-1} resulted in the highest value in spring planting and the lowest value in autumn planting; it suggests the interpretation that different results can be obtained in seasonal potassium applications.

Former studies carried out in camelina, thousand seed weight values; 1.32 g (Karahoca and Kırıcı, 2005), 1.19 g (Mason, 2009a), 0.8 - 1.8 g (Berti et al., 2011), (Katar et al., 2012), 0.85 g in spring sowing and 1.26 g in autumn sowing in Konya ecology (Koç, 2014) was determined in the range of 1.06 g (Yıldırım and Önder, 2016), and it coincides with the thousand-grain weight values obtained as a result of this study.

As a result of the research, when the values for seed yield are examined; In the plots planted in spring, the lowest value was 63.76 kg da^{-1} and 10.0 kg da^{-1} potassium application. In camelina planted in autumn, the lowest grain yield was determined with a value of 80.65 kg da^{-1} in potassium application at a dose of 20.0 kg da^{-1}, and the highest grain yield value was found in potassium application with a value of 125.93 kg da^{-1} in 10.0 kg da^{-1}. It has been observed that potassium application in camelina in autumn planting fluctuates depending on the dose in terms of grain yield. When a general evaluation is made, it has been determined that the grain yield of camelina is higher in winter plantings, regardless of the effect of potassium doses.

The results of other studies that determined the grain yield in camelina are as follows: 105-325 kg da^{-1} (Vollmann et al., 1996), 116-180 kg da^{-1} (Agegnehu and Honermeier, 1997), 260-330 kg da^{-1} (Zubr, 1997), 360-400 kg da^{-1} (Crowley and Fröhlich, 1999), 255.47 kg da^{-1} (Mason, 2009a), 235.87 kg da^{-1} (Mason, 2009b), 67–74 kg da^{-1} (Koncius and Karcauskiene, 2010), 259.05 kg da^{-1} (Mason, 2010), 120.2-150.1 kg da^{-1} (Sadhuram et al., 2010), 87.81-281.27 kg da^{-1} (Katar et al., 2012), 71.12- 97.90 kg da^{-1} (Yıldırım and Önder, 2016), 80-140 kg da^{-1} (Kurt and Göre, 2018), 37.05-55.13 kg da^{-1} (Dağ Subaş, 2022), 103.1-227.8 kg da^{-1} (Koçer, 2022). Grain yield in camelina plant; It varies greatly according to the genetic character of the cultivar grown, climatic conditions and cultivation techniques as it seen on the other field crops (Kahraman, 2022).

Considering the average values obtained for the oil rate determined in the camelina; in the spring plantings, the lowest value was found at 22.54% at the application dose of 20.0 kg da^{-1}, while the highest rate was determined with 29.66% in the plots where 15.0 kg da^{-1} of potassium fertilizer was applied. In the case of planting camelina in autumn, the lowest value of the oil rate was 14.47% at a dose of 20.0 kg da^{-1}, while the highest oil rate was 18.77% in the plots without potassium application. When the winter and summer plantings of camelina are evaluated in general; while the lowest value in terms of oil content was observed in 20.0 kg da^{-1} potassium application, it was determined that the oil ratio was higher in camelina in spring plantings.

Other research results in which the oil rate was determined in the camelina; 28%-37% (Atakişi, 91), 38.5-45.5% (Vollmann et al., 1996), 37-43% (Agegnehu and Honermeier, 1997), 42-45% (Zubr, 1997), 39.30% (Mason) , 2009a), 38.8% (Mason, 2009b), 32.6% (Mason, 2010), 25.16-37.15% (Katar et al., 2012), 22.72-37.55% (Koç, 2014), 30-49% (Berti et al., 2016, Boyle et al., 2018, Hossain et al., 2019), 24.02-29.33% (Yıldırım and Önder, 2016), 17.26-22.53% (Dağ Subaş, 2022), 24.66 – 30.62 Koçer (2022) is specified. The oil rate in the grain; it is known that it may vary depending on the variety, growing conditions, and climatic conditions, as well as the storage period (Tura et al., 2022). As a matter of fact, as seen in the research on camelina, the oil rate in the grain varies in a wide range.

In this study, when the average values of oil yield in camelina grown in summer and winter are examined; the lowest value was found – 14.05 kg da^{-1} in the plots where potassium was not applied in spring plantings, and the highest value (22.25 kg da^{-1}) was reached in the application of potassium at a dose of 15.0 kg da^{-1}. In the case of planting camelina in autumn, the lowest value of oil yield occurred at a dose of 11.97 kg da^{-1} and 20.0 kg da^{-1}, while the highest oil yield was observed in plots treated with potassium at a dose of 10.0 kg da^{-1}, reaching a value of 19.74 kg da^{-1}.

The findings related to oil yield in various studies on camelina were examined; 12.06-72.39 kg da^{-1} (Karahoca and Kırıcı, 2005), 100.91 kg da^{-1} (Mason, 2009a), 84.45 kg da^{-1} (Mason, 2010), 103.84-22.94 kg da^{-1} (Katar et al., 2012), 57.93 kg da^{-1} (Yıldırım and Önder, 2016), 30.1-66.5 kg da^{-1} (Koçer, 2022). It is stated that many metabolic factors such as seed yield and quality in plants are affected by genetic structure and climatic conditions (Onder and Kahraman, 2016; Deng et al., 2022).

4. Conclusions

As a result of this research, regardless of the effect of potassium applications, seed yield in camelina plant; found to be higher in autumn sowings. It is very striking that the application of the highest dose of potassium in spring planting resulted in the lowest 1000 seed weight. Looking at the winter sowings; the highest value of 1000 seed weight is observed in the plots without potassium application and the application dose is 10.0 kg da^{-1}, and the highest thousand seed weight in summer cultivation and in winter cultivation; reach the lowest value; it has been suggested that the results obtained from potassium applications may vary depending on the season. In the spring sowing, an increase was observed in the seed yield value with the increase of the potassium dose, and it was determined that the potassium application in winter cultivation differs depending on the application doses in terms of grain yield. The highest oil rate in autumn planting; It was observed that the oil rate was higher in the spring plantings, while it appeared in the plots where potassium was not applied. In terms of oil yield, the lowest value was observed in the plots where potassium was not applied in summer cultivation, and the highest oil yield was reached at the potassium application dose of 15.0 kg da^{-1}, respectively.

It is important to expand the cultivation of alternative oil crops, to implement systems to encourage oilseed farming with government support, to create a product pattern suitable for the region, and to enter the rotation of alternative oil crops. To meet the need for oilseeds by evaluating fallow fields with these plants, growing second crops, supporting research projects, and making a planned and programmed study; It will pave the way for being a self-sufficient country in vegetable oil production and exporting surplus production.

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