UAZİMDER Uluslararası Anadolu Ziraat Mühendisliği Bilimleri Dergisi ***ISSN: 2667-7571***
IJAAES International Journal of Anatolia Agricultural Engineering ***2019 (2): 6-10***

Teslim / Received:10.12.2018 **Araştırma Makalesi / ResearchArticle**
Kabul Edilme / Accepted: 15.01.2019

Comparison of Local Sesame (*S. indicum* L.) Genotypes for Yield and Some Yield Components

Fatih Kıllı

Prof. Dr., Kahramanmaraş Sütcü İmam University
Agricultural Faculty, Field Crops Department, Kahramanmaraş, Turkey.

fakilli@ksu.edu.tr

Abstract

Local sesame genotypes are an important genetic resource for many agricultural and technological features and resistance to disease and insect. The objective of this experiment was to find out seed yield and some yield components of local sesame genotypes grown under field conditions. In this study one registered variety (Hatipoglu) and eleven local genotypes (Akceli, Bivan, Gerger, Gökceköy, Hosmos, Pirag, Sincik, Sögütlübahce, Sutepe-1, Sutepe-2 and Taslıca) were used as plant materials in randomized complete block design with three replications and investigated number of flowering days, physiological maturity days, plant height, number of branches, number of capsules, one thousand seed weight, seed yield and oil content.

It was determined that there were significant differences among the sesame genotypes for physiological maturity days, number of branches,number of capsules and seed yield. The results showed that number of flowering days, physiological maturity days, plant height, number of branches, number of capsules, one thousand seed weight, seed yield and oil content for sesame genotypes ranged between 37 – 39, 98.7 – 113.8, 51.9 – 64.0 cm, 1.5 – 3.5, 12.9 – 37.4, 3.1 – 3.9 g, 43.5 – 51.7 % and 34.9 – 115.4 kgda^{-1}, respectively. The highest seed yield (115.4 kgda^{-1}) was obtained from the Hatipoglu variety, and this variety was followed Hosmos and Gökceköy. The lowest seed yield was obtained from Bivan genotype. Hosmos genotype produces as much yield as standard variety Hatipoglu suggests that this genotype may be promising.

Key Words: Sesame, local genotype, seed yield

Introduction

Sesame (*Sesamumindicum* L.) is a crop, which is cultivated in diverse agro-ecologicalconditions. It is called as the "Queen of oil seeds" because of its perfect qualities of the seed, oil and meal (Saxena and Bisen, 2017).Sesame (*Sesamumindicum*L.) is very valuable industrial crops forTurkey.Sesame seed contains 45-60% oil, 17-32% protein, 20-25% carbohydrates and 5-6% mineral (BaydarveErbas, 2014). Its oil is stable and high quality which contains high unsaturated fatty acids. Sameresearches have been carry out to measure the agronomical and technological properties of sesamevarieties in different areas of Turkey and other countries of the world (Bahkali et al.,1998; Öz and Karasu, 2010; Tan, 2011; Uzun et al., 2012; El-Sherif, 2016; Kashani et al., 2016).An experiment was done in Aegean regionof Turkey in order to establish performance of sesame genotypes by Tan (2011). He reported that the average (1700-2820 kg) seed yield per hectare were obtained. The experiment was laid out with threerecorded sesame varieties, Muganli-57, Gölmarmara, and Özberk by Uzunet al.(2012). It was detected that the variations among all the sesame cultivars were statistically significant for days to 50% flowering, number of seeds per capsules, 1000 seed weight and seed yield. These studies recommended that the varieties showed broad distinctions in their agronomic performance and yield.

Oilseed crops growing have always been an important subject in Turkey agriculture. Turkey produced 1.5 million tons of crude vegetable oil in 2014. But in the same year oil supply realized around 3 million tons. The highest vegetable oil

supply of Turkey is sunflower and palm oil. About 75% of the total supply of crude vegetable oil are provided from abroad (directly crude oil imports and domestic production from imported oilseeds) (Killi and Tekeli, 2016). In order to improve our output of vegetable oil, it should be utilize from our diverse ecological areas and various oilseed crops. Turkey imports about 107 000 tons of sesame seeds every year. In 2016, 19.521 ton sesame seed were produced in 28.932 ha production area with low average yield of 680 kg ha^{-1}. We have to increase the seed yield of sesame cultivars, solve the disease and insect problems and develop harvestable sesame cultivars with the machine. Local sesame genotypes are an important genetic resource for many agricultural and technological features and resistance to disease and insect. In this case, to set up field trial with varioussesame genotypes in different areas has a vital importance. The aim of this study was specifically to observeand to determine the local sesamepopulations for their agricultural and technological performance and the differences between sesame populationsand standard cultivar in terms of yield and yield components.

Material and Methods

Eleven sesame populations (Akceli, Bivan, Gerger, Gökceköy, Hosmos, Pirag, Sincik, Sögütlübahce, Sutepe-1, Sutepe-2 andTaslıca) and one registered variety (Hatipoglu) were used plant material. These twelve sesame genotypes were sown at 20May in 2012 at the field area of Sögütlübahce village of Sinciktown in Adiyaman province, Turkey. Adiyaman province is located in the South-east Anatolia region of Turkey between 37° 76' north parallel and 38° 27' east meridians. The experiment was done on alluvial clay loam with the following mean properties; pH = 7.5, organic matter = 1.6%, CaCO3 = 21.6%, available P = 29.8 kg ha^{-1}, and available K = 104 kg ha-1. Nitrogen and phosphorus fertilizer were applied at the rate of 70 kg N and P_2O_5 ha^{-1}, respectively. All treatments such asinsects and weeds control and irrigation were applied as needed during the growth season.

Experimental design was a randomized complete block with three replications. The plot size was 10.5 m^2,withthree rows at 70 cm spacing. The sesame seeds were sown by hands. Ten plants were chosen at random from each plot to estimate number of flowering days (NFD), physiological maturity days (FMD), plant height (PH), number of branches (NB), number of capsules (NC), andthousand seed weight (TSW).Seed yield (SY) was estimated from an area 0.7 m wide and 4 m long of the center one row of each plot. Seedssampled from each plots were ground and transferred to a disposable filter column nearly 5 g samples and seed oil content (OC) was analyzed by the Soxhlet. In the experiment, sesamegenotypes were harvested at 110-130 days after sowing. Experimental results were statistically processed using the SAS computer programme. Means were separated using LSDtest ($P < 0.05$).

Results and Discussion

According to variance analyze results, highly significant genotype effects were foundon PH, FMD,NB, NC, OC and SY except NFD andTSW(Table 1).

Table 1. The result of variance analyses, showing genotype effects on investigated characteristics.

Source	Df	PH	NFD	FMD	NB	NC	TSW	OC	SY
Genotypes	11	62.95**	0.89^{ns}	2.72**	7.78**	5.00**	1.36^{ns}	2.24*	38.29**

PH: Plant height, NFD: number of flowering days, FMD: number of physiological maturity days, NB:number of branches per plant, NC: number of capsulesper plant, TSW: 1000-seed weight, OC: Oil content, SY: Seed yield

*, P <0.05; **, P<0.01; ns, not significant

According to sesame genotypes (Table 2), PH values were significantly different ($p<0.01$). Akceli, Bivan, Sögütlübahce, Sutepe-1 and Hatipoglu genotypes gave the higher PH values while Gergergave the lower value. SesamePH values ranged from 47.5 cm (Gerger) to 64.0 cm (Bivan). The observed values PH was lower than those reported by Caliskan et al. (2004), Öz and Karasu (2010) and Tan (2011). There is no significant differences among the sesame genotypes for NFD. The mean values of NFD ranged from 37.3 to 39.7 days. Gökceköy and Hatipoglu genotypes had the highest FMD while the genotypes Akceli and Taslıca had the lowest. The values of FMD of the twelve genotypes ranged from 98.7 to 113.3 days. The FMD is an important characteristic for earliness in sesame cultivation. Paroda (2013) reported that character of earliness

is of major importance in breeding for early maturing varieties/hybrids of oilseed plants.The use of flowering period may be effective in the selection for improving uniform ripening capsule (Jamie et al., 2002).

The genotypes Hatipoglu and Pirag had the highest NB while the four cultivars (Gökceköy, Hosmos, Sincik and Sögütlübahce) had similar and the lowest. The NB is an important characteristic affecting to NC directly. In this experiment, NB of 1.5-3.5 wassimilar to those obtained previously (Öz and Karasu, 2010; Arslan et al., 2014).

Table 2. Mean values of PH, NFD, FMD and NB.

Genotypes	PH (cm)	NFD	FMD	NB
Akçeli	61.8 a	39.0	98.7 b	3.2 ab
Bivan	64.0 a	38.0	105.0 ab	3.2 ab
Gerger	47.5 b	37.3	103.3 ab	2.5 abc
Gökçeköy	54.7ab	38.7	113.3 a	1.5 c
Hosmos	58.1ab	39.3	104.7 ab	1.5 c
Pirag	57.1ab	38.7	108.7 ab	3.3 a
Sincik	51.9ab	37.7	104.3 ab	1.9 c
Söğütlübahçe	60.8 a	39.7	104.3 ab	1.9 c
Sutepe-1	62.0 a	38.7	104.3 ab	3.1 ab
Sutepe-2	52.8ab	39.3	104.7 ab	3.0 ab
Taşlıca	56.7ab	39.0	99.7 b	2.4 bc
Hatipoğlu(St)	60.4 a	39.0	112.0 a	3.5 a

Means of the same column followed by the same letter is not significantly different ($P < 0.05$) according to the Duncan multiple range test.

St: Standard variety

In Table 3, among the cultivars, no significant differences in TSW were observed. The mean values of TSW ranged from 3.1 to 3.9 g. The observed values TSW was close to those reported by Öz and Karasu (2010) and Arslan et al. (2014). Genotypes Hatipoglu (37.4) and Sögütlübahce (34.3) had the highest NC while the genotype Gerger (12.9) had the lowest. In studies related with sesame, different results of NC values have been reported by the researchers. Caliskan et al. (2005), El-NakhlawyandShaheen (2009), Öz and Karasu (2010), Arslan et al. (2014) reported number of capsules per plant of 30 – 49, 16 – 71, 78 – 114, 75 – 130, respectively.

The standard variety Hatipoglu (51.7 %) had the highest oil content, while Akceli (43.7 %) and Taslıca (43.5%) had the lowest. Sesame oil content values of the twelve genotypes ranged from 43.5 to 51.7%. Oil content is an important feature that is influenced by genotype, growing conditions and plant nutrients (Misganaw et al., 2015). Bahkali et al. (1998) reported that the dark sesame seeds have higher oil and lower protein content than the light colored sesame seeds. The oil contents of light and dark sesame seeds were found to be 47.02% and 49.07%, respectively.

Table 3. Mean values of TSW, NC, OC and SY.

Genotypes	TSW (g)	NC	OC (%)	SY (kg ha^{-1})
Akçeli	3.4	23.3 b	43.7 b	606 ef
Bivan	3.4	19.2 bc	47.3 ab	349 h
Gerger	3.9	12.9 c	47.0 ab	835 cd
Gökçeköy	3.4	15.4 bc	46.2 ab	939 bc
Hosmos	3.3	14.7 bc	44.6 ab	1017 ab
Pirag	3.7	23.1 b	44.1 ab	428 gh
Sincik	3.6	19.7 bc	45.6 ab	570 efg
Söğütlübahçe	3.1	34.3 a	45.5 ab	764 d
Sutepe-1	3.4	14.5 bc	45.0 ab	683 de
Sutepe-2	3.6	20.3 bc	48.3 ab	495 fgh
Taşlıca	3.3	20.0 bc	43.5 b	536 efg
Hatipoğlu St)	3.9	37.4 a	51.7 a	1154 a

Means of the same column followed by the same letter is not significantly different ($P < 0.05$) according to the Duncan multiple range test.St: Standard variety

The diversities in seed yield of sesame cultivars were statistically significant (Table 3). Hatipoglu cultivar (standard variety) gave higher seed yield than other varieties while Bivan genotype had the lowest seed yield. In the current study, seed yield of 349-1154 kg ha^{-1} were similar to those achieved previously in Turkey (Öz and Karasu, 2010; Uzun et al. 2012; Arslan et al., 2014) but lower than those reported by some other authors. Previous literature reported seed yield of 720-2580 kg ha^{-1} (Baydar, 2005; Tan, 2011; Kashani et al., 2016). The major differences in seed yield values can be due to ecological conditions or to the genetic potential of the tested genotypes for seed and oil yield. Considerable distinctions were found between varieties for seed yield and oil content, as reported by El-Sherif (2016). High yielding cultivars Hatipoglu was shown to have the high NB, NC and OC. Daniya et al. (2013) indicated that seed yield related favorable and importantly with plant height, branches and capsules per plant, number of seeds per capsule and one thousand seed weight. Siva et al. (2013) declared that three considerable selection criteria affecting seed yield were capsule numbers per plant, seed numbers per capsule and weight of seed. Two significant characters affecting seed yield in sesame are the capsule number per plant and plant height (Yol et al., 2010).

Conclusion

In thisexperiment, which was carry out under Adiyaman (Turkey) province condition to find out the yield potential of 11local sesame genotypes and one standard cultivar, demonstrated that all investigated characteristics except number of flowering daysand 1000-seed weightwere significantly affected by genotypes. Among the investigatedcultivars, plant height of 47.5-64.0 cm, branch numberper plant of 1.5-3.5, capsule number per plant of 12.9-37.4, seed yield of 349-1154 kg ha^{-1} and oil content of 43.5 to 51.7% were changed and the highest plant height, capsule number per plant, seed yieldand oil content were obtained from standard cultivar Hatipoglu. All the local sesame genotypes except Hosmos gave lower results than standard varieties due to all the characteristics examined.

The results found out in the study showed that genotype had influence on seed yield and yield components.The fact that the Hosmos genotype produces as much yield as standard variety Hatipoglu suggests that this genotype may be promising.

Acknowledgements

The author would like to thanks to the KahramanmaraşSütcü İmam University (KSU), and also thanks to the coordination unit for scientific research projects for the financial supports. This study has been presented in International Agriculture Congress, May 3-6, 2018, Komrat/Gaguzya/Moldova.

References

Arslan H, Hatipoglu H,Karakus M, 2014. Şanlıurfa Yöresinde Tarımı Yapılan Susam Genotiplerinden Seçilen Bazı Hatların İkinci Ürün Koşullarında Verim ve Verim Unsurlarının Belirlenmesi. Turk J Agric Res, 1: 109-116. (in Turkish).

Bahkali AH, Hussain MA,Basahy AY, 1998. Protein and oil composition of sesame seeds (*Sesamumindicum*, L.) grown in the Gizan area of Saudi Arabia. *International* Journal of Food Sciences and Nutrition, 49: 409-414.

Baydar H, 2005. Susamda verim, yağ, oleic ve linoleik tipi hatların tarımsal ve teknolojik özellikleri. Akdeniz Üniversitesi Ziraat Fakültesi Dergisi, 18(2): 267-272. (in Turkish).

Baydar H, Erbaş S, 2014. Yağ Bitkileri Bilimi ve Teknolojisi. Süleyman Demirel Üniversitesi Ziraat Fakültesi, Yayın No: 97, 227-248. (in Turkish).

Caliskan S, Arslan M, Arioglu H, Isler N, 2004. Effect of planting method and planting populations on growth and yield of sesame in a Mediterranean type of environment. Asian Journal of Plant Sciences, 3(5): 610-613.

Daniya E, Dadari SA, Ndahi WB, Kuchinda NC, Babaji BA, 2013. Correlation and Path Analysis between Seed Yield and some Weed and Quantitative Components in Two Sesame (*Sesamumindicum* L.) Varieties as influenced by Seed Rate and Nitrogen Fertilizer. Journal of Biology, Agriculture and Healthcare, 3(15): 12-16.

El-NakhlawyFS,Shaheen MA, 2009. Response of Seed Yield, Yield Components and Oil Content to the Sesame Cultivar and Nitrogen Fertilizer Rate Diversity.Env.& Arid Land Agric. Sci., 20(2): 21-31.

El-Sherif AMA, 2016.Sesame (*Sesamumindicum* L.) Yield and Yield Components Influenced by Nitrogen and Foliar Micronutrient Applications in the Fayoum Region, Egypt. Egypt. J. Agron. 38 (3): 355-367.

Jamie SD, Langham DR,Wongyai W, 2002. Potential selection criteria for the development of high – yielding determinate sesame varieties. Sesame and Safflower News,17: 29-35.

Kashani H, Shahab-u-Din, KandhroM N, Ahmed N, Saeed Z, Nadeem A, 2016. Seed Yield and Oil Content of Sesame (*Sesamumindicum* L.)Genotypes in Response to Different Methods of Nitrogen Application.Indian Journal of Science and Technology, 9(30), DOI: 10.17485.

KilliF,Tekeli F, 2016. Seed yield and some yield components of sunflower (*Helianthus annuus*L.) genotypes in Kahramanmaras (Turkey) conditions. Journal of Scientific and Engineering Research,3(4):346-349

Misganaw M, MekbibF,Wakjira A, 2015. Genotype x environment interaction on sesame (*Sesamumindicum* L.) seed yield. African Journal of Agricultural Research, 10 (21): 2226-2239.

Öz M, Karasu A, 2010. Bazısusamçeşitvehatlarının Bursa koşullarında performanslarının belirlenmesi.*J. Agric. Fac. HR. U.*, 14(2): 21-27. (in Turkish).

Paroda RS, 2013. The Indian oilseeds scenario: Challenges and opportunities. Journal of Oilseeds Research, 30 (2): 11-126.

SaxenaK,Bisen R, 2017. Line x Tester Analysis in Sesame (*Sesamumindicum* L.). International Journal of Current Microbiology and Applied Sciences, 6(7): 1735-1744.

Siva PYVN, Krishna MSR,Yadavalli V, 2013. Correlation, path analysis and genetic variability for economical characteristics in F2 and F3 generations of the cross AVT 3 × TC 25 in Sesame (*S.indicum* L.).J. Environ. Appl. Biores,1(2): 14-18.

Tan AŞ, 2011. Bazı Susam Çeşitlerinin Menemen Koşullarında Performansları. Anadolu J. of AARI, 21 (2): 11 – 28. (in Turkish).

Uzun B, Yol E, Furat S, Topakci M, Canakci M, Karayel D, 2012. The effects of different tillage methods on the post-wheat second crop sesame: seed yield, energy budget, and economic return. Turk J Agric For, 36: 399-407.

Yol E, Karaman E, Furat Ş, Uzun B, 2010.Assessment of selection criteria in sesame by using correlation coefficients, path and factor analyses. Aust J Crop Sci, 4: 598-602.