Second Crop No-Till Safflower Crop Performance in South East Anatolia Reveals Speed Breeding Potential of Safflower

Uğur SEVİLMİŞ[1], Şerif KAHRAMAN[2], Halil KARAHAN[3]

[1]East Mediterranean Agricultural Research Institute, Adana, TURKEY.

[2]GAP International Agricultural Research and Training Center, Diyarbakır, TURKEY

[3]Karahan Agricultural Enterprise, Mardin, TURKEY

* Corresponding author. Tel: +90 322 334 00 56, Fax: +90 322 334 03 57, e-mail:sevilmisugur@yahoo.com

Abstract

This study was carried out to investigate the performance of no-tilled, drip irrigated, second crop safflower under South East Anatolia (Mardin) conditions. For this aim, a three replicated trial was established in year 2014 with Dincer and Remzibey-05 cultivars. Biomass production was so low and plant height average was 50 cm. under these conditions. The average seed yield of Dincer cv. was 503 kg/ha and Remzibey-05 cv. was 488 kg/ha. Plant height of Dincer was 52.9 cm and Remzibey-05 was 47.7 cm. According to the results, it was found that safflower is a high temperature sensitive plant. With the tested varieties, no-tilled, drip irrigated, second crop safflower it is not rantabl in South East Anatolia conditions and can not compete with maize. Breeding effords are needed to improve the tolerance of safflower to high temperatures to adopt this crop to this conditions. This study revealed the potential of safflower to conduct speed breeding activities in that crop with three to four breeding cycles in one year.

Keywords: Safflower, Second crop, No-till, Drip irrigation, *Carthamus tinctorius*

Güneydoğu Anadolu Koşullarında İkinci Ürün Toprak İşlemesiz Aspirin Performansı Bu Türün Hızlı Jenerasyon Atlatmaya Uygunluk Potansiyelini Göstermektedir

Özet

Bu çalışma, aspir bitkisinin toprak işlemesiz ve damla sulamalı olarak ikinci ürün koşullarında Güneydoğu Anadolu Bölgesi'ndeki (Mardin) performansını tespit etmek için yürütülmüştür. Bu amaçla 2014 yılında üç tekerrürlü bir deneme Dinçer ve Remzibey-05 aspir çeşitleri kullanılarak kurulmuştur. Test edilen koşullar altında biyomas üretimi çok düşük olmuş ve bitki boyları 50 cm civarında gerçekleşmiştir. Dinçer çeşidinin ortalama verimi 50.3

kg/da, Remzibey-05 çeşidinin ortalama verimi ise 48.8 kg/da olmuştur. Dinçer çeşidinin ortalama bitki boyu 52.9 cm, Remzibey-05 çeşidinin ortalama bitki boyu ise 47.7 cm olmuştur. Elde edilen sonuçlar aspir bitkisinin yüksek sıcaklığa hassas bir bitki olduğunu göstermiştir. Test edilen çeşitlerle Güneydoğu Anadolu Bölgesinde ikinci ürün toprak işlemesiz damla sulamalı aspir tarımı rantabl bulunmamış ve aynı koşullardaki mısırla rekabet edemeyeceği görülmüştür. Bu koşullara aspirin adapte edilmesi için ıslah çalışmalarına gerek vardır. Bu çalışma aynı zamanda aspir bitkisinin yılda 3-4 jenerasyon elde edilebilecek ve hızlandırılmış jenerasyon atlatma ıslahına uygun bir tür olduğunu ortaya koymuştur.

Anahtar Kelimeler: Aspir, ikinci ürün, Toprak işlemesiz, Damla sulama, *Carthamus tinctorius*

1. Introduction

Turkey's safflower production was 45.000 tons, on 30.000 hectares with average yield of 1.5 t/ha in year 2013. South East Anatolia Region's acreage was 1.100 hectares in same year (TUIK, 2013). Safflower is tolerant to drought and cold which is well adopted to winter cropping conditions of Turkey. With delayed safflower sawing times, reductions in grain yields, plant heights, branch numbers, head numbers, 1000 grain weights are reported (Kızıl and Şakar, 1997; Kızıl and Gül, 1999; Öztürk et al. 1999; Özkaynak et al. 2001).

Lentil production is widespread in South East Anatolia and leaves field earlier than wheat crop. Because of irrigation water scarce, drip irrigation usage is widespread in this region on second crop maize. First crop production of maize is not possible in this reigon due to hot winds blowing at tasselling time of maize. Electric fluctiations and water scarce reasoning of accumulated high water and electric demand of farmers at summer times is forcing farmers for deficit irrigation. Under these conditions maize yields may reduce to 5-6 t/ha in region which is not profitable.

Under these conditions, no-till farming may be valuable to extend cropping period, to escape some from water scarce and to reduce production costs. And safflower may adopt to this deficit irrigation conditions well. Aim of this trial is to check adoptability of safflower to second crop conditions after lentil, under no-tilled, drip irrigated conditions in South East Anatolia.

2. Materials And Methods

Material of the trial was varieties Dincer and Remzibey-05; drip irrigation system; DAP and AN fertilizers.

Trial was established in Mardin-Kiziltepe-Cagil Village of Turkey in a farmer field between maize crop in year 20014. After lenfil harvest, safflower seeds are direcly planted into field without tillage, via no-till sawing machine on date 23.06.2014. Trial is established in a randomized complete block in split-plot experimental design with 3 replications. Each parsel consists of 8 lines, each line was 35 m long and inter-row distance is 35 cm. 30 kg seed was used per hectare.

27 kg/ha N and 69 kg/ha P_2O_5 was used as a starter fertilizer. 100 kg N (in urea forma) topdressed via drip irrigation in three equal parts. Irrigation is done via surface drip tapes on a weekly basis. Harvest is done on 27.10.2014 via plot harvest machine. Used "JMP 5.0.1" (SAS Institute Inc) for statistical analysis.

3. Results and Discussion

We found statistically no significant differences in terms of grain yield between varieties. Grain yield was 503 kg/ha for Dincer and 488 kg/ha for Remzibey-05 varieties (Table 1). There exists statistically significant differences in terms of plant height. Plant height was 52.9 cm for Dincer and 47.6 cm for Remzibey-05 varieties. There were no significant differences in terms of primery branches per plant. Primery branches per plant was 4,7 number/plant for Dincer and 4,6 number/plant for Remzibey-05 varieties. We found statistically no significant differences in terms of head numbers. Head numbers was 8.2 number/plant for Dincer and 7.7 number/plant for Remzibey-05 varieties.

Table 1. Statistical Analysis of Yield and Agronomic Traits of Safflower Cultivars

Varieties	Grain Yield (kg/ha)	Plant Height (cm)	Primery Branches per plant	Number of Heads	Head Diameter (mm)	1.000 Seed Weight (g)
Dincer	503	52.9 a	4.7	8.2	0.85 a	26.1 a
Remzibey	488	47.6 b	4.6	7.7	0.79 b	24.7 b
Average	496	50.3	4.7	7.9	0.82	25.4
CV	12.4	0.42	6.63	5.37	0.50	1.45
LSD	N.S	0.74**	N.S	N.S	0.014**	1.29*

* Significant at level 5%, ** Significant at level 1%; NS: not significant.

There were significant differences in terms of head diameter; 0.85 cm for Dincer and 0,79 cm for Remzibey-05 varieties. We found statistically significant differences in terms of 1000 grain weight; 26.1 g for Dincer, 24.7 for Remzibey-05 varieties. In international literature, there exist no second crop safflower trial. This result is the first written result related to second crop safflower production. In general, all yield related parameters (branch number, number of heads, head diameters and 1000 seed weight, grain yield) and plant height are reduced by exess summer conditions. But instead of this, safflower was successful to produce some grain yield under second crop South East Anatolia conditions of Turkey. This character may be used to conduct speed breeding in safflower. In one year, 2-3 generations may be obtained in breeding activities.

4. Conclusions

As a result, these safflower varieties are not suitable to second crop, no-tilled, drip irrigated hot Mardin conditions and probably winter adopted safflower varieties are not rantabl under these conditions because of high temperature depression. Plant heights and biomass are so low to produce enough yields. It is needed breeding effords to adopt safflower to high temperature and irrigated conditions to use in second crop South East Anatolia conditions. But this study revealed the potential of safflower to conduct speed breeding activities in that crop with three to four breeding cycles in one year.

5.References

Kızıl, S., & Sakar, D. (1997). Diyarbakır ekolojik koşullarında aspirde (*Carthamus tinctorius L.*) uygun ekim zamanının saptanması üzerine bir çalışma. Türkiye 2. Tarla Bitkileri Kongresi, 22-25 Eylül, s. 634-636, Samsun.

Kızıl, S., & Gül, O. (1999). Diyarbakır koşullarında farklı ekim zamanlarının aspirde (*Carthamus tinctorius L.*) boyar madde oranı, taç yaprağı verimi ve bazı tarımsal karakterler üzerine etkisi. Türkiye 3. Tarla Bitkileri Kongresi, 15-18 Kasım, s. 241-246. Adana.

Özkaynak, E., Samancı, B., & Başalma, D. (2001). Bazı aspir çeşitlerinde farklı ekim zamanlarının verim ve verimle ilgili özellikler üzerine etkisi. Türkiye 4. Tarla Bitkileri Kongresi, 17-21 Eylül, s. 79-83, Tekirdağ.

Öztürk, Ö., Akınerdem, F., & Gönülal, E. (1999). Konya ekolojik şartlarında farklı ekim zamanı ve sıra aralıklarının aspirde (*Carthamus tinctorius L.*) tohum ve yağ verimine etkisi. Türkiye 3. Tarla Bitkileri Kongresi, 15-18 Kasım, s. 368-371, Adana.

TUIK. (2013). Turkish Statistical Institute. Access date:12.08.2014.