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Response of Safftower *(Carthamus tinctorius* L.) Genotypes to Rust Disease

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Abstract: Ten safflower genotypes were evaluated for their reaction to the rust disease under field conditions durihg 1999. *Puccinia carthami* was present on the leaves of all genotypes tested. The highest disease incidence was observed on the Syrfan 1 genotype, and the lowest on the Afyon genotype . Afyon had signlficantly less symptoms than !he genotypes Syrian 1. Sivas. Syrian Hama, Cyprebregon, Pi 537598. Pi 251982 and Gila,

Key Words: *Puccinia caithami, Caithamus tinatorius.* genotype response

Aspir *(Carthamus tinctorius* L.) Genotiplerinin Pas Hastalığına Karşı Tepkisi

Özet 10 aspir genotipi pas hastalığına karşı tepkileri bakımından tarla koşullarında değerlendirilmişlerdir, *Puccinia carthami* test edilen bütün genot(plerin yapraklarında hastalık oluşturmuştur. En yüksek hastalık Syrlan 1 genottpinde, en düşük hastalık Afyon genotipinde görülmüştür. Afyon genotipinde Syrian 1, Sivas, Syrian Hama, Cyprebregon, Pi 537598, Pi 251982 ve Gifa genotiplerine oranla daha az hastalık görülmüştür.

Anahtar Kelimeler: *Puccinia ceithami, Carthamus t/notorius,* genotip tepkisi

Introduction

Safflower *(Carthamus tinctorius* L.) is an oil crop with high oil quality. Its seed contaiiis 30-35 % oil. Safflower is used as a cfye in many industries (Gürbüz 1987). Oil obtained from safflower is used *tor* manufacturing of paints, polishes and soaps in addition to use of it as an edible oiL Due to rapid drying, the oil is in high demand in paint and emulsion industries. The oil has about 10% saturated acids. Unsaturated acids like linoleic acids are about 760/o, which increases its value among olher oil seeds. The safflower oil is golden yellow in coior and contains high amount of linoleic acid. This makes it irnportant tor reduction of blood cholesterol ahd it is helpful for treatment of heart diseases. it has also 18-22% raw protein, 1.5-3% raw ash and 5-8% water. it is also used as animal feed (Başalma 2000). After extraction of oil from the seed, 40% protein rernains which makes it useful tor animal feeding.

Saffiower has resistance to cold. drought and salinity stress. Since it is resistant to drought. it could be grown successfully on drylands of Central Anatolia and surrounding regions which have insufficient precipitation. in the recent years. because of inadequate support by Ministry of Agriculture, low yield and 1ack of studies about adaptability of new cultivars and irnprovement techniques, saffiower product[on has been limited. However, it is cultivated in Balıkesir, Isparta, Eskişehir, Kütahya, Konya and Çankırı provinces (Başalrna 2000).

Rust disease caused by *Puccinia carlhami* Corda is an important disease of saffiower. Th1s disease is *common* ,n Turkey as well as in the world (Khan 1972. Gürcan 1976, KIIsiewicz 1977). it has been reported that the disease could be damaging in the Central Anatolia Region (Karaca 19Ei5). it is also damaging urıder Ankara conditfons (Gürcan 1976). Oetermination of the response of safflower genotypes to rust disease is very important since the disease could prevent the growth of safftower in Ankara (Karaca 1954).

Sağır and Kızıl (1998) evaluated the reactions of cultivars Dinçer, Yenice and 5/154 to the rust disease under Diyarbakır conditions. Extensive disease symptoms were observed.

Despite its importance no detailed work has been done regarding the disease *and* its effect on different cultivars which are growing in the Central Anatolia region. in this study, saffiower seeds collected from varıous parts of Turkey, and safflower lines obtained frorn iCARDA (International Center for Agricultural Research in Dry Areas) and a cul!ivar grown in the region were evaluated for their response to the rust disease.

Materials and Methods

Some of safflower seeds tested were oollected from Afyon and Sivas provinces (Afyon populatlon and Sivas populalion). The lines Pl537598, Pl250537, Pl251982 and cultivars CW74. Syrian1. Syrian Hama. Cyprebregon were obtained from iCARDA. GHa cuitiVar used in this study has been grown in the region for long years. The planting date was April 5, 1999. This study was carried at the experimental field of Department of Fleld Crops, Facuity of Agnculiure, University of Ankara. No artificial inocuiati.ons

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Table 1. The meteorological data of experimental area for 1999 and long period means (Anonymous, 2000)

Months	Temperature (°C)		Relative Humidity (%)		Precipitation (mm)	
	Long period means	1999	Long period means	1999	Long period means	1999
January	-0.1	3.3	78.0	72	40.5	27.9
February	1.3	3.2	74.0	72	34.9	86.2
March	5.4	6.6	65.0	63	35.6	54.5
April	11.2	12.1	59.0	60	40.3	14.2
May	15.9	16.9	57.0	52	51.6	7.3
June	19.8	20.0	51.0	60	32.6	35.4
July	23.1	24.4	44.0	51	13.5	44.7
August	23.0	23.8	42.0	52	10.3	31.0
September	18.4	18.8	47.0	55	17.4	20.8
October	12.8	13.9	58.0	64	24.4	43.3
November	7.3	6.7	70.0	68	30.9	31.1
December	2.3	5.0	78.0	73	45.6	38.9
Mean	11.7	12.9	60.6	61.8	Total: 377.6	Total: 435.3

were made. Randomized block design with three replications was employed.The characteristics of the experimental area were as follows: clay and loam, pH 7.96, lime 4.5 %, clay 34.6 %, sand 23.5 % and silt 44.5 %. The temperature, relative humidity and precipitation values were presented in Table 1. Plant spacing between rows was 40 cm, and 10 cm within rows. 10 kg/da nitrogen was applied to plots before sowing as urea (45 % N) and disked into the surface soil. Evaluations were made on August, 5, 1999.

In this study, fifty leaves were collected from the plants. Data are square root transformed before the analysis. A zero to five numerical scale was used for evaluation (Sağır and Kızıl 1998).

Zero to five numerical scale:
0: No disease
1: 1-5 % of the leaf area diseased
2: 6-10 % of the leaf area diseased
3: 11-25 % of the leaf area diseased
4: 26-50 % of the leaf area diseased
5: > 50 of % the leaf area diseased

Results and Discussion

Puccinia carthami produced symptoms on the leaves of all the cultivars tested. Although differences were present, in all cultivars percentage of the diseased area were below 50%. The highest disease incidence was observed on the Syrian1 genotype (Table 2). The lowest disease incidence was observed on the Afyon genotype (population). Afyon had significantly less symptoms than the genotypes Syrian1, Sivas, Syrian Hama, Cyprebregon, PI537598, PI251982 and Gila. PI250537 had significantly less disease than Syrian1, Sivas and Syrian Hama.

More genotypes should be tested for their response to rust disease. Detailed studies should address the biology of the pathogen and the effect of planting time and planting density on the occurrence of this disease. Seed and foliar application of fungicides should also be recommended when the disease is too prevalent.

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Table 2. Response of various safflower genotypes to rust disease caused by *Puccinia carthami* Corda. A numerical scale was used to calculate the means (see text)

Genotypes	Replication 1	Replication 2	Replication 3	Mean	
Syrian1	2.92	3.64	3.67	3.410	A*
Sivas	2.65	3.35	4.02	3.340	A
Syrian Hama	3.20	3.27	3.36	3.277	A
Cyprebregon	3.12	3.55	3.24	3.303	AB
PI537598	3.14	3.32	3.21	3.223	AB
PI251982	2.14	3.06	3.35	2.850	AB
Gila	1.96	2.48	4.07	2.837	AB
CW74	2.57	2.80	3.01	2.793	ABC
PI250537	1.96	3.38	2.81	2.717	BC
Afyon	1.26	2.17	2.06	1.830	C

* Means followed by the different letters are statistically significant according to Duncan's Multiple Range Test (P=0.05)

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