

REGISTRATION OF “ÇİFTÇİ” CHICKPEA (*Cicer arietinum* L.) VARIETY

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Summary. The most limiting factor for the spread of our registered chickpea varieties in chickpea production areas of Turkey is the unsuitability of the varieties for mechanized harvesting and their susceptibility to *Ascochyta rabie* disease. Upright growth form, first pod height and tolerance to *Ascochyta rabie* are among the important selection criteria in chickpea breeding programs. “Çiftçi” which is a chickpea cultivar bred in National plant breeding studies carried out in our country with the aim listed above is a result of cross Flip 97-122c and Flip 91 and 91-149C/Flip 86-110C from the different nurseries in 2004 and was chosen as the seventh plant of the segregating population at F5 generation by bulk method. The line of Flip 97-122C// Flip 91-149C/Flip 86-110C was taken to plant-to-progeny rows in 2010, was checked in preliminary yield trials between 2011 and 2015, and finally was evaluated according to multi-location advanced yield trials. “Çiftçi” cultivar with good characteristics such as tolerance to *Ascochyta rabie*, high yield capacity and a broad adaptation capability was registered to fix some problems in chickpea cultivation areas in 2021. Elite seed production of “Çiftçi” cultivar has been processed at Transitional Zone Agriculture Research Institute since 2021.

Keywords: Chickpea, Breeding, Variety, *Ascochyta rabie*.

Introduction

Food legumes are an important source of nutrition for human nutrition with their cheap and high-quality plant protein content, mineral, vitamin and fiber ratio. They contain an average of 20-25% protein in their seeds, which is approximately twice as much as cereal grains, and are a good source of nutrition due to the appropriate amount of amino acids in the protein composition (Şehirali, 1988; Friedman, 1996).

Chickpea, which is produced in almost every region of our country, is the first one among food legumes with 55.4% (Anonymus 2023). The main factor limiting the unit area grain yield in our country's chickpea production areas is the Anthracnose disease caused by the fungus *Ascochyta rabiei*. This disease, which is locally referred to as cloud stole and wind struck, causes great damage and product losses in chickpea fields, especially in regions with abundant rainfall, high relative humidity and air temperatures around 20°C in spring and early summer. Chemicals are used to combat this disease, and chemical control is not economical. The most effective solution to combat anthracnose disease is to use resistant varieties (Muehlbauer and Singh, 1987). In both national and international breeding programs, very successful studies are carried out to develop resistant varieties. With the studies carried out to date, sources of resistance have been determined and efforts have been made to transfer resistance to desired genotypes using classical breeding techniques (Singh and Reddy, 1993).

As a result of the chickpea breeding studies that started in 1965 and are still ongoing at Transitional Zone Agricultural Research Institute, 9 ram head chickpea varieties have been registered. “Çiftçi” chickpea variety is a very good variety in terms of agronomy, morphology and quality characteristics and is tolerant to *Ascochyta rabie* disease. Certified seed production of the variety is carried out at the Institute.

Materials and methods

The aim of Chickpea Breeding Studies carried out at Transition Zone Agricultural Research Institute is to breed and put chickpea varieties that are suitable for mechanized agriculture and also TSE standards in terms of quality, color and grain size, are tolerant to diseases, especially “*Ascochyta rabie*”, and have high yield capacities for the climate and soil conditions of the Transition Zone and Central Anatolia Region into service of chickpea producers.

Chickpea is a self-pollinated plant and Introduction, Selection and Hybridization methods are used in its breeding studies aimed to develop varieties for use as food and roasted chickpeas. The material obtained by hybridization and then segregated until F4-F6 generation with the modified bulk method, individual plant selection has been made. The segregating material or single plants selected from landraces and the lines selected from foreign nurseries have been taken to the observation garden to observe them in larger plots. The lines selected from that have been taken to comparative yield trials which are preliminary and multi-location advanced yield trials in order to be evaluated in terms of yield as well as other criteria. Lines that are seen as promising in preliminary yield trials have been tested in advanced Yield trials in farmer fields located in different regions or provinces of our country. As a result of the evaluations, lines that show superiority to the standards are tested in 8 locations in National chickpea yield trials at other agricultural research institute within the framework of National Chickpea Breeding Studies before being offered for registration. Finally, lines with superior characteristics have been determined to be offered for registration.

The lines included in the trials and the advanced generation segregating material have been tested against *Ascochyta rabie* in Anthracnose disease gardens established in Eskişehir and Ankara locations under artificial epidemic conditions within the framework of National Chickpea Breeding studies, and in the Çukurova Agricultural Research Institute disease garden under natural epidemic conditions with winter planting. Disease readings have been made according to the 1-9 scale (1: Immune, 2: Very Resistant, 3: Resistant, 4: Moderately resistant, 5: Tolerant, 6: Moderately susceptible, 7: Susceptible, 8: Very susceptible, 9: Most susceptible) developed by Reddy et al (1984), Reddy and Singh (1984) and Singh and Reddy (1993). In addition, the same lines used in the disease garden have been tested with molecular markers, TA2, TS54, and CaETR established by Tekeoglu et al. (2004), Cingilli et al. (2005), Kottapalli et al. (2009), Yorgancilar et al. (2009) and Madrid et al. (2013) in the Biotechnology Laboratory of the Transitional Zone Agricultural Research Institute.

Results and discussion

“Çiftçi” chickpea variety; Flip 97-122C and Flip 91-149C/Flip 86-110C lines in different nurseries were hybridized in 2004, and it was selected as the 7th plant of the segregating population that reached the F5 generation with bulk method until 2009. Flip 97-122C// Flip 91-149C/Flip 86-110C line was taken to plant-to-progeny rows in 2010. Then, it was evaluated in preliminary yield trials between 2011 and 2015, and in multi-location advanced yield trials between 2015 and 2017. Flip 97-122 C is a genotype with medium tolerance to *Ascochyta rabie* disease, suitable for the climate and soil conditions of the Transition Region and Central Anatolia Region and in accordance with T.S.E. standards in terms of quality, color and grain size. Flip 91-149C/Flip 86-110C is a genotype that is suitable for TSE standards in terms of quality, color and grain size, is tolerant to *Ascochyta rabie* disease and has good agronomic properties. In the hybridization breeding initiated in our Institute in order to obtain a new variety that has the agronomy and quality characteristics of Flip 97-122 C genotype and is resistant to *Ascochyta rabie* disease, Flip 97-122 C has been used as the mother and Flip 91-149C/Flip 86-110C as the father.

During the breeding of varieties, resistance to *Ascochyta rabie* disease, agronomic properties, yield capacity and grain properties were considered as selection criteria for individual plant selection from the segregating population, and the Çiftçi chickpea variety has stood out in

terms of these properties. The tolerance of the variety to Anthracnose disease has been tested in Ankara and Eskişehir under artificial conditions within the framework of the National Chickpea Breeding Program. In addition, in the tests conducted with molecular markers in the Biotechnology Laboratory of the Transitional Zone Agricultural Research Institute, it has been found tolerant to *Ascochyta rabiei* disease.

The Çiftçi chickpea variety has been evaluated in variety yield trials within the framework of the Transitional Zone Chickpea Breeding Studies conducted at the Transitional Zone Agricultural Research Institute between 2011 and 2014, and have always attracted attention in terms of its tolerance to Anthracnose disease and yield capacity. In the National Regional Yield trials established in Samsun, Ankara, Konya and Eskişehir provinces in 2015, it showed superiority to the standards in terms of yield capacity, while it has provided moderate adaptation to bad conditions, it has also gave good yields in good conditions, and it has achieved better a unit area grain yield than all the lines and varieties in the trial (Table 1). In addition, in the trials conducted in different provinces of our country (Tokat, Ankara, Konya, Amasya and Samsun) in 2019 by Republic of Türkiye, Ministry of Agriculture and Forestry, Seed Registration and Certification Directorate and evaluated impartially, Çiftçi chickpea variety ranked above all the lines and varieties in the trial with the highest average yield (Table 2). At the same time, as a result of the 2-year trials conducted by this institution, the Çiftçi variety again gave the highest unit area grain yield above all the varieties and variety candidates in the trial (Graphic 1) (Anonymus 2021).

Table 1

2015 National Chickpea Breeding Studies Regional Yield Trial Yield (kg/da) and Disease (*Ascochyta rabiei*) Results

Breeding line/Variety	Grain yield (kg/da)					Disease(1-9)		
	Samsun	Ankara	Konya	Eskişehir	Ortalama	Eskişehir	Ankara	Molecular Markers R: resistant S: susceptible
1	142,1 bc	283,3 a	151,9 ab	124,5 b	175,5	6	5	R
2	119,8 c	248,6 b	112,6 de	115,8 b	149,2	5-6	6	R
3(Çiftçi)	140,2 bc	293,1 a	98,1 e	187,0 a	179,6	4	5	R
4	144,9 bc	287,1 a	111,3 de	139,4 b	170,7	5	4	R
5	136,4 bc	269,0 ab	147,9 ab	141,6 b	173,7	4	5	R
AZKAN (National variety)	197,4 a	289,2 a	122,0 cd	65,2 c	168,5	6	5	R
AKÇA (National variety)	160,5 b	146,3 c	132,9 bd	26,3 c	116,5	6	6	R
GÖKÇE (National variety)	127,7 c	134,5 c	159,7 a		140,6	6	5	R
UZUNLU-99 (National variety) (Standart)	128,3 c		143,4 ac		135,9	9		
CANITEZ-87 (National variety) (Standart)	118,6 c		143,0 ac		130,8	9	9	S
LSD	23,8	34,5	31,6	38,4				
CV(%)	12,4	9,6	15,4	20,3				

Table 2

**Yield Results of Summer Planting Chickpea Agricultural
Values Measurement Trials in 2019 (kg/da)**

Varieties	Ankara	Konya	Amasya	Samsun	Tokat	Avarege
1- Çağatay (NV)	103,5 c	130,3 bc	104,3 de	168,1	257,5 abc	152,7 De
2- Akçin 91 (NV)	115,8 bc	124,4 c	88,8 ef	182,3	268,5 ab	155,9 cde
3- Ilgaz (NV)	103,7 c	155,0 ab	75,0 ef	199,7	282,5 a	163,2 bcd
4- Azkan (NV)	131,8 b	138,0 abc	128,1 cd	189,5	223,3 de	162,1 bcd
5- 15ESNBVD14	127,8 b	122,9 c	193,6 ab	186,1	236,6 b-e	173,4 Ab
6- ÇİFTÇİ	159,2 a	157,7 a	161,2 bc	188,3	254,2 a-d	184,1 A
7- Gökhöyük	102,8 c	121,1 c	201,8 a	182,9	237,6 b-e	169,2 B
8- Karlı	151,2 a	129,6 bc	152,5 c	189,5	219,9 e	168,5 Bc
9- Aydoğan	120,1 bc	121,3 c	190,6 ab	200,3	232,5 cde	173,0 Ab
10- Tragen N1	120,0 bc	129,8 bc	66,2 f	174,4	225,4 cde	143,1 E
11- Tragen N7	102,8 c	115,0 c	137,9 cd	131,7	242,8 b-e	146,0 E
F	**	*	**	ÖD	*	**

NV: (National variety)

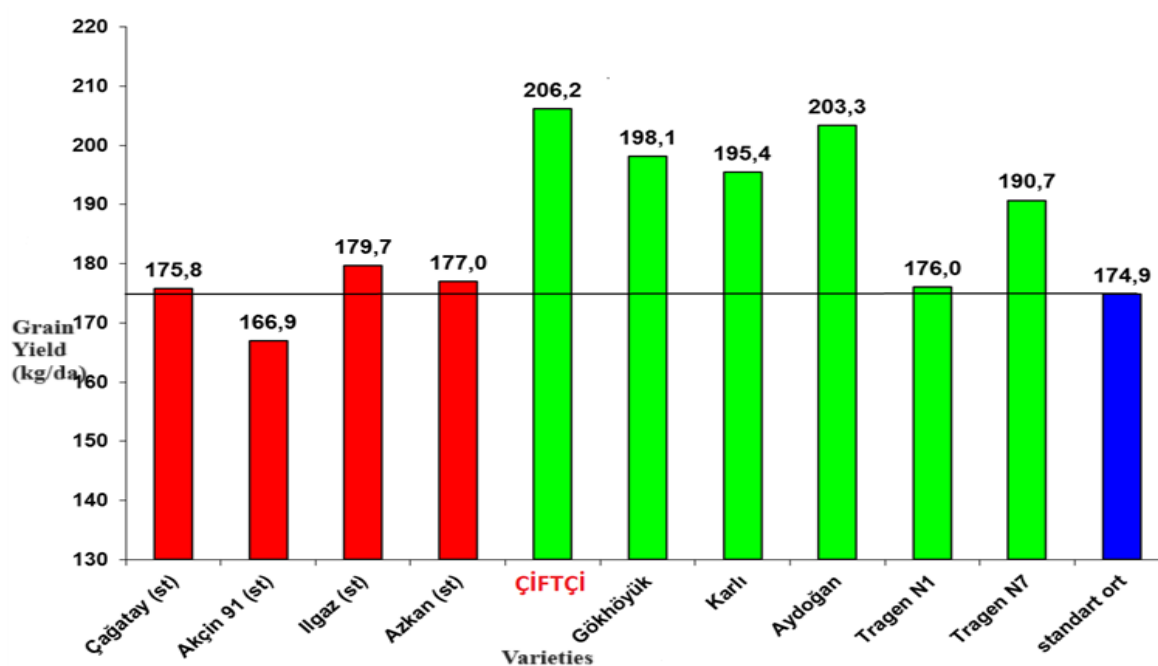


Figure 1. Yield Graph of Attempts to Measure Chickpea Agricultural Values in Summer Planting in 2019 and 2020

Conclusions

Çiftçi chickpea variety has had high yield and adaptation potential, been tolerant to *Ascochyta rabie* disease and been a large-grain variety, and differed from other chickpea varieties in that it has had an upright growth form, the first pod height and the plant height have varied between 20-38 cm and 37-70 cm respectively. Having these characteristics by the variety has allowed it to be easily harvested and threshed with a combine harvester, and chickpea planting areas to be moved to larger areas. This variety, which is tolerant to *Ascochyta rabie*, should be planted in early spring. The characteristics of this variety are shown in Table 3.

Table 3

**Morphological, Agricultural, Quality, Disease and other characteristics of
Çiftçi Chickpea Variety**

Morphological Traits	The plan height is middle high (35-70) cm, the first pod height is suitable for machine harvesting (20-38 cm), seed colour is cream, and seed shape is ram head.
Agronomic Traits	Middle late (106-125 days) Yield 206,2 kg/da, Min- Maximum Yield 157,7-331,7 kg/da. Sowing Norm 14-16 kg/da. Fertilization 6-7 kg/da phosphorus and 3-4 kg/da N are advised.
Quality Traits	100 Seed Weight 35,9-48,5 g, Sieve Analysis 9 mm: % 48,4-55,7 8 mm: % 35,2-42,9 7mm: % 8,6 Protein Content % 19,7-22,3 Cooking time varies between 43-49 minutes.
Diseases and Pests	It has been found tolerant to <i>Ascochyta rabie</i> disease in artificial epidemic conditions in the field.
Where Is It Advise to Cultivate?	It is advised in all region(Turkiye) where chickpea cultivation has been done.

While Elite stage certificated seed production of Çiftçi cultivar has cultivated at Transitional Zone Agriculture Research Institute, a SEED PRODUCTION RIGHTS agreement has been signed with ALTAT AGRICULTURAL PRODUCTS, operating in the Alaca District of Çorum Province in order to ensure faster production and multiplication to entry into the market.

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