

THE ADAPTATION TRIAL ON DIFFERENT CHICKPEA GENOTYPES IN DIYARBAKIR, TURKEY

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Abstract

*Thirty-seven chickpea (*Cicer arietinum* L.) genotypes and long term check (ILC 482) (Nursery:Chickpea international adaptation trial-2012) from International Center for Agricultural Research in the Dry Areas (ICARDA) also, one local check were tested at Diyarbakir, Turkey, in 2012 spring growing season. Analysis of variance revealed that differences among forty chickpea lines was significant for days to flowering and maturity, plant height, number of pods and seeds plant⁻¹, grain yield, natural plant height, plant habit, *Ascochyta* blight and *H. armigera*. The earliest matured genotypes were FLIP82-150C, FLIP87-40C, FLIP97-263C and ILC 482. ILC3279, FLIP86-5C, FLIP97-706C were recorded as tall genotypes. FLIP88-85C, ILC 482 and ILC484 had produced more pods. ILC1929, FLIP87-8C and local variety were susceptible, ILC 482, ILC72 together seventeen genotypes was resistant for *Ascochyta* blight.*

Key words: chickpea, *Cicer arietinum*, yield, drought, Diyarbakir-Turkey.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is a cool-season annual pulse crop that is grown in tropical, subtropical, and temperate regions of the world (Muehlbauer and Tulu, 1997, Khanna-Chopra and Sinha 1987). Most production and consumption of chickpea (95%) takes place in developing countries. It was grown on about 11.9 million hectares in 2010. Chickpea production has increased over the past 30 years from 6.6 million metric tons to 10.0 million metric tons. Most chickpeas are grown in South Asia, which accounts for more than 75% of the world chickpea area. Turkey is by far one of the largest chickpea producing country. Over the period 1980 to 2011, the area under chickpea in Turkey decreased marginally from 874 000 hectares to 400 000 hectares, similarly production decreased from 855 000 487 000 tons by average 50%. Other mainly chickpea producing countries are India, Pakistan, Mexico, Canada and Australia (TUIK, 2013). Chickpea is too an old legume crop to Southeastern Anatolia of Turkey. This region climate is characterized by rainy winters and dry and hot summers. Traditionally, the chickpea crop is predominately a late spring crop in rainfall conditions, but a little of the crop is irrigated in nowadays. Also,

management practices such as pesticide, insecticide and fertilization almost never apply. Optimum plant population ranges from farmer to farmer, and mechanization is less or no, and seeds is sown generally by wheat sown machine. Therefore, yield and yield components show the fluctuations year to year, and generally total grain yield is low (Biçer and Tonçer, 2012). In South east Anatolia of Turkey, chickpeas are almost mixed populations with short plant and small seeds. However, in Turkey, many chickpea cultivars were released by Ministry of Agriculture, which were improved from either ICARDA nurseries or local varieties by crossing. New chickpea varieties adapted to warmer/cold, short-season environments are bringing increasing prosperity to all regions and offer hope for farmers elsewhere in Turkey. These cultivars were produced by research institute and private seed firms. Nevertheless, farmers need to new varieties for new requirements, so we will try to improve a new variety for region by this and others researches.

MATERIALS AND METHODS

Thirty-seven chickpea genotypes and long term check (ILC 482) (Nursery:Chickpea international adaptation trial-2012) from

International Center for Agricultural Research in the Dry Areas (ICARDA) also, one local check (Yerli Nohut) were tested at Diyarbakir, Turkey, in 2012 spring growing season. Soil of

experimental area is sandy, slightly stony, low clay and low organic matter. Soil quickly dried after rainfall, due to high infiltration.

Table 1. Climatic conditions in 2012 crop season at Diyarbakir, Turkey

Months	Temperature (°C)			Precipitation (mm)	Humidity (%)
	Mean	Max.	Min.		
January	2.4	11	-8.6	78.3	85
February	1.9	14.8	-8.4	74.4	68
March	5.1	18.1	-5.8	44	59
April	15.2	27.8	2	26.2	58
May	19.6	33	8.6	41	58
June	27.7	41.7	9.4	7	27.8
July	31.3	43.7	14.5	1.6	20.9

Climatic conditions were given Table 1. Total precipitation during cropping season from February to July was 272.5 mm, but most precipitation was recorded from January to March. Plants were stressed by low precipitation and high temperature from April to July.

Each of the genotypes was planted in 2 rows with 4 m length with inter-row spacing of 45 cm. the experiment was conducted a randomized complete block design with two replications. Genotypes were sown in the second week of March. Plants were harvested in 19th July.

Observation for *Ascochyta blight* (1-9) was record two times during growing season. Overall resistance score to *H. armigera* damage during the flowering stage of genotypes was recorded. The plants were visually rated for leaf feeding on 1 to 9 damage scale. Foliage color (intensity of green color: light: 3, medium: 5, dark: 7) in flowering, plant habit after flowering (erect: 3, semi erect: 5, prostate: 7) and natural plant height when pods fully developed in field (short: 3, medium: 5, tall: 7) were observed. Ten plants were selected in harvest time for other traits. The data were statistically analyzed by using 'MSTATC' (Michigan State University, East Lansing, MI) computer package.

RESULTS AND DISCUSSIONS

The mean of genotypes were given in Table 2. Analysis of variance revealed that differences among forty chickpea lines was significant for days to flowering and maturity, plant height, number of pods and seeds plant⁻¹, grain yield, natural plant height, plant habit, *Ascochyta blight* and *H. armigera*.

Days to flowering ranged from 57 days to 73 days. FLIP87-8C, FLIP87-45C, FLIP91-77C, FLIP97-263C, FLIP97-266C and FLIP97-281C genotypes flowered 12-13 days earlier than others. The latest flowered genotypes were ILC 3279, FLIP97-137C and Elixir. All genotypes were matured between 97 day and 105 days. Maximum days to maturity (105 days) were recorded from FLIP86-5C, and FLIP97-137C. The earliest matured genotypes were FLIP82-150C, FLIP87-40C, FLIP97-263C and ILC 482, long term check variety.

Plant height ranged from 24 cm to 39 cm. ILC3279, FLIP86-5C and FLIP97-706C were recorded as tall genotypes. Natural plant height in field generally was scale 5 and 7 which plants were medium and tall. Genotype ILC 3279 and Elixir were tall by scale 7. ILC 482 and local variety were short by scale 5. Other researcher reported that ILC3279 and ILC195 were tall types (Singh, 1990).

Differences among genotypes for number of branches plant⁻¹ were no significant. However, plant branching was medium or strong. Number of pods plant⁻¹ varied from 3.2 to 12.9 pods. Although plants were showing the strong stand, number of pods per plant was average 7.2 pods. FLIP88-85C, ILC 482 and ILC484 had produced more pods than other genotypes. Canci and Toker (2009) reported that number of pods per plant ranged from 1.0 to 15.0 in genotypes from ICARDA.

Grain yield ranged from 31.5 g/m² to 227.3 g/m² by average 125.6 g/m². FLIP91-77C, FLIP93-58C and FLIP87-45C were recorded as high yielding genotypes. Minimum grain yield was obtained from FLIP81-71C, FLIP84-48C, FLIP97-137C, FLIP97-503C and Elixir.

Table 2. Chickpea International Adaptation Trial-2012

Access.No.	DAF	DAM	PH (cm)	PNH (3-5-7)	NBP	NPP	NSP	SYP (g)	GY (g/m ²)	FGC (3-5-7)	PGH (3-5-7)	AB (1-9)	HA (1-9)
ILC72	64	100	30	5	3.3	9.8	8.8	1.13	124.8	7	3	1	1
ILC195	60	98	30	5	2.7	7.5	5.9	0.81	144.3	5	3	1	3
ILC464	62	101	29	3	3.0	5.7	6.1	1.28	173.5	5	5	5	3
ILC484	58	98	29	3	3.8	11.2	10.7	1.50	171.5	5	5	3	3
ILC1929	58	98	28	3	3.0	10.4	8.3	1.27	143.3	7	5	8	5
ILC2555	68	104	30	5	4.0	7.9	7.3	0.87	72.0	5	3	1	3
ILC3279	73	101	39	7	2.4	7.2	5.9	0.77	77.0	5	3	1	3
FLIP81-71C	70	100	33	7	3.0	5.2	4.9	0.65	57.7	3	3	3	3
FLIP81-293C	61	99	32	7	3.9	10.0	9.7	1.70	101.5	7	3	3	5
FLIP82-150C	64	97	28	5	3.1	7.0	6.6	0.92	98.0	7	3	1	1
FLIP83-7C	65	98	34	7	3.9	9.7	7.7	1.02	113.8	5	3	3	1
FLIP84-48C	72	102	33	7	2.9	4.0	3.2	0.51	66.5	5	3	1	1
FLIP84-79C	63	100	29	3	2.7	5.6	5.4	0.66	82.3	7	3	3	1
FLIP84-92C	70	104	33	5	2.5	4.7	5.2	0.78	98.0	7	5	5	3
FLIP84-182C	68	104	32	7	2.6	7.1	7.7	1.25	92.5	5	3	3	3
FLIP84-188C	69	101	29	5	2.7	8.7	9.4	1.22	117.3	7	3	1	3
FLIP85-1C	63	100	27	5	3.1	3.2	2.4	0.47	96.3	7	5	5	5
FLIP85-17C	66	104	30	5	2.0	4.3	4.6	0.70	80.5	3	3	3	1
FLIP86-5C	61	105	35	7	2.7	6.9	6.7	1.25	138.0	5	3	3	3
FLIP86-6C	60	102	31	7	2.6	6.0	5.0	0.90	108.5	3	3	3	5
FLIP87-8C	57	99	30	3	2.6	10.4	9.1	1.91	189.3	7	5	7	3
FLIP87-45C	58	97	29	3	2.7	8.0	8.1	1.25	192.5	7	5	3	3
FLIP88-85C	63	99	32	5	2.8	12.9	10.4	1.66	189.0	5	5	1	1
FLIP90-96C	64	101	30	5	3.0	5.8	6.3	0.79	120.8	5	1	1	3
FLIP91-77C	57	100	29	3	2.8	8.3	8.4	1.25	227.3	5	5	5	3
FLIP93-58C	60	98	27	5	2.5	8.1	10.5	1.62	209.5	5	5	3	3
FLIP93-93	62	98	27	5	2.1	3.6	3.5	0.52	143.5	7	5	1	3
FLIP93-146C	66	98	32	5	3.0	10.6	10.6	1.23	124.3	7	5	3	1
FLIP97-137C	73	105	29	5	3.3	7.3	6.5	1.23	31.5	3	5	1	1
FLIP97-263C	57	97	29	3	1.7	4.5	4.6	0.90	154.0	7	5	3	1
FLIP97-266C	57	98	30	5	2.7	7.3	7.0	3.53	175.0	5	5	5	3
FLIP97-281C	57	100	30	7	2.9	6.6	5.4	0.95	129.3	7	3	5	3
FLIP97-503C	70	103	29	5	3.3	6.3	5.7	1.12	48.8	5	3	3	3
FLIP97-530C	68	104	33	7	2.6	8.3	7.6	1.52	131.3	5	3	3	3
FLIP97-677C	70	102	31	5	3.4	3.4	2.3	0.37	75.5	3	3	1	3
FLIP97-706C	68	103	39	7	2.5	7.6	8.4	1.66	159.3	5	3	1	3
FLIP98-121C	60	98	24	3	3.2	6.2	6.5	0.87	140.0	5	5	3	3
Elixir	71	100	31	7	3.2	5.4	4.6	0.56	66.5	7	5	1	3
ILC 482	59	97	28	3	2.8	11.7	13.8	2.11	187.0	7	5	3	3
Local variety	59	98	28	3	2.6	7.2	6.4	1.26	175.0	5	5	7	3
Mean	64	100	30		2.9	7.3	6.9	1.1	125.6				
LSD	**	**	**	**	-	*	*	-	**	-	**	**	**

DAF: Days to Flowering, DAM: Days to Maturity, PH: Plant Height, NBP: Number of Branches Plant-1, NPP: Number of Pods Plant⁻¹, NSP: Number of Seeds Plant-1, SYP: Seed yield plant⁻¹, PGH: Plant Growth Habit, FGC: Foliage intensity of Green Color, PNH: Plant Natural Height (When Pods Fully Developed) in Field, AB: *Ascochyta blight*, HA: *H. armigera*

Genotypes were evaluated using 1-9 scale for *Ascochyta blight*, and fourteen genotypes were free, seventeen genotypes were resistant and six genotypes were tolerant. ILC1929, FLIP87-8C and local variety were susceptible. While ILC 482 was recorded, ILC72 was resistant. These findings agree with other researcher (Reddy et al, 1992; Saccardo and Calcagno 1990). *H. armigera* was observed in genotypes, and they evaluated to 1-9 scale. Total ten genotypes

were free (scale: 1), twenty-five genotypes were resistant (scale: 3) and five genotypes were moderately resistant (scale: 5). Local variety, FLIP85-1C, FLIP97-281C and ILC1929 were affected moderately by *Botrytis fabae*. Genotypes were evaluated for intensity of green color of foliage and plant growth habit. Color of foliage was mostly medium and dark green. Plant habit was semi-erect and prostrate.

Table 3. Evaluation of Genotypes for Earlier, Plant Height and Antracnose

Acc.No:	Flowering	Acc.No:	Maturity	Plant height	<i>Ascochyta blight</i>
Local variety	E	Local variety	E	S	S
ILC1929	E	ILC1929	E	S	S
FLIP87-8C	E	FLIP87-8C	E	M	S
ILC 482	E	ILC 482	E	S	R
FLIP87-45C	E	FLIP87-45C	E	S	R
FLIP97-263C	E	FLIP97-263C	E	S	R
FLIP91-77C	E	FLIP98-121C	E	S	R
FLIP97-281C	E	FLIP83-7C	E	T	R
ILC484	E	ILC484	E	M	R
FLIP97-266C	E	FLIP97-266C	E	M	MR
		ILC195	E	M	F
		FLIP93-93	E	S	F
		FLIP82-150C	E	S	F
		FLIP93-58C	E	S	R
		FLIP93-146C	E	T	R
FLIP97-137C	L	FLIP97-137C	L	S	F
FLIP84-48C	L	FLIP84-48C	L	T	F
FLIP84-92C	L	FLIP84-92C	L	T	MR
FLIP97-503C	L	FLIP97-503C	L	T	R
FLIP97-677C	L	FLIP97-677C	L	M	R
ILC3279	L	ILC3279	L	T	F
		FLIP97-706C	L	T	F
		FLIP84-182C	L	T	R
		FLIP86-5C	L	T	R
		FLIP85-17C	L	M	R
		FLIP86-6C	L	M	R
		ILC2555	L	M	R
	E:early L:late		E:early L:late	S:.short M: medium, T: tall	F: free, R: resist. MR: Mod. Resist. S: suscept.

CONCLUSIONS

Thirty-seven chickpea genotypes and long term check (ILC 482) from ICARDA as Chickpea international adaptation trial-2012 and one local variety were tested at Diyarbakir, Turkey. Differences among genotypes were significant for all of traits. Ten genotypes early flowered, fifteen genotypes early matured eighty of them both early flowered and matured. Six genotypes late flowered, twelve genotypes late matured six of them late flowered and late matured. Early flowering and maturing genotypes had short plant height. Late maturing genotypes had medium or tall plant height, except FLIP97-137C. Three susceptible genotypes for *Ascochyta blight* were determined within earlier genotypes. However, association between plant height, earlier and *Ascochyta blight* not found (Table 3).

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