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Evaluation of Chickpea Germplasm for Semi Arid Zones of Balochistan

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ABSTRACT

Fifty seven exotic genotypes of chickpea classified under three categories were evaluated to identify suitable cultivars for Balochistan. There was a considerable variation between genotypes for days to 50% flowering, days to maturity, number of pods per plant and grain yield per hectare. Days to maturity, number of pods per plant and grain yield per hectare (kg) ranged from 207–220, 17–32 and 615–1490, respectively. On the basis of grain yield and pods per plant, nine genotypes were identified for direct exploitation and in breeding programs aimed at development of high yielding cultivars for arid and semi arid areas of Balochistan. Present study revealed that chickpea might be a potential future crop of Balochistan and the research shall concentrate on the development of extra short duration cultivars.

Key Words: Semi Arid; Balochistan; Germplasm; Chickpea; Evaluation

INTRODUCTION

Chickpea is an important food legume that can be grown under a wide range of environments. It is well known as a drought tolerant crop that performs well in low input agriculture. Its total area in Pakistan exceeds one million hectare where it is mainly grown as a rain fed crop.

The drought is overwhelmingly increasing in Pakistan very rapidly, obviously trend of chickpea cultivation and crops like that shall increase. Identification of high yielding cultivars and development of site-specific production technology is instantly desired in this regard. To improve the profitability, major thrust of chickpea research shall focus on improvement of yield potential and grain quality especially in areas where yields are very low (Corbin, 1975).

Balochistan is the largest province of Pakistan with hot and arid climate during summer and cold and partially wet during winter. Only 4% (1.42MH.) of its total area (34.7MH.) is under cultivation whereas 60% of cultivated area is rain fed (Alvi & Sharif, 1995). Irrigated area in Balochistan is limited and used for high value crops. Soil moisture deficiency is the major constraint in crop production as rainfall varies from 150-300 mm and wheat cannot be grown successfully (Alvi & Sharif, 1995). Therefore, chickpea being a drought and cold tolerant crop could be a better option. Presently, chickpea is limited to 11000 ha irrigated area in Balochistan with 800 kg ha^{-1}. grain yield (MINFAL, 2000). It can be adopted in arid and semi – arid areas of the province. However, it requires identification of high yielding genotypes and development of location specific production technology (Singh & Singh, 1983).

The objective of present study was, therefore, to evaluate Desi chickpea genotypes VIZ; high yielding with multiple resistance, drought resistance and large seeded cultivars, and select suitable ones.

MATERIALS AND METHODS

Sixty genotypes (including local checks as control) were obtained from ICRISAT, India under the international chickpea germplasm exchange program. These were divided into three groups on the basis of seed size, disease resistance, drought resistance and response to input, i.e. (i) high yielding genotypes with multiple resistance, (ii) with drought resistance and (iii) large seeded genotypes. Each set had 19 genotypes and one controle (CM 72). These sets of genotypes were separately sown in Randomized Complete Block Design with two replications in the experimental field of Agriculture Research Institute, Sariab, Quetta. Seed was sown in second week of October with pre-planting application of NPK @ 20: 50: 30, kg ha^{-1}. There were 4 m long rows in each plot while row-row and plant-plant distance was maintained at 30 and 10 cm, respectively. Single irrigation was applied before sowing to raise the crop. Data were recorded for these parameters i.e. days to 50% flowering, days to maturity, plant height (cm), number of pods per plant and yield per plot (g). Data on grain yield (g) per plot was converted to grain yield (kg) per ha. These data were statistically analyzed to determine the significance of difference between genotypes (Steel & Torrie, 1980). Least significant difference test (LSD) was applied to compare the individual genotypes at 5% probability.

RESULTS AND DISCUSSION

Significant differences were observed between genotypes studied under the three categories, for all the

Table1. Evaluation of Desi chickpea genotypes with high yield potential and multiple disease resistance for grain yield and yield contributing parameters

S.No.	Name of genotype	Days to Flowering	Days to Maturity	Plant Height (cm)	No. of Pods plant^{-1}	Grain yield (kg ha^{-1})
1	ICCV 86111	147	212	27	26	865bcd
2	ICCV93213	150	213	33	25	823bcd
3	ICCV93214	154	217	26	32	313f
4	ICCV93215	152	216	30	26	865bcd
5	ICCV93216	149	214	24	27	1011abc
6	ICCV93217	152	216	29	27	678de
7	ICCV93048	148	214	23	26	854bcd
8	ICCV93049	150	218	27	27	981abcd
9	ICCV93050	153	216	24	31	355ef
10	ICCV93051	148	212	25	23	1146ab
11	ICCV93053	148	211	22	25	917bcd
12	ICCV93002	149	218	32	26	1282a
13	ICCV93054	153	216	32	25	802cd
14	ICCV93055	147	213	26	29	1136ab
15	ICCV93056	147	217	28	27	1094abc
16	ICCV93057	154	217	22	29	1021abc
17	ICCV94001	152	218	21	30	917bcd
18	ICCV94201	149	210	26	28	917bcd
19	ICCV93202	149	216	33	27	1032abc
20	CM 72	150	210	29	23	1032abc
	Mean	149.9	214.4	26.9	26.8	901.6

Means sharing the same letter are non significantly different at 5% probability

Table II. Evaluation of Desi chickpea genotypes with high yield potential and multiple disease resistance for grain yield and yield contributing parameters

S. No.	Name of genotype	Days to flowering	Days to maturity	Plant height (cm)	Number of Pods plant^{-1}	Grain yield (Kg ha^{-1})
1	ICCV 4958	150	216	34	20	823cd
2	ICCV93030	148	220	33	18	1000bcd
3	ICCV93031	147	213	30	18	1032bcd
4	ICCV93032	147	211	34	19	979bcd
5	ICCV93034	149	217	34	20	1010bcd
6	ICCV93035	150	218	26	20	1198abc
7	ICCV93036	150	214	33	22	1052bcd
8	ICCV93038	148	217	33	20	1188abc
9	ICCV93039	146	214	32	19	750d
10	ICCV93040	149	211	29	18	907cd
11	ICCV93041	146	210	37	20	854cd
12	ICCV93042	154	212	35	19	1042bcd
13	ICCV93043	150	215	34	21	1490a
14	ICCV93044	148	213	32	18	1406ab
15	ICCV93045	152	220	30	19	990bcd
16	ICCV94007	149	209	33	19	1084abcd
17	ICCV94008	151	218	31	21	802cd
18	ICCV94009	152	218	29	22	729d
19	ICCV94010	150	213	29	20	823cd
20	CM 72	149	207	29	18	865cd
	Mean	149.0	214.0	31.7	19.4	1001.0

Means sharing the same letter are non significantly different at 5% probability

parameters (Table I, II, III). Maximum days to flowering (154) were recorded in cultivars ICCV 93214 and ICCV 93057 and minimum days to flowering (146) were recorded in ICCV93039 and ICCV 93041. The maximum days to maturity (220) were recorded in ICCV93030 and ICCV93045 whereas minimum days to maturity (210) were taken by ICCV 94001. Maximum grain yield (1490 kg ha^{-1}.) was obtained from ICCV 93043 which was followed by 1375 kg ha^{-1} obtained from ICCV 93027 (Table I & III). The maximum (37) and minimum (17) number of pods per plant were recorded in ICCV 93041and ICCV93023, respectively. The means of different parameters for each of the three categories showed that maximum mean grain yield ha^{-1}. (1021kg), maximum average number of pods plant ha^{-1} (19.90) and maximum average plant height (34.1cm), were recorded in the category of large seeded genotypes

Table III. Evaluation of Desi chickpea genotypes with high yield potential and multiple disease resistance for grain yield and yield contributing parameters

S. No.	Name of genotype	Days to Flowering	Days to maturity	Plant height (cm)	No. Pods Plant^{-1}	Grain yield Kg ha^{-1}
1	ICC5003	150	218	31	21	1334ab
2	ICCV91010	151	217	36	22	1094abcde
3	ICCV91016	151	216	31	19	927abcde
4	ICCV91025	151	216	32	20	834bcde
5	ICCV93016	149	215	33	19	813cde
6	ICCV93019	149	216	35	19	1125abcde
7	ICCV93020	148	214	32	20	959abcde
8	ICCV93021	151	214	35	19	615e
9	ICCV93023	148	217	30	17	1302abc
10	ICCV93024	151	211	33	21	1365a
11	ICCV93025	148	213	35	20	938abcde
12	ICCV93027	147	220	37	22	1375a
13	ICCV93028	148	217	38	21	1365a
14	ICCV93029	148	217	35	21	771de
15	ICCV94004	153	214	39	20	677de
16	ICCV94005	149	216	33	19	980abcde
17	ICCV94006	148	218	37	21	761de
18	Co 3	150	217	34	20	1084abcde
19	Shoba	150	216	37	21	958abcde
20	CM 72	149	217	33	20	1167abcd
	Mean	149.0	214.0	34.1	19.9	1021.0

* Means sharing the same letter are non significantly different at 5% probability

Table IV. Promising genotypes identified as suit able for cultivation in Balochistan and their important characters

Genotype	Days to Flowering	Days to Maturity	Yield (Kg ha^{-1})	Other attributes
ICCV93051	148	212	1146	Resistant to Fusarium wilt And pod borer
ICCV93002	149	218	1281	Resistant to Fusarium wilt And pod borer
ICCV93055	147	213	1136	Resistant to Fusarium wilt, pod borer and dry root rot
ICCV93035	150	218	1198	Drought resistant
ICCV93038	148	217	1188	Drought resistant
ICCV93043	150	215	1490	Drought resistant
ICCV93044	148	213	1406	Drought resistant
ICCV93024	151	211	1365	Large seeded
ICCV93027	147	220	1375	Large seeded
ICCV 93028	148	217	1365	Large seeded

(Table I, II, III). A comparatively narrow range of variation (18-22) was observed for number of pods per plant in high yielding and drought resistant genotypes (Table II), however, grain yield in this category varied from 729 kg ha^{-1} to 1490 kg ha^{-1}.

The genotypic differences for various traits of large seeded genotypes were significant except for days to maturity which was non significantly different. Although significantly different, but a narrow range of variation (148-153) for days to flowering was observed in these genotypes. Number of pods per plant and grain yield, respectively ranged from 19-22 and 615 to 1375 kg ha^{-1} in this category. Maximum grain yield in this category genotypes was recorded in ICCV 93027 which also had maximum number of pods per plant. Minimum grain yield (615 kg ha^{-1}.) under this category of genotypes was obtained from ICCV 93021.

Present study revealed considerable variation for grain yield, maturity time, plant height, and pods per plant. Genetic variability for these characters that is in line with our findings has been demonstrated in chickpea by Ali *et al.* (2002), Kumar *et al.* (1999) and Wanjari *et al.* (1996). Yield and yield components are inherited traits though influenced by environment (Wanjari *et al.,* 1996; Jahargirdar *et al.,* 1996). As our work was conducted in arid condition of Balochistan, the variability recorded in the genotypes can be exploited for selection of high yielding lines for this environment. Khan and Qureshi (2001) and Guler *et al.* (2001) have reported that number of pods per plant are positively correlated with grain yield. Present study showed that some of the genotypes with high number of pods per plant had low yield. This difference might be due to susceptibility of these genotypes to cold that would have caused damage to the seed or the seed size of these genotypes could be small inherently.

Grain yield and pods per plant were used as selection parameters for genotypes suitable for cultivation in arid and semi-arid zones of Balochistan. Following these criteria, nine lines were selected and recommended for cultivation in Balochistan (Table IV). The genotypes identified may be exploited for cultivation after further evaluation and

development of production technology. Our study revealed that chickpea might be proposed as a potential future crop of Balochistan if suitable genotypes and production technology are developed.

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