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Agronomic assessment of cold tolerant chickpea (*Cicer arietinum* L.) genotypes in fall sowing at Mashhad conditions

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Introduction: In fall-winter sowing, seed yield and biological yield increase compared to spring sowing because of extended vegetation period and optimal use of precipitations

Our Goal:

- Evaluating of agronomic characteristics of chickpea cold tolerant genotypes in fall sowing
- Introducing of superior genotypes with the highest seed yield, plant height and survival percent

Material & Methods

- Three field trials in 2002-2003, 2003-2004 and 2004-2005 at the experimental field of College of Agriculture, Ferdowsi University of Mashhad.
- Rainfed conditions with only two times irrigation at planting stage and 20 days after that.
- In the first year (2002-2003), 46 chickpea genotypes (30 cold tolerant accessions resulted from previous studies at Mashhad and some genotypes from ICARDA and Canada) were planted based on Randomized Complete Block Design with three replications.
- In first year, cold injury caused complete loss; so, in the next two years by adding of 106 other accessions, totally, 152 chickpea genotypes with 4 checks were evaluated based on the Augmented Preliminarily Design. In each year, genotypes were categorized according to their seed yields to some groups, and some statistical indices such as mean, standard deviation and range were calculated for each group.

Results & Discussion

- There were significant differences ($p \leq 0.05$) among genotypes with each other and with checks in yield, yield components and plant height.
- In the second year (2003-2004), the range of seed yield among the first yield group (39.5% of all genotypes) was from 251 to 622 g.m^{-2}
- In the third year (2004-2005) the range among the first yield group (20% of all genotypes) was from 254 to 442 g.m^{-2}
- finally, 20 chickpea genotypes with the most promising yields were selected in each year for future studies (Table 1&2).

Table 1. Characteristics of 20 superior cold tolerant chickpea genotypes with the highest yields resulted from the second trial of fall sowing of 152 chickpea genotypes (Mashhad, 2003-2004)

No.	Genotype Name	Seed Type	Origin	Seed yield (g.m^{-2})	Biological yield (g.m^{-2})	Harvest index (%)	100 Seeds weight (g)	Plant height (cm)	Survival percent (%)
1	MCC791	Kabuli	Flip97-152C	622	2133	36.7	31.7	57	81
2	MCC783	Kabuli	Flip97-120C	570	982	65.0	31.8	60	87
3	MCC752	Kabuli	Flip97-179C	533	857	65.0	25.5	42	57
4	MCC741	Kabuli	Sel93TH2467	500	1031	59.7	24.1	42	60
5	MCC55	Kabuli	ZiTi2	499	1203	57.3	37.3	65	53
6	MCC771	Kabuli	Flip97-94C	477	1092	26.2	33.4	58	67
7	MCC785	Kabuli	Flip97-122C	460	1291	65.2	32.7	50	68
8	MCC798	Kabuli	Flip97-163C	456	1237	61.8	31.9	48	57
9	MCC788	Kabuli	Flip97-129C	444	1471	51.0	38.3	61	53
10	MCC786	Kabuli	Flip97-124C	424	1077	62.7	39.5	57	81
11	MCC775	Kabuli	Flip97-102C	422	1369	47.7	44.3	48	73
12	MCC780	Kabuli	Flip97-116C	412	856	31.6	32.2	48	63
13	MCC819	Desi	IRAN	399	858	29.7	23.2	43	29
14	MCC797	Kabuli	Flip97-150C	389	254	65.0	29.7	45	29
15	MCC843	Kabuli	ILC482-205	388	645	65.0	23.1	50	45
16	MCC779	Kabuli	Flip97-114C	387	1281	30.6	39.5	72	63
17	MCC769	Kabuli	Flip97-87C	386	806	31.3	34.4	53	75
18	MCC795	Kabuli	Flip97-134C	383	904	25.4	29.4	53	51
19	MCC784	Kabuli	Flip97-78C	384	684	63.4	34.9	47	57
20	MCC753	Kabuli	Flip97-102C	380	632	46.2	29.2	42	39

Table 2. Characteristics of 20 superior cold tolerant chickpea genotypes with the highest yields resulted from the third trial of fall sowing of 152 chickpea genotypes (Mashhad, 2004-2005)

No.	Genotype Name	Seed Type	Origin	Seed yield (g.m^{-2})	Biological yield (g.m^{-2})	Harvest index (%)	100 Seeds weight (g)	Filled pod numbers per plant	Seeds number per pod	Survival percent (%)
1	MCC802	Kabuli	Flip97-187C	442	651	65	37	48	1.4	79
2	MCC798	Kabuli	Flip97-163C	356	1254	25	35	38	1.4	70
3	MCC753	Kabuli	Sel96TH11459	350	1634	19	27	118	1.4	75
4	MCC779	Kabuli	Flip97-91C	346	747	43	34	89	1.3	88
5	MCC809	Kabuli	Flip97-211C	342	788	41	43	31	1.0	75
6	MCC761	Kabuli	Flip97-42C	328	824	37	30	49	1.5	50
7	MCC814	Kabuli	Flip97-220C	326	735	42	33	34	1.7	79
8	MCC728	Kabuli	Flip97-166C	318	684	47	27	58	1.6	91
9	MCC743	Kabuli	Sel97TH2467	303	728	49	15	59	1.0	75
10	MCC776	Kabuli	Flip97-230C	295	632	53	20	32	1.2	103
11	MCC815	Kabuli	Flip97-221C	289	793	36	41	46	1.1	63
12	MCC730	Kabuli	Flip97-172C	285	689	41	36	59	1.1	67
13	MCC760	Kabuli	Flip97-45C	285	695	40	46	105	1.1	55
14	MCC776	Kabuli	Flip97-111C	283	1092	34	43	16	1.2	95
15	MCC795	Kabuli	Flip97-129C	281	731	38	41	54	1.3	59
16	MCC767	Kabuli	Flip97-82C	277	754	36	46	90	1.2	31
17	MCC806	Kabuli	Flip97-196C	277	752	36	41	61	1.0	71
18	MCC758	Kabuli	Flip97-28C	276	753	35	40	32	1.6	54
19	MCC774	Kabuli	Flip97-101C	276	693	39	40	43	1.4	82
20	MCC723	Kabuli	Flip96-90C	274	700	37	29	30	1.3	75

Conclusion

The results showed that there are chickpea genotypes adapted to the cold and rainfed conditions of fall-winter sowing. Considering the importance of field investigations, these results should be subject for future research and development programs.

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