

## Artificial Cross Pollination of Chickpeas at Debre Zeit, Ethiopia

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Flower buds of chickpea are small, and artificial hybridization is difficult. The success rate of

hybridization is often low. Chickpea breeders are therefore interested in possible improvements in crossing methods and techniques.

Geletu and Tesfaye (1981) investigated what times of emasculation and pollination would give the best results for chickpea grown in a greenhouse at Debre Zeit, Ethiopia. They observed that the seed set was highest when the flower buds were emasculated between 0800 and 1000, and the pollination took place the same day between 1200 and 1400, but the

**Table 1a. Results of chickpea crossing trial conducted at Debre Zeit, Ethiopia, 22-31 Oct 1987.**

Number of pods resulting from 10 pollinations.

Day of crossing	Person 1			Person 2			Grand total of pods set
	Crossing method			Crossing method			
	Pod set M-1	Pod set M-2	Total pod set	Pod set M-1	Pod set M-2	Total pod set	
1	4	2	6	5	2	7	13
2	5	3	8	4	6	10	18
3	1	4	5	1	0	1	6
4	1	1	2	4	0	4	6
5	0	0	0	0	0	0	0
6	0	0	0	2	1	3	3
7	0	0	0	0	0	0	0
Total	11	10	21	16	9	25	46

**Table 1b. Results of chickpea crossing trial conducted at Debre Zeit, Ethiopia, 22-31 Oct 1987.**

Analysis of variance of number of pods resulting from 10 pollinations.

Source of variation	df	MS	F <sup>1</sup>
Day of crossing	6	11.32	7.12***
Person	1	0.57	NS
Person x day of crossing	6	1.42	NS
Method	1	2.29	NS
Method x person	1	1.30	NS
Method x day of crossing	6	1.54	NS
Method x person x day of crossing	6	1.87	NS
Total	27		

1. Tested against the combined MS of the 2nd- and 3rd-order interactions: 1.59; CV = 77%

differences between the various time combinations were not significant. For instance, emasculation between 1200 and 1400, followed by pollination between 0800 and 1000 the following day resulted in seed set not significantly different from that of the method described above. Unfortunately, the success rates these authors scored were low, ranging from 1.7-7.7%. They suspected that the high temperatures in the greenhouse--sometimes 36-37°C--were the main cause for the poor seed set and suggested it might be better to make crosses under normal field conditions than in a greenhouse.

Their suggestion was followed, and in December 1987, two parents were selected for making crosses in the field: DZ 10-11, a released desi variety, was used as the female, and ICCV 2, an early-maturing, wilt-resistant kabuli, as the male parent. Two different methods of crossing were used:

M-1: Emasculate at 1600, and pollinate the following day at 0830

M-2: Emasculate and pollinate at 0900 the same day.

Two trained persons made the required crosses daily for 7 consecutive days. The female parent was sown on 31 Aug 1987, in a block with 16 rows, 5-m long. The block was divided into two plots of eight rows each, which were allotted at random daily to the persons who were to make the crosses. The plots were divided into sub-plots to which the two different crossing methods were allotted, again at random. Ten plants were chosen in each sub-plot for the emasculation and pollination of one flower bud on

each plant daily. The trial resembled a split-plot experiment, the different days being the replications, representing the main plots, and the crossing methods the sub-plots. The final pod count was made 18 days after the trial had started. The results are presented in Table 1a, while the analysis of variance of the results is shown in Table 1b. Weather data and mean percentages of pod formation are given in Table 2.

The data are limited, show a high CV, and need to be looked at cautiously. It is concluded that crossing in the field indeed gave better results than crossing in the greenhouse; the two persons were equally skilled in making crosses; the crossing methods gave no significantly different results, which agrees with observations made by Pundir and Reddy (1984); but the day-to-day success rate differed considerably. It may be that the drop in success rate was due to high minimum temperatures and high humidity.

## References

- Geletu, B., and Tesfaye, T.** 1981. Identification of the optimum time of emasculation and pollination to increase percentage of hybrid seed set in chickpea. *Ethiopian Journal of Agricultural Science* 3(2):129-134.
- Pundir, R.P.S., and Reddy, K.N.** 1984. Comparison of cross pollination methods in chickpea. *International Chickpea Newsletter* 11:9-11.

**Table 2. Weather data during chickpea cross-pollination trial at Debre Zeit, Ethiopia, 1987, and mean success rate of crosses.**

October date	Temperature (°C)		Relative humidity (%)	Success rate of crosses (%)
	Maximum	Minimum		
20	28.7	6.5	39.6	-
21	29.3	6.7	37.2	-
22	28.8	7.1	34.8	32.5
23	28.9	6.1	35.6	45.0
24	28.3	7.4	37.0	15.0
25	28.5	9.5	41.4	15.0
26	28.2	15.7	49.2	0.0
27	28.2	13.5	47.4	7.5
28	26.9	10.2	56.2	0.0
29	27.6	11.8	46.8	-
30	27.4	10.1	43.8	-
Mean	28.25	9.51	42.64	16.43