Iran. Jour. Agric. Res. Vol. 1, No. 1, October 1971

ALLEY AND INTER-PLOT EFFECT ON CHICKPEAS

(Cicer Arietinum L.) YIELD TRIALS

M. Niknejad & M. Khosh-khui [1]

ABSTRACT

Effect of alleys and inter-plot competition was investigated on yield performance of 25 chickpea varieties using two-row and four-row plots. A high correlation value (r=0.83) was found between yield of two outisde and two center rows. Ranking of varieties remained almost unchanged where calculations were based on four-row and two-row plots. Alley and inter-plot competition did not affect plot yields differently. On the basis of data obtained in this study, use of two-row plots in chickpea variety trials is recommended under the conditions of this experiment.

INTRODUCTION

In plant breeding programs usually large number of varieties are compared in a single experiment. Therefore, determination of the optimum size of the experimental plots and number of rows per plot for yield evaluation of genotypes is one of the important phases of such programs. By and large, investigators have constantly searched for methods which would save both time and money.

Competition between adjacent plots often raises some yields and lowers others (1). Broder effect due to alleys not only may affect the yield of the plots but also may change the rank of varieties in yield trials (8). Use of a sixty centimeter border between plots resulted in a highly significant border effect in three winter wheat tests and one spring oat test (2). A study on the effect of alleys on plot yield in cereals showed that with 45-cm alleys, when only the outside border rows were considered, the yield was excessively high. It was also shown that the ranking of varieties were different when

[1] Associate Professor and Instructor, Department of Plant Science, College of Agriculture, Pahlavi, University, Shiraz, Iran.

the border rows were eliminated (8). There are numerous reports on interplot competition and alley effect on yield of border rows. These reoprts deal mainly with small grains (9, 10, 11) and to some extent with crops such as sugar beets (3, 7) soybeans (5) cotton (4) and alfalfa (6), Due to lack of data concerning the effect of unplanted borders and inter-plot competition on yield of chickpea variety trials, it seemed worthwhile to conduct a test for determination of such effects.

MATERIALS AND METHODS

Twenty-five chickpea varieties with different agronomic characters from different sources were planted for yield comparison in a balanced lattic design with six replications. The varietal names were alphabetically coded for simplicity.

Varieties were planted in four row plots, each 12 meters long with 75-cm between rows. Margin plots were surrounded by a 2.5 meter wide alley. Each alley consisted of two 75-cm wide pathways and an irrigation ditch of one meter width and a half meter deep, in between. The pathways and the ditches were kept free of weeds during growth period. Seeding rate was 75 Kg/ha for all varieties, and seeds was planted around the first of April. Superphosphate was applied before planting at the rate of 100 Kg/ha. The experiment was carried out at Bajgah Experimental Station, in alluvial silty-clay loam soil. Irrigation and weeding were practiced uniformly as required for all plots.

At harvest time, after discarding half a meter from both ends of each plot, the two center rows and two outside rows were harvested separately. The lattice design was analyzed in two different ways; first, taking the yield of the two center rows and second, the pooled yield of all four rows in each plot. For determination of alley effect on plot yield, data from margin plots (60 out of a total 150), were analyzed separately and compared with data obtained from all plots. Correlations were calculated between the yield of two center rows and the yield of two outside rows, both in all of the 150 plots and also in the 60 marginal plots.

RESULTS AND DISCUSSION

Adjusted mean yields of the 25 varieties, designated by letters, based on four-row and two-row plots are listed in Table 1. In general, ranking of the 25 varieties has not changed significantly. This suggests that there has been no interaction between variety and border effect. This is of practical importance because investigators are usually interested in relative rather than actual yields. The yield of two out side and two center rows had a correlation value of r=0.83 for all plots and r=0.89 for marginal plots. Mean yield of all outside rows (2508g) was not significantly different from the mean

Table 1. Arrangement of Twenty Five Chickpea Varieties, According to Adjusted Mean Calculated From two and Four-Row Plots

Order	Two Rows		Fours Rows	
	Variety Symbols	Adjusted Yield Kg/ha	Variety Symbols	Adjusted Yield Kg/ha
1	A	2460	A	2258
2	B	2085	C	2080
3	C	2057	D	2052
4	D	2024	E	1995
5	E	1960	B	1941
6	F	1856	G	1929
7	G	1852	H	1882
8	H	1810	F	1865
9	I	1744	J	1774
10	J	1695	I	1774
11	K	1693	K	1732
12	L	1678	N	1701
13	M	1660	M	1688
14	N	1627	L	1680
15	O	1608	O	1650
16	P	1592	Q	1628
17	Q	1580	S	1598
18	R	1518	R	1590
19	S	1455	P	1559
20	T	1443	T	1423
21	U	1381	U	1361
22	V	1380	V	1323
23	W	1239	W	1252
24	X	1066	X	1108
25	Y	742	Y	749
L.S.D.	0.05	408 Kg/ha		384 Kg/ha
	0.01	541 Kg/ha		510 Kg/ha

of two center rows (2474g). No significant differences were detected between means of two outside rows (from all plots) with means of two outside rows from marginal plots and between mean of middle rows of the same set of plots.

Results of this experiment suggest that in chickpea variety trials, two-row plots could be used as efficiently as four-row plots. With the row distance used in this experiment, it may be assumed that there has not been much competition between adjacent rows. However, it must be noted that even with such a distance, plants had completely covered the soil surface and branches were so intermingled that it was difficult to pass between rows. This implies that at least arerial competition prevailed and there is no reason to doubt that this was not the case in the soil. Lack of alley effect on margin plots, as indicated in this experiment, may be due to the fact that soil compaction in pathways along with more dust cover on foliage of these plots may have counter balanced the beneficial effect of alleys.

Using two-row plots instead of four-row plots, which is a usual practice in yield trials, saves a great deal of expense and increases land efficiency.

LITERATURE CITED

1. Anonymous. 1933. Standardization of Field Experiments. Amer. Soc. Agron. 25: 803-828.
2. Brown, C.M., and R.O. Weibel. 1957. Border Effects in Winter Wheat and Spring Oat Tests. Agron. J. 49: 382-384.
3. Deming, G.W., and H.E. Brewbaker. 1934. Broder Effect in Sugar Beets. Jour. Amer. Soc. Agron. 26:615-619.
4. Hancock, N.I. 1936. Row Competition and its Relation to Cotton Varieties of Unlike Plant Growth. Jour. Amer. Soc. Agron. 28:948-957.
5. Hartwig, E.A., H.W. Johnson, and R.B. Carr. 1951. Border Effect in Soybean Test Plots. Agron. J. 43:443-445.
6. Hollowell, E.A., and D. Heusinkveld. 1933. Border Effect Studies of Red Clover and Alfalfa. Jour. Amer. Soc. Agron. 25: 779-788.
7. Immer, F.R. 1934. Varietal Competition as a Factor in Yield Trials with Sugar Beets. Jour. Amer. Soc. Agron. 26:259-261.
8. LeClerg. E.L., W.H. Leonard, and A.G. Clark. 1962. Field Plot Technique. Burgess Publishing Company, Minneapolis, Minnesota. 373 p.
9. Meclelland, C.K. 1929. The Effect of Narrow Alleys on Small Grain Yields. Jour. Amer. Soc. Agron. 21:524-532.
10. Maclelland, C.K. 1934. Border Rows of Oat Plots as Affecting Yields and Variability. Jour. Amer. Soc. Agron. 26: 491-496.

Ross, W. M. 1958. A Comparison of Grain Sorghum Varieties in Plots with and Without Border Rows. Agron. J. 50: 344-345.