GAU Res. J. 1987. 13 (1) : 41-44

Border Effect in Jassids Count of an Insecticidal Trial of Hybrid-4 Cotton*

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ABSTRACT

An experiment with ten treatment combination of (i) number of border row(s) (no border, one, two, three and four border rows) on either side of the net plot and (ii) spraying levels (no spraying and recommended spraying) was conducted in a randomized block design with three replications on hybrid-4 cotton at college farm of N. M. College of Agriculture, Gujarat Agricultural University, Navsari, to assess the border effect in Jassids count in an insecticidal trial. The results lead to the conclusion that three border rows on either side of the net plot are necessary to eliminate border influence for unbiased estimate of Jassids count in an insecticidal trial.

(*Received on 1st Sept., 1986*)

INTRODUCTION

The large variation in the treatments of the adjacent plots (e.g. spraying of insecticides and no spraying of insecticides) is likely to cause inter-plot competition affecting treatment means (Federer, 1974). The treatment effects obtained from such experiments are not free from border effect. It inflates the error estimate by increasing heterogeneity among plots. (Hutchinson and Panse, 1935). Multiple row plots with the centre rows for the estimation of yield are generally adopted in field trials to eliminate inter-plot competition component of variance from the experimental error variance.

Muller (1953) studied the invading flight of aphids and concluded that in crops threatened by aphid attack, paths between rows should be largely avoided in order to eliminate the peripheral infestation also on the inside edges. Jassids with similar migratory behaviour is expected to cause inter-plot competition affecting treatment means in insecticidal trial.

The elimination of inter-plot competition is accomplished by leaving non-experimental margin (border area) around net plot. The size (width) of margin usually varies with the kind of crop and nature of treatment. The present investigation on hybrid-4 cotton was, therefore, undertaken to determine the width of the border area (rows) to be provided around net plot, in an insecticidal trial.

MATERIAL AND METHODS

Ten treatment combinations of number of border rows viz., b_0-No bor-

der, b_1-One border, b_2-Two border, b_3-Three border and b_4-Four border rows on either side of the net plot and insecticidal treatments viz., s_0-No spraying of insecticides and s_1-Spraying of insecticides recommended by the department of Entomology, N. M. College of Agriculture, Navsari were studied in a randomized block design with three replications.

From each row randomly two plants were selected and tagged. Three leaves viz., top, middle and lower from each tagged plant were selected and tagged. The influence of border effect was measured by recording jassids population on each tagged leaf before spraying and 24 hours after spraying.

Statistical : The border rows on either side of a plot might be affected by the adjacent plots. The difference in performance of the border row as compared to corresponding net row or row adjacent to border row is an indication of the border effect. If there were no border effect for a given treatment(s) the estimates available should not differ significantly.

Let $\bar{d}_{ij}$ be the difference between the mean performance of border and net rows (or first row adjacent to border row) on ith side of the jth treatment, i.e. $\bar{d}_{ij}' = \bar{S}_{ij}' - \bar{S}_{ij}$

Where

$\bar{S}_{ij}'$ = average performance due to jth treatment in border row on ith side of the plot

$\bar{S}_{ij}$ = average performance due to jth treatment in net row (or first row adjacent to border row) on ith side of the plot.

The border effect for ith side was tested by paired t-test.

RESULTS AND DISCUSSION

The difference in jassids population of the border row as compared to the corresponding row adjacent to border row was tested by paired 't' test. Such two t-values, one for side-1 and second for side-2 were obtained except b_0s_0 and b_0s_1 treatments. The average performance of two border rows of each treatment was also compared with the average performance of the net rows. Thus three t-values (side-1, side-2 and overall) were worked out for each treatment to assess border effect in an insecticidal trial.

The population of jassids per plant for border and net rows of eight treatments (except b_0s_0 and b_0s_1 treatments) alongwith t-values are presented in Table 1.

The examination of results (Table 1) revealed that the treatment involving S_1 level of insecticidal spray had all positive t-values for side-1, side-2 and overall and vice-versa for S_0 level of insecticidal spray barring side-1 of b_2s_0 and b_3s_0. This is because jassids population in border rows of sprayed plots (S_1) was increased while decreased in non-sprayed plots (S_0) for same rows due to the migration of jassids from non-sprayed plots to the sprayed plots. Schheider (1962) also noticed that the aphids moved towards most favoured feeding sites or dispersed from over crowded position to new ones.

The results further reveal that the overall 't' values for b_1s_1, b_2s_1, b_3s_1 are positive and significant which indicate that the jassids population of the border rows of sprayed plot has increased and this effect of increase can be seen upto b_3s_1 i.e. upto three border. Individually side-1 and side-2 could show border effect, but has not reached to significant level except side-1 of b_2s_1.

TABLE 1

The treatmentwise population of jassids for border and net rows alongwith t-values.

Treatment		*JASSIDS*		
		Border row	*Net row*	*t-value*
b_1s_0	Side-1	91.17	121.83	–2.587
	Side-2	112.83	129.50	–0.863
	Overall	102.00	125.66	–5.856*
b_1s_1	Side-1	15.00	5.50	2.106
	Side-2	11.83	5.83	0.770
	Overall	13.42	5.66	4.556*
b_2s_0	Side-1	128.75	124.00	0.895
	Side-2	118.42	125.17	–0.481
	Overall	123.58	124.58	–0.192
b_2s_1	Side-1	16.58	4.83	41.080*
	Side-2	4.42	4.00	0.472
	Overall	10.50	4.42	19.785*
b_3s_0	Side-1	127.78	121.50	1.953
	Side-2	114.11	125.00	–1.391
	Overall	120.94	123.25	–0.544
b_3s_1	Side-1	6.66	3.50	1.330
	Side-2	6.99	4.83	1.428
	Overall	6.83	4.17	5.393*
b_4s_0	Side-1	116.46	127.17	–2.026
	Side-2	120.30	129.33	–1.163
	Overall	118.42	128.25	–7.457*
b_4s_1	Side-1	6.21	5.17	0.881
	Side-2	6.00	5.00	7.142*
	Overall	6.10	5.08	1.913

*P=0.05

The jassids population data were further examine in details for the following combination of the adjacent plots to study migratory movement of the jassids and presented in Table 2.

(1) Sprayed plot adjacent to non-sprayed plot

(2) Non-sprayed plot adjacent to sprayed plot

(3) Sprayed plot adjacent to sprayed plot

(4) Non-sprayed plot adjacent to non-sprayed plot

The results revealed that differences between border row and first row for jassids population was significant in two combinations viz., sprayed plot adjacent to non-sprayed and non-sprayed plot adjacent to sprayed plot. Whereas such differences were not significant for next two combinations viz., sprayed plot adjacent to sprayed plot and non-sprayed plot adjacent to non-sprayed plot.

This implies that jassids from non-sprayed plots moved towards sprayed plots. The sprayed plots have most favoured feeding site and less crowding of

TABLE 2

The populations of jassids per plant for border and first row adjacent to border row (first row) of four combinations of sprayed and non-sprayed plots alongwith t-values.

Sr. No.	*Combinations*	*Row*	*Jassids*
1.	Sprayed plot adjacent to non-sprayed plot	Border row	13.88
		First row	5.21
		t	4.565*
2.	Non-sprayed plot adjacent to sprayed plot	Border row	104.66
		First row	126.42
		t	−3.986*
3.	Sprayed plot adjacent to sprayed plot	Border row	4.64
		First row	4.45
		t	0.425
4.	Non-sprayed plot adjacent to non-sprayed plot	Border row	126.75
		First row	121.94
		t	2.019

*P=0.05

jassids due to insecticidal spraying. Muller (1953) indicated the need for a border area around the experimental plots to check the aphid migration. The jassids with similar migratory behaviour also cause corresponding similar inter-plot competition. Thus results lead to the conclusion that three border rows on either side of the net plot are required to eliminate the border influence for unbiased estimate of jassids count in an insecticidal trial on cotton.

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