▼ Journal of Research (Science) , Bahauddin Zakariya University, Multan, Pakistan, 2000, Vol. 11, No. 1, pp.42-45 ISSN 1021-1012

RESISTANCE OF DIFFERENT COTTON VARIETIES TO COTTON LEAF CURL VIRUS UNDER FIELD CONDITIONS

Muhammad Aslam* and Atif Ali Gilani
University College of Agriculture, Bahauddin Zakariya University, Multan, Pakistan

Abstract: Nine cotton varieties (228/19, S-12, AC-134, MNH-440, MNH-410, MNH-295, MNH-395, MNH-329, and MNH-93) were evaluated for Cotton Leaf Curl Virus (CLCV) resistance. For CLCV, percent-infected plants were recorded on 62, 75, 82, 97, 104 and 114 days after planting (DAP). For whitefly, adults per leaf were counted on all these days expect 62 DAP. Difference in percent CLCV infected plants was non-significant among varieties on the first observation (62 DAP). From 75 to 114 DAP difference in percent infected plants was significant among the varieties tested. On 114 DAP, MNH-93 had the lowest infection (5.17%) followed by MNH-329 (9.93%). Highest infection was recorded in 228/19 (46.97%) and the second highest in S-12 (31.3%). Infection in other varieties was 18 to 28%. It was concluded that MNH-93 was resistant, MNH-329 moderately resistant, 228/19 highly susceptible and S-12 susceptible to CLCV. Whitefly, Bemisia tabaci (Genn.) population was not significantly different among varieties on any observation date, which indicates that response of the tested varieties to CLCV was independent of the whitefly population.

Keywords *Bemisia tabaci, CLCV resistance, cotton.*

INTRODUCTION

Cotton Leaf Curl, a viral disease of cotton, was reported for the first time in 1912 from Nigeria[1]. Later on it was reported from Tanzania in 1926[2] and from Sudan in 1934[3]. In Pakistan, Cotton Leaf Curl Virus (CLCV) was observed near Multan in 1967[4]. The disease did not receive much attention in the beginning due to its casual occurrence and minor economic importance. Since 1987 it has become a serious threat to Pakistan's cotton crop[5]. The disease-hit area was reported to be 97,580 hectares with a loss of 543,294 bales of cotton during 1992-93 season in the Punjab[6].

To develop CLCV control strategies, the use of resistant varieties has been advocated as the most promising and least expensive method of disease suppression[7]. The present study was conducted to test different cotton varieties for resistance against CLCV, and to identify relatively resistant varieties for CLCV management. Whitefly, *Bemisia tabaci* (Genn.) has been reported to transmit CLCV[7-10]. Thus, the study also aimed at to note the effect of whitefly population on the severity and spread of the disease.

MATERIALS AND METHODS

The study was conducted at the Cotton Research Station, Multan. Nine cotton varieties (Table 1) were planted on June 19, 1993 in a randomized complete block design having three replications. Each plot had four rows and row length was 12m. Spacing between rows was 75cm and between plants 30cm.

Data for CLCV infection was recorded after 62, 75, 82, 97, 104 and 114 days of planting. Plants with leaves showing small vein thickness, main vein thickness, curling and small 'enation' were considered infected. Numbers of all the plants showing disease symptoms were counted in each plot on each observation date and percentage of infected plants was calculated.

For whitefly population, data were recorded on 75, 82, 97, 104 and 114 days after planting (DAP). Whitefly adults were counted early in the morning on three randomly taken plants per row in all the rows. Adults were

* Author to receive correspondence

counted on an upper leaf of one plant, on a middle leaf on the second plant and on a lower leaf on the third plant.

The data were analyzed by analysis of variance and mean separation was done by calculating the least significant difference at P = 0.05.

RESULTS AND DISCUSSION

No significant difference in CLCV infection was found after 62 days of planting (Table 1). Difference in infection was significant among varieties after 75, 82, 97, 104 and 114 days of planting. The highest infection was noted in the variety 228/19 after 75 days of planting. AC-134 and S-12 had no significant difference in percent plants infected, but both of these varieties had significantly lower infection than 228/19 and higher than all other varieties tested. Difference in percent-infected plants was non-significant among MNH-440, MNH-410 and MNH-295 and MNH-395, but these varieties had significantly higher infection than that in MNH-329 and MNH-93. MNH-329 and MNH-93 had significantly lower infection as compared to other varieties tested, whereas the difference between these two was non-significant.

After 82, 97, 104 and 114 days of planting, 228/19 had the highest infection and MNH-93 the lowest. S-12 ranked second highest and MNH-329 the second lowest in infection. AC-134 and MNH-440 had non-significant difference in infection and ranked third highest. MNH-410, MNH-295 and MNH-395 were non-significantly different in infection, but had significantly higher infection than that in MNH-329 and MNH-93 and lower than all other varieties tested.

Increase in percent CLCV infected plants was maximum between 62 and 75 DAP in all the varieties, except MNH-329 in which it was highest between 82 and 97 DAP. A small increase in infection was noted after 75 days of planting in most of the varieties. No increase in percent-infected plants was noted after 104 days in MNH-440, MNH-410, MNH-295 and MNH-395, whereas in MNH-93 there was no increase in infected plants after 97 days. In all the varieties, very little increase in infection was noticed after 82 days. It is clear that an increase in percent plants infected decreased with the age of the plants. Similar results have been reported in the past also[11].

To put these results in terms of host plant resistance terminology by keeping S-12 as standard, it can be concluded that MNH-93 was resistant, MNH-329 moderately resistant, 228/19 highly susceptible to CLCV and all other varieties were susceptible. These findings partially support the results of the previous workers[12, 13], who reported that MNH-93 was tolerant and S-12 susceptible.

Number of whitefly adults per leaf was not significantly different among varieties tested in any of the observation recorded throughout the study (Table2). Whitefly population was lower when recorded 82 DAP compared to that on other days. An increase in percent CLCV infected plants in different varieties ranged from 0.37 to 10.97 from 75 to 82 DAP. When whitefly population was higher on 104 DAP compared to that on all other days, the increase in CLCV infected plants was 0.49 to 6.88% from 82 to 104 DAP. This indicates that whitefly population has no appreciable effect on the increase of CLCV infection after 82 days after planting.

In spite of the fact that whitefly adult population per leaf was not significantly different among varieties, the percentage of CLCV infected plants was significantly different among varieties. This indicates that varieties tested have different response to CLCV, which is independent of the whitefly infestation or population. Based on the results, it is recommended that for the management of CLCV, resistant varieties should be planted and whitefly should be controlled at an early stage of the crop.

Table 1. Cumulative mean of Cotton Leaf Curl Virus infected plants of different cotton varieties at Multan, 1993.

Plants infected (%)*

Variety	Days after Planting					
	62	75	82	97	104	114
228/19	9.30	31.10a	37.68a	41.04a	44.56a	46.93a
S-12	5.10	21.00ab	24.79ab	28.34ab	30.26ab	31.30ab
AC-134	4.67	20.80ab	24.43b	24.97b	26.87b	27.50bc
MNH-440	4.98	17.33abc	19.93b	21.75b	23.72b	23.72bc
MNH-410	4.70	15.67abc	16.04bc	16.39bc	19.24bc	19.24cd
MNH-295	2.33	13.3abc	15.59bc	19.27bc	20.19bc	20.19cd
MNH-395	1.63	11.03abc	12.81bc	15.44bc	17.94bc	17.94cd
MNH-329	3.03	5.65c	5.73cd	9.28cd	9.93cd	9.93e
MNH-93	2.80	4.60c	4.68d	5.17d	5.17d	5.17e

* Means followed by the same letter in columns are not significantly different (LSD: P=0.05)

Table 2. Mean number of *Bemisia tabaci* adults on different varieties of cotton at Multan, 1993.

Bemisia tabaci* adults / leaf

Variety	Days after Planting				
	75	82	97	104	114
228/19	6.67	1.60	3.87	21.63	15.60
S-12	6.33	1.77	4.93	30.77	21.50
AC-134	8.67	2.10	7.90	27.00	18.13
MNH-440	9.67	2.47	10.23	43.17	18.20
MNH-410	8.33	1.57	4.30	34.77	14.87
MNH-295	6.67	2.80	8.70	23.60	24.57
MNH-395	8.33	1.53	6.07	22.97	15.80
MNH-329	8.00	2.10	8.17	31.80	24.83
MNH-93	8.23	0.93	4.23	27.53	21.23

* Means in columns are not significantly different (LSD: P = 0.05).

REFERENCES

1. C. O. Ferquharson, "A report of the Mycologist", Agri. Dept., Nigeria, 1912.
2. G. H. Jones and T. G. Mason, *Ann Bot.,* 1926, **160**, 722.
3. M. A. Bailey, Sudan *Empire Cotton Gr.* Rev.*,* 1934, **11**, 280.
4. T. Hussain, and M. Ali, *Pak. Cottons,* 1975, **19**, 71.
5. T.Hussain, and T. Mahmood, *Pak. Cottons,* 1988, **32**, 248.
6. Govt. of the Punjab, "Assessment of damage due to Cotton Leaf Curl Virus in the Punjab", Report, Govt. of the Punjab, 1992.
7. A. Saleemand, E. Haque, "A report on the study of Cotton Leaf Curl Virus in Sudan", 1992.
8. A. Coutear, P. L. Lefort and E. Kuakuvi, *Cotton et Fibre Trop.,* 1968, **23**, 506.
9. E. El-Nur, Report of Agri. Res. Div., Sudan, 1967.
10. F. D. Golding, Nigeria Empire Cotton Gr. Rev., 1930, **7**, 120.
11. C. J. Lewin, "Incidence of leaf curl of cotton in Southern Nigeria.", *6th Ann. Bull.*, Agri. Dept., Nigeria, 1927.
12. M.Ali, Z. Ahmed, T. Hussain and M. Tanveer, "Cotton Leaf Curl Virus situation in the Punjab", Hoechst Pak. Ltd., 1992.
13. A. Hussain, A. Saleem, W. S. Khan and A. H. Tariq, "Cotton Leaf Curl Virus: The problem, disease situation, research update and control." Directorate of Agric. Information, Lahore, 1991.