Search for Elite Sources of Resistance to Leaf Curl Virus in Upland Cotton (*Gossypium hirsutum* L.)

D. Singh, P. Rathore, R. Singh and K. Singh
Punjab Agricultural University (PAU), Regional Research Station, Faridkot 151203 (Punjab) India

ABSTRACT

Cotton leaf curl virus (CLCuV) is a serious disease of cotton in the state of Punjab, causing heavy losses in an epiphytotic year. During kharif season (May-November) 1997, 284 entries from different state and co-ordinated trials, and 592 germplasm lines/cultivars were screened against CLCuV at PAU, Regional Research Station, Faridkot and 72 entries at Regional Fruit Research Station, Abohar. Screening was carried out under natural epiphytotic conditions on a scale 1-4 scale (1-Resistant; 2-Moderately resistant; 3-Moderately susceptible; 4 Susceptible). One cultivar was resistant at both the locations. Twelve lines/cultivars were free of the disease and categorized as resistant at Faridkot. Four entries were moderately resistant at both locations. Sixty and four lines/cultivars were moderately resistant with 0.1-10.0 percent infection at Faridkot and Abohar, respectively.

Introduction

Cotton is an important crop in which India ranks first in the world in area and third in production. In Punjab, the area under cotton in 1995-96 was 750,000 hectares but since then, it has declined. The fall in area and production is due to an increase in the incidence of pests and diseases. Cotton is vulnerable to the attack of various diseases, cotton leaf curl virus (CLCuV) becoming an important disease in Punjab, causing a reduction in boll size and number and seed cotton yield (Singh et al, 1994). It is caused by Gemini Virus and was first reported by Farquarson in Nigeria on *G. barbadense* in 1912 (El Nur and Abu Salih, 1970). It has also been reported from Tanzania (Jones and Mason, 1926). It occurred in epidemic proportion in Pakistan in 1992-93 and 93-94, affecting 889,000 hectares (Mahbub Ali *et al.*, 1995). CLCuV was first noticed in India in 1989 at IARI, New Delhi on the germplasm collection of *G. barbadense* (Verma, 1990). In 1993, it was observed on *G. hirsutum* near Sriganganagar in Rajasthan (Ajmera, 1994) and in 1995-96, in areas of Punjab and Haryana, adjoining Sriganganagar (Chopra *et al.*, 1996). It appeared in serious form on almost all *G. hirsutum* cultivars in Punjab in 1997. This study was to screen germplasm lines/cultivars of cotton for resistance to the disease.

Materials and Methods

Field experiments on screening of cotton germplasm lines/cultivars against CLCuV under natural epiphytotic conditions were carried out during kharif season 1997 at PAU, Regional Research Station, Faridkot and Regional Fruit Research Station, Abohar. A total of 876 entries from different state and co-ordinated trials and germplasm lines were sown at Faridkot and 72 entries at Abohar in six metre rows at 67.5 cm between rows and 15 cms in row spacing. The disease was observed in the last week of June, 1997 and spread rapidly on all varieties. The rapid spread was aided by favourable climatic condition and plentiful virus inoculum on susceptible host plants. The percent disease infection was monitored from the appearance of the disease in June to October, 1997 at 15 days interval at both locations. The percent disease infection was calculated using the following formula:

$$\% \text{ disease infection} = \frac{\text{No. infected plants}}{\text{Total no. plants}} \times 100$$

Cultivars were graded on a 1-4 scale: 1: Resistant (no infection); 2: Moderately resistant (0.1-10.0 % infection); 3: Moderately susceptible (10.1-25.0 % infection) and 4: Susceptible (> 25.0 % infection).

Result and Discussion

One cultivar was resistant at both the locations. 12 germplasm lines/cultivars were free of infection and categorized as resistant at Faridkot and four entries were moderately resistant at both the locations. Sixty and four lines/cultivars were also moderately resistant with 0.1-10.0 percent infection at Faridkot and Abohar, respectively (Table 1). A number of lines were moderately susceptible to susceptible at both locations (Table 1). Ajmera (1996) reported that the cultivar RS 875 and hybrid LHH 144 were resistant to CLCuV. Chopra *et al.* (1996a) reported that hybrids LHH 144 and LHH 1028 were resistant and tolerant to CLCuV respectively. The results highlighted that the resistant germplasm lines/cultivars that were found resistant at both locations can be used in the breeding of adapted cultivars to increase cotton production.

References

Ajmera, B.D. (1994): Occurence of leaf curl virus on American Cotton (*G.hirsutum*) in

north-Rajasthan. Proc. National seminar- Cotton production challenges in 21st century at C.C.S. HAU., Hissar. Abstract p.86

Ali, M., Z. Ahmad, M. Tanveer and T. Mahmood. (1995): Cotton leaf curl virus (CLCuV) in the Punjab. Current situation and review of work. Report of central Cotton Research Institute, Multan, CLCuV Project.

Chopra, B.L, A.K. Dhawan and L.S. Randhawa. (1996): Present status of cotton leaf curl virus in Punjab and its management. Plant Dis. Res. 14:218

Chopra, B.L., L.S. Randhawa, Indu and B.S. Sandhu. (1996a): Comparative performance of indegenous and exotic hybrids for reaction to leaf curl virus. Plant Dis. Res.14:223

El Nur, E. and H.S. Abu Salih (1970): Cotton leafcurl. In: Cotton Growth in the Gezira Environment. M.A., Siddig and L.C. Hughes (Ed). The Agricultural Research Corporation, Wad Medani, Republic of Sudan. Pp. 196-206.

Jones, G.H. and T.G. Mason. (1926): Studies on two obscure disease of cotton. Ann. Bot., 160:759-72

Singh, J., A.S. Sohi, H.S. Mann and S.P. Kapur. (1994): Studies on Whitefly, Bemisia tabaci transmitted Cotton Leaf Curl disease. Punjab. J. Insect Sci. 2:194-197

Verma, A. (1990): Annual Progress Report (1989-90), Indian Agricultural Research Institute. New Delhi.

Table 1. Reaction of Cotton germplasm lines/ varieties against cotton leaf curl virus (CLCuV) at Faridkot and Abohar Punjab, India.

Reaction	PDI[1]	Germplasm lines/Cultivars			
			Faridkot		Abohar
Resistant	0	(12)	CNH 1012, CNH 120, RS 2060, RS 2059, RS 2013, LHH 144, LHH 144-R, LRA 5166, F 776, F 1488, F 1861, Kanchana	(1)	CNH 1012
Moderately resistant	0.1-10.0	(64)	LH 1896, LH 1903, LH 1911, RS 992, F 1694, Pusa 325, Pusa 1241, CA 1397, RS 2009, 12 ES, F 1424, CNH 120, LH 1899, Pusa 19-17, LHH 107 LHH 1028, LHH 10X43, PCHH 37, RajHH 23, RajHH 465, RajHH 459, CSHH 25, CNHH 109, CSHH 85, FHH 83, CNHH 112, Anjali, F 556, F 572, F 1607, F 1792, F 1808, F 1819, F 1827, F 1830, F 1831, F 1832, F 1835, F 1836, F 1838, F 1839, F 1855, F 1856, F 1857, F 1859, F 1866, F 1882, F 1884, LH 1556, LH 1770, LH 1896, LH 1951, LHH 308, LHH 323, LHH 325, LHH 809, LHH 934, LHH 1028, LHH 1028-R, LHH 1070, LHH 1125, SRT 1, Reba B 50, Supryia	(8)	Anjali, LH 1556, LH 1720, LH 1770, LH 1896, LH 1903, LH 1911, LH 1912
Mod. Sus.	10.1-25.0	(572)		(23)	
Susceptible	> 25.0	(228)		(40)	

[1] Per cent disease infection