

Screening of urdbean germplasm for the sources of resistance against urdbean leaf crinkle virus

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Abstract

Sixty seven urdbean [*Vigna mungo* (L.) Happer] germplasm lines, originating from various research organizations, were screened against natural infection of urdbean leaf crinkle virus in a field trial conducted at Pulses Research Institute, Faisalabad during kharif season 2006. Out of 30 test lines originating from Barani Agricultural Research Institute, Chakwal, none was found to be immune or resistant; however, two lines (3 CM-707 and CH-Mash 97) were found to be moderately resistant to urdbean leaf crinkle virus infection while all other test lines were moderately susceptible to susceptible. Similarly, out of 24 test lines originating from Pulses Research Institute Faisalabad, none was found to be immune or resistant; only one line (AARI M-32) displayed moderately resistant reaction while the remaining behaved as moderately susceptible to susceptible. Of the 13 lines originating from National Agriculture Research Centre, Islamabad, only one line (NCH-9-3) was moderately resistant while the rest were moderately susceptible to susceptible.

Keywords: *Vigna mungo* (L.) Happer, germplasm accessions, resistance, urdbean leaf crinkle virus.

Introduction

Black gram (*Vigna mungo* (L.) Happer) also known as mashbean or urdbean is an ancient and important pulse crop of Pakistan. It is cultivated on an area of about 34.5 thousand hectares annually with a production of 16.5 thousand tones of grain. The average yield of 488 kg/ha is obviously very low (Anon., 2006). Diseases are among the most important factors limiting its yield. Leaf crinkle disease caused by urdbean leaf crinkle virus is a very serious disease of urdbean and is widely distributed in Pakistan (Bashir and Zubair, 1985; Ilyas *et al.*, 1992a). The disease was first reported from India (Williams *et al.*, 1968). The disease causes stunting of plants and crinkling of leaves (Kolte and Nene, 1973). The crinkling is observed on some branches while others remain apparently healthy (Brar and Rataul, 1986). The disease affects both the vegetative growth and yield components of urdbean plants (Beniwal and Chaubey, 1979; Kadian, 1982; Kolte and Nene, 1973 and Ilyas *et al.*, 1992a). The ULCV has been reported to be transmitted by several species of aphids such as *Aphis crassivora*, *Aphis myzus persicae* insects like *Acyrtosiphon pisum* and *Henosepilachna dodecastigma* Wied (Bardwaj and Dubey, 1986, Beniwal and Bharathan, 1980; Dhingra, 1976; Brar and Rataul, 1987; Dhingra and Chenula, 1981) and also by whitefly (*Bemisia tabaci*) (Narayanasamy and Jaganathan, 1973). The virus

is also transmitted through sap inoculation, grafting and seed (Bashir *et al.*, 2005). Since the cheapest way of controlling plant diseases is the use of resistant cultivars, this paper reports the results of screening of urdbean germplasm originating from three research organizations against natural infection by urdbean leaf crinkle virus.

Materials and Methods

Sixty seven germplasm lines of urdbean originating from three research institutes were screened for the sources of resistance against natural infection of urdbean leaf crinkle virus in a field disease screening nursery sown at Pulses Research Institute, Faisalabad during kharif season of 2006. Out of 67 test urdbean lines, 30 entries belonged to Barani Agriculture Research Institute Chakwal, 24 belonged to Pulses Research Institute, Faisalabad and 13 belonged to National Agricultural Research Centre, Islamabad. Each entry was planted in single row subplot with row length 3 meter, row spacing 30 cm and plant to plant spacing 10 cm. A row of a susceptible local check of urdbean was planted after every two test lines. The nursery was subjected to natural invasion and build up of population of aphid species and whiteflies, the vector of urdbean leaf crinkle virus and consequently to infection of urdbean plants by

the virus. The disease incidence of each of the test lines was assessed by following disease rating scale of 0-5 grades and consequently level of resistance/susceptibility of test lines was determined.

Grade	Percent infection	Response
0	Zero percent infection and all plants free of symptoms	Highly Resistant (HR)
1	1-5 percent plants infected with ULCV	Resistant (R)
2	5-10 percent plants infected with ULCV	Moderately Resistant (MR)
3	10-20 percent plants infected with ULCV	Moderately susceptible (MS)
4	20-40 percent plants infected with ULCV	Susceptible (S)
5	More than 40 percent plants infected with ULCV	Highly susceptible (HS)

Results and Discussion

Depending upon their genetic make up each of 67 test lines of urdbean responded differently to urdbean leaf crinkle virus. Out of 30 lines originating from BARI chakwal, none was found immune or resistant; however, two test lines i.e. 3CM -707 and CH-Mash 97 were found to be moderately resistant to urdbean leaf crinkle virus infection. Twenty four test lines responded moderately susceptible reaction while four lines such as 4CM-718, 4 CM-719,90 CM048 and 95 CM-508 responded susceptible reaction. Similarly, out of 24 lines originating from PRI, Faisalabad, none was found to be immune or resistant, only one line i.e. AARI M-32 displayed moderately resistant reaction to

urdbean leaf crinkle virus infection. Eight test lines such as AARI M-4, AARI M-5, AARI M-176, AARI M-256, 6026-5, ES-1, Mash-97 and NCH-9-5 displayed moderately susceptible reaction while fifteen test lines such as AARIM-130, AARIM-164, AARIM-174, AARIM-191, AARIM-220, 6036-7, 6036-22, 6039-1, 62027, 6049-7-1, 6049-I, 6049-II, 62006, 62027 and 95019 exhibited susceptible reaction. Only one line (93CM-006) displayed highly susceptible reaction. Again out of 13 lines originating from NARC, Islamabad none was found immune or resistant, only one line i.e. NCH-9-3 responded moderately resistant reaction. Ten lines such as NCH-1-2, NCH-10-1, NCH-9-2, NCH-3-3 NCH -3-4, Mash-1, Mash -3, Mash -95009 and Mash -95017 exhibited moderately susceptible response while two lines such as nsh-9-7 (NCH7-5) and Chakwal Mash displayed susceptible reaction.

The overall situation of the urdbean germplasm screening/evaluation against natural infection of ULCV revealed that out of 67 lines none of the test line from the three research organizations was found to be immune or resistant to urdbean leaf crinkle virus disease. However, two lines originating from BARI, Chakwal and one test line each from PRI, Faisalabad and NARC, Islamabad exhibited moderately susceptible reaction. Thus the screening of urdbean germplasm revealed that immunity/resistance against ULCV disease is scarce in the germplasm. Such scarcity of resistance has earlier been reported (Iqbal *et al.*, 1991; Ilyas *et al.*, 1992b, Ilyas, 1999; Bashir and Zubair, 2002; Basher *et al.*, 2005). This scarcity of resistance in urdbean against ULCV disease calls for introduction of resistance foreign lines/cultivars from foreign international sources and breeding their resistant into the existing commercial cultivars through conventional breeding procedures or development of resistant sources through mutation breeding using radiation or chemical mutagens.

Table 1: Level of Resistance/Susceptible of Various Urdbean Germplasm lines Against urdbean CrinkleVirus Infection

Rating in scale 0-5	Response/Reaction against ULCV infection	Sources of Germplasm		
		BARI Chakwal	PRI, Faisalabad	NARC, Islamabad
0	Highly Resistant	-	-	-
1	Resistant	-	-	-
2	Moderately Resistant	3 CM-707, CH-Mash-97	AARI M-32	NCH-9-3
3	Moderately Susceptible	1CM-710, 2 CM -703, 2 CM -710, 2 CM -724, 3 CM -702, 3 CM -703, 3 CM -704, 3 CM -705, 3 CM -706, 3 CM -708, 4 CM -715, 4 CM -716, 4 CM -717, 4 CM -720, 4 CM -721, CH-Mash, 90 CM -015, 90 CM -056, 94- CM -019, 96 CM -016, 97 CM -518, 99 CM -001, 99 CM -011, and AARI M-4.	AARI M-4, AARI M-5, AARI M-176, AARI M-256, 6026-5, ES-1, Mash-97 and NCH-9-5.	NCH-1-2, NCH-7-2, NCH-10-1, NCH-9-2, NCH-3-3, NCH-3-4, Mash-1, Mash-3, Mash-95009 and Mash-95017.
4	Susceptible	4 CM -718, 4 CM -719, 90 CM -048, 95 CM -508	AARI M-130, AARI M-164, AARI M-174, AARI M-191, AARI M-220, 6036-7, 6036-22, 6039-1, 62027, 6049-7-1, 6049-1, 6049-II, 62006, 62027, 95019.	NCH-9-7 and Chakwal Mash
5	Highly Susceptible	-	93 CM -006 Local susceptible check	-

References

- Anonymous, 2006. Agricultural Statistics of Pakistan. Ministry of Food, Agricultural and Livestock. Govt. of Pakistan. Food and Agri. Division. Planning Unit Islamabad.
- Bashir M, Zubair M, 1985. Survey of kharif pulses in Islamabad, Rawalpindi and Sialkot Distt. PARC, Islamabad, Pulses Programme Survey Report 2002, pp-15.
- Bashir M, Zubair M, 2002. Identification of resistance in urdbean (*Vigna mungo*) against two different viral diseases. *Pak. J. Bot.*, **34**: 49-51.
- Bashir M, Ahmad Z, Ghafoor A, 2005. Source of genetic resistance in mung bean and blackgram against urdbean leaf crinkle virus (ULCV) *Pak. J. Bot.*, **37**: 47-51
- Beniwal SPS, Chaubey SN, 1979. Urdbean leaf crinkle virus: Effect on yield contributing factors, total yield and seed characters of urdbean (*Vigna mungo*). *Seed Res.* **7**: 125-181.
- Beniwal SPS, Bharathan N, 1980. Beetle transmission of urdbean leaf crinkle virus. *Indian Phytopath.*, **33**: 600-601
- Bhardwaj SV, Dubey GS, 1986. Studies on the relationship of urdbean leaf crinkle virus and its vectors *Aphis crassivora* and *Acerthosiphon pisum*. *J. Phytopathol.*, **15**: 83-88.
- Brar JS, Rataul HS, 1986. Some field characteristics of leaf crinkle virus of urdbean, *Vigna mungo* (L) Happer, *Indian J. Virology*, **2**: 49-56.

- Brar JS, Rataul HS, 1987. Evidence against the transmission of urdbean leaf crinkle virus (ULCV) in mash, *Vigna mungo* (L.) through insects- a field approach. *Indian J. Ent.*, **49**: 57-63.
- Dhingra KL, 1976. Transmission of urdbean leaf crinkle virus by two aphid species. *Indian Phytopath.*, **28**(1): 80-82.
- Dhingra KL, Chenula VV, 1981. Studies on the transmission of urdbean leaf crinkle and chickpea leaf reduction viruses by *Aphis crassivora* Koch. *Indian Phytopath.*, **34**: 38-42.
- Ilyas MB, Haq MA, Iftikhar K, 1992a. Studies on the responses of growth components of urdbean against leaf crinkle virus. *Pakphyton* (4): 51-56.
- Ilyas MB, Haq MA, Iftikhar K, 1992b. Screening of urdbean germplasm for the sources of resistance against yellow mosaic virus and leaf crinkle virus. *Pak. J. Agri. Sci.*, **29**: 144-147.
- Ilyas MB, 1999. Production constraints of pulses in Pakistan. Proc. 2nd Nat. Con. Pl. Path., Sept., 27-29, 1999. Univ. of Agric., Faisalabad. Pp. 36-40.
- Iqbal SM, Ghafoor A, Zubair M, Malik BA, 1991. Reaction of urdbean cultivars against leaf crinkle virus disease. *J. Agri. Sci.*, **58**: 123-124.
- Kadian OP, 1982. Yield loss in mungobean and urdbean due to leaf crinkle disease. *Indian Phytopath.*, **35**: 642-644.
- Kolte SJ, Nene YL, 1973. Studies on the symptoms and mode of transmission of leaf crinkle virus of urdbean (*Phaseolus mungo*) *Indian Phytopath.*, **25**: 401-404.
- Narayanasamy P, Jaganathan T, 1973. Vector transmission of black gram leaf crinkle virus. *Madras Agri. J.*, **60**: 651-652.
- William FJ, Grewal JS, Amin KS, 1968. Serious and new diseases of pulses crop in India in 1966 *Plant Dis. Rept.* **52**: 300-304.