INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2002/04–4–488–490
http://www.ijab.org

Sources of Resistance in Chickpea Against *Ascochyta* Blight Disease

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ABSTRACT

In order to identify sources of genetic resistance against chickpea blight caused by *Ascochyta rabiei* Pass. (Lab.), 356 chickpea germplasm accessions of different origins were evaluated under greenhouse conditions. None of the genotypes was found highly resistant. However, seven genotypes (FLIP94-90C, FLIP95-68C, FLIP95-47C, FLIP97-132C, FLIP97-227C, FLIP98-224C and FLIP98-231C) were resistant and 75 were moderately resistant. These genotypes are additional sources of resistance to be used in hybridization programme to develop chickpea resistant cultivars.

Key Words: Chickpea; Germplasm; Blight; Seedling

INTRODUCTION

Chickpea is an important grain legume crop sown under rainfed conditions in Pakistan. It is a rich and cheap source of vegetable protein for human nutrition (Hulse, 1991). Average yield of chickpea in Pakistan is very low, almost half of the world and Asia (Malik, 1984). Although, a number of factors contribute for low chickpea production, but blight disease caused by *Ascochyta rabiei* (Pass.) Lab. is the major cause when weather conditions become conducive. Blight has been reported to cause 50-70% crop losses (Malik & Tufail, 1984). Disease epidemics in Pakistan as well as in different parts of the world have been reported (Kausar, 1965; Radulescu *et al*., 1971; Kaiser, 1973).

Although, chickpea blight disease can be controlled by the application of foliar and seed dressing fungicides (Bashir & Ilyas, 1983; Rauf *et al*., 1996), use of disease free seeds and field sanitation, but when weather conditions are favoured for spread of the disease. Under such situation, resistant sources against blight disease are the cheapest and the most effective strategy for its control. Therefore, identification and use of resistant sources must be important component of genetic improvement programme. Previously a number of chickpea resistant lines/ cultivars have been identified against *Ascochyta* blight at national and international levels (Haq *et al*., 1981; Hawtin & Singh, 1984; Nene & Reddy, 1987; Iqbal *et al*., 1989, 1994). Since the host plant resistance is not stable due to emergence of new pathotypes of *A.rabiei*, therefore, identification of resistant sources against the prevalent pathotypes/isolates should be considered. The present study was conducted to identify the new sources of resistance to develop blight resistant chickpea cultivars.

MATERIALS AND METHODS

Three hundred and fifty six chickpea germplasm accessions of local and exotic origin were included in this study (Table I). Seeds of all the accessions were surface sterilized with Clorox solution (0.1% available chlorine) for 2 minutes and sown in disposable pots (7.5 x 15 cm) filled with sterilized soil and sand mixture (2: 1). Each pot contained five chickpea seedlings. A blight susceptible chickpea variety, C 727 was included as control for comparison and spread of the disease. Pots were kept under greenhouse at 20±2ºC in natural light for 15 days before inoculation. Pots were watered from the top prior to inoculation. Two week old seedlings were inoculated by spraying aqueous spore suspension having a concentration of 5 x 10^5 spores/mL. The inoculum was prepared from 15 days old culture of *A. rabiei* multiplied on chickpea grains according to the procedure of Ilyas and Khan (1986). The inoculated seedlings were

Table I. Sources of germplasm accessions screened against blight

Centre/ Institute	Number of Accessions
International Centre for Agricultural Research in the Dry Areas (ICARDA), Syria	40
Ayub Agriculture Research Institute (AARI), Faisalabad, Pakistan	89
Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad, Pakistan	76
Nuclear Institute for Food & Agriculture (NIFA), Peshawar, Pakistan	76
Arid zone Agricultural Research Institute (AZRI), Bhakhar, Pakistan	75
Total	356

incubated in humid chamber 20 ± 2^0C for 72 h in the greenhouse, and were continuously sprayed with water. Disease observations were taken when susceptible check lines were completely killed. Disease scoring was recorded on 1-9 disease rating scale (Singh *et al*., 1981).

RESULTS AND DISCUSSION

The results of the present study revealed a considerable variation towards disease reaction among chickpea genotypes (Table II). Mainly three types of disease response i.e., resistant, tolerant (moderately resistant) and susceptible were noticed in these genotypes. It was observed that none of the 356 genotypes was highly resistant, whereas seven genotypes (FLIP94-90C, FLIP95-68C, FLIP95-47C, FLIP97-132C, FLIP97-227C, FLIP98-224C and FLIP98-231C) were resistant and 75 were moderately resistant (Tables II & III). Most of the resistant genotypes were of indigenous origin and developed through breeding. The number of resistant and moderately resistant genotypes was higher that might be due to use of resistant material in the study obtained from national and international sources.

It was observed from the present study that *Ascochyta* blight at seedling stage caused high level of infection, thus it is suggested that large number of germplasm lines may be screened at seedling stage under greenhouse conditions to save time and labour. The genotypes those exhibit a considerable level of resistance are suggested to be screened at reproductive stage to confirm resistance at this stage. This would save the resources which are required to create high humidity (90%) during the months of January and February in the field. It has been estimated that for screening experiments under field conditions at least two weeks of continuous 90% RH are necessary for uniform spread of the disease, which sometimes become difficult under dry weather conditions. None of the genotypes was highly resistant which indicated the conducive environmental conditions for disease during screening. Seven chickpea germplasm lines were resistant and seventy five were moderately resistant under greenhouse conditions. The genotypes found with resistance and moderately resistance would be tested to confirm their resistance at reproductive stage. At ICARDA several sources of resistance to *Ascochyta* blight have been reported (Reddy & Singh, 1984; Singh *et al*., 1984). Some of these lines i.e., ILC-72 and ILC-3279 showed resistance in several countries. However, none was resistant in India and Pakistan, the two major chickpea growing countries. This indicated that the fungus *A. rabiei* is highly variable and the pathotypes present in Pakistan and India are more aggressive than those prevalent in the Mediterranean region (Singh *et al*., 1984).

The frequency of highly resistant lines is generally very low. Only seven lines were found resistant during this screening, whereas none of the lines was found highly resistant. This indicates the high aggressiveness or relatively narrow diversification of genetic materials studied. Bashir *et al.* (1985) evaluated 3360 chickpea germplasm accessions obtained from ICRISAT for disease reaction to blight at NARC, Islamabad during 1983-84, and reported that only 55 accessions were resistant. Iqbal *et al.* (1989) screened 759 chickpea lines and found that only one breeding line (PK51863 x NEC 138-2) was resistant to blight. Many workers have reported the occurrence of moderate resistance to blight (Katiyar & Sood, 1985; Bashir *et al.*, 1985; Guar & Singh, 1987; Del-Serrone *et al.*, 1987; Reddy & Singh, 1990; Ilyas *et al*., 1991; Reddy & Singh, 1993).

Table II. Distribution of chickpea genotypes in various disease reaction groups

Sources	Response of chickpea genotypes to blight			
	HR (1)	R (2-3)	MR (4-5)	S & HS (6-9)
International Centre for Agricultural Research in the Dry Areas (ICARDA)	0	0	7	33
Ayub Agriculture Research Institute (AARI)	0	3	30	56
Nuclear Institute for Agriculture and Biology (NIAB)	0	1	11	64
Nuclear Institute for Food & Agriculture (NIFA),	0	2	8	66
Arid zone Agricultural Research Institute (AZRI)	0	1	19	55
Total	0	7	75	274

Table III. Chickpea germplasm lines resistant/ moderately resistant to blight

Sources	HR (1)	R (2-3)	MR (4-5)
ICARDA	-	-	FLIP94-90C, FLIP95-68C, FLIP95-47C, FLIP97-132C, FLIP97-227C, FLIP98-224C, FLIP98-231C,
AARI	-	2001004, 2001039, 2001074	20011002, 20011005, 20011006, 20011012, 20011014, 20011018, 20011028, 20011029, 20011034, 20011036, 20011037, 20011038, 20011041, 20011042, 20011043, 20011044, 20011045, 20011058, 20011059, 20011060, 20011062, 20011064, 20011066, 20011069, 20011070, 20011072, 20011081, 20011082, 20011085, 20011086
NIAB	-	001158	001105, 001106, 001120, 001132, 001142, 001144, 001149, 001152, 001155, 001174, 001175
NIFA	-	017, 041	025, 033, 039, 048, 050, 057, 063, 067,
AZRI	-	NCS98K4	PC-2000, Bittle-98, 96A4599, 92A276, 93A095, 96A3774, 92A295, 92A373, 92A117, 93A082, 92A376, 91A120, 93A048, 98A013, 96A3148, 91A39, NCS950261, FLIP87-59C

Although, a number of chickpea lines have been reported as resistant to blight, but the present study reports some additional sources of resistance to be used in breeding programme.

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(Received 04 May 2002; Accepted 20 August 2002)