SCREENING OF GROUNDNUT GENOTYPES FOR LEAF SPOTS AND RUST RESISTANCE

M. D. HOSSAIN[1], M. Z. RAHMAN[2*], ABEDA KHATUN[2] and M. M. RAHMAN[3]

[1]Principal Scientific Officer, [2]Senior Scientific Officer, Oilseed Research Center, Bangladesh Agriculture Research Institute (BARI), [3]Scientific Officer, Plant Pathology Division, BARI, Joydebpur, Gazipur-1701, Bangladesh.

[*]Corresponding Author: E-mail: mzrahman66@yahoo.com

Accepted for publication: 25 December, 2006.

ABSTRACT

Hossain, M. D., Rahman, M. Z., Abeda Khatun and Rahman, M. M. 2007. *Screening of Groundnut Genotypes for Leaf Spots and Rust Resistance*. Int. J. Sustain. Crop Prod. 2(1): 07-10.

A total of 25 groundnut genotypes were evaluated during 2000-01, 2001-02 and 2002-2003 against leaf spot and rust diseases to select resistant sources. The genotypes were scored at 0-5 scale one week before harvest against both the diseases. The genotypes namely; 259/88 and 262/88 were found moderately resistant to both leaf spot and rust diseases. It was noted that genotype 269/89 was moderately resistant against leaf spot disease only and M-5 and 255/88 were moderately resistant to rust only. Leaf spots and rust moderately resistant genotypes had lower percentage defoliation.

Key words: Groundnut, leaf spot, rust and resistance

INTRODUCTION

Leaf spots caused by *Cercospora arachidicola*, Hori, *Phaseoisariopsis personata* (Berk & curt) V. Arx. and rust by *Puccinia arachidis* Speg. are the most important fungal diseases affecting groundnut production in Bangladesh (Fakir 1980) as well as where ever it is grown of the world (Bromfield 1974; Hammons 1977 and McDonald *et al.* 1985). These diseases damage the plant by reducing the leaf area available for photosynthesis and by stimulating leaflet abscission leading to heavy defoliation (McDonald *et al.* 1985). Both diseases occur together and cause yield loss as high as 70% (Subrahmanyam *et al.* 1984). Although the foliar diseases can be controlled by spraying certain fungicides (Smith and Littrell 1980) but they are costly and not readily available to the small scale farmers of the semiarid tropics (Gibbons 1980). Among different approaches of disease management, growing of resistant variety is the best environment friendly means of reducing yield loss from these diseases (Gibbons 1980 and Subrahmanyam *et al.* 1995). Therefore, it is important to identify sources of resistance that can be used to evolve resistant variety. The study was undertaken to screen some genotypes of groundnut to locate sources of resistant for both diseases.

MATERIALS AND METHODS

Field trials were conducted in disease screening nursery with 25 genotypes during rabi 2000-2001 and 2001-02 respectively, at Bangladesh Agricultural Research Institute (BARI) Joydebpur, Gazipur and during 2001-2003 seasons at Regional Agricultural Research station (RARS), Ishurdi, Pabna, Bangladesh following the screening method described by Subrahmanyam *et al.* (1995). Among those which showed moderately resistant to leaf spots and rust diseases were included in the third year screening. Susceptible cultivar Dhaka-1 was used as check on both sides of every test materials to spread diseases to the test plots. Vitavax 200 (2g/kg kernel) treated seeds were sown in field rows 4 cm long and 40 cm apart with 3 replications. A spacing of 15 cm between plants within a row was maintained. To enhance disease development previously collected leaves of groundnut were also scattered in the experimental plots. Fertilizers were applied at the rate of 25, 160, 85, 300 and 10 kg/ha of urea, triple super phosphate (TSP), murate of potash (MP), gypsum and boric acid respectively (Mondal and Wahhab 2001). Intercultural operations were done as and when needed.

Response of genotypes on disease severity of leaf spots and rust were recorded one week before harvest the crop using 0-5 (Mehta and Mandal 1978) scale (0=no disease and 5= 75-100% leaf area covered by leaf spots and rust diseases). Ten randomly selected plants were counted for percentage defoliation, 100-pod weight, pod size and kernel color.

RESULTS AND DISCUSSION

Leaf spot

None of the genotypes showed resistant to leaf spots. At Joydebpur seven genotypes namely, M-9, NCAC-17090, 255/88, 259/88, 262/88, 264/89 and 269/89 showed moderately resistant reaction against leaf spot disease. But, at RARS, Ishurdi only three genotypes namely, 259/88, 262/88 and 269/89 were found moderately resistant during 2001-2002. Therefore, the genotypes 259/88, 262/88 and 269/89 showed stability in resistance against leaf spot in both locations. Many sources of resistance of groundnut against leaf spots have been identified and reported by many workers (Mehta and Mandal 1978). Considerable variations were noted among genotypes with respect to leaf spot disease reaction in between locations. Genotypes M-9, NCAC-7090, 255/88 and 264/89 were found moderately resistant reaction at Joydebpur (2000-2001) while they exhibited moderately

© 2006 Green World Foundation (GWF)

susceptible in both seasons at Ishurdi locations. The susceptible reactions of these genotypes indicate the pathogenic variability in the parasite. More or less similar observations have been suggested by Paningbatan (1980) who reported that variations in virulence exits among isolates of leaf spots. Remaining 22 genotypes were found moderately susceptible to susceptible against leaf spot at Ishurdi. The genotypes showing moderate reaction may be evaluated for yield performance and earliness before release as variety.

Rust

Variation among the genotypes in response to rust disease became evident in both the locations. The genotypes namely, M-9, NCAC-17090, 255/88, 259/88 and 262/88 showed moderately resistant against rust disease at Joydebpur (Table 1). While at Ishurdi in 2001-2003, all above genotypes except M-9 showed moderately resistant reaction against the disease (Table 2 and 3). So genotypes, M-5, NCAC-17090, 255/88, 259/88 and 262/88 showed stability in resistance in rust disease in both locations. At ICRISAT several sources of rust resistance of groundnut genotypes were identified (Subrahmanyam and Mcdonald 1986; Subrahmanyam *et al.* 1986 and Subrahmanyam *et al.* 1982). Subrahmanyam *et al.* 1983 reported that rust resistance is stable over separated locations. Rest of the genotypes showed moderately susceptible to susceptible reactions. The breeders may evaluate moderately resistant genotypes for yield potential before placing National Seed Board for releasing as variety.

Table 1. Reaction of groundnut genotypes to leaf spots and rust diseases during 2000-2001 at Joydebpur location.

Genotype	Disease score (0-5)		Reaction to	
	Leaf spots	Rust	Leaf spots	Rust
M-9, NCAC-17090, 255/88, 259/88, 262/88	2.0	1.1-2.0	MR	MR
264/89, 269/89	2.0	2.1-3.0	MR	MS
M-56,M57, NCAC-2142, SAMARLA, 247/88, 257/88, 266/88, 272/89 Chibahandati	2.1	3.0	MS	MS
M-53, NCAC-827, Black seed, 246/88,250/88, 260/88, 265/89, 268/89	3.0	4.0	MS	S
M-5	3.1	1.2	MS	MR
Dhaka-1 (check)	4.1	5.0	HS	HS

MR= Moderately resistant, MS= Moderately susceptible, S= Susceptible, HS= Highly susceptible.

Table 2. Reaction of groundnut genotypes to leaf spots and rust diseases during (2001-2002) at RARS, Ishurdi.

Genotype	Disease score(0-5)		Reaction to	
	Leaf spots	Rust	Leaf spots	Rust
259/88, 262/88	2.0	2.0	MR	MR
255/88, M-5, NCAC-17090	3.0	2.0	MS	MR
269/89	2.0	3.0	MR	MS
M-9, M-59, M-57, 247/88 260/88, 246/89, 272/89 NCAC-2142, Samarala	3.0	3.0	MS	MS
257/88, 266/88	3.0	4.0	MS	S
NCAC-827, 246/88, 250/88 265/89, 268/89, Black seed, Chibahandati, M-53	4.0	4.0	S	S
Dhaka-1 (check)	5.0	5.0	HS	HS

MR =Moderately resistant, MS= Moderately susceptible, S= Susceptible, HS =Highly susceptible.

Seed weight

The highest (150g) 100 pod weight was recorded from the moderately resistant genotype 259/88 which was statistically similar with genotypes 255/88 and NCAC –17090 (Table 3). This might be due to large to medium pod size of the genotypes. Although one genotype (262/88) showed moderately resistant reaction to both diseases but it produced lowest (103.33 g) 100-pod weight. This might be due to small pod size of this genotype.

Kernel color

The leaf spot moderately resistant genotypes kernel color was brown, whereas, moderately rust resistant genotypes were of purple color (Table 3). Similar result was also reported by Subrahmanyam *et al.* 1983 and Subrahmanyam and McDonald 1982.

Defoliation (%)

The percent defoliation in groundnut genotypes varied 7.33% to 18.66% (Table 3). In general, moderately resistant genotypes against both diseases had lower percentage defoliation compared to genotypes showing moderately resistant reaction to single disease. Genotypes 259/88 and 262/88 that showed moderately resistant reaction to both diseases resulted lower defoliation. These two genotypes also gave statistically similar defoliation with genotypes M-5 and NCAC-17090 (Table 3). Genotype 269/88 showed the highest (18.66%) defoliation that was statistically similar with genotypes M-5 and 255/88.

Table 3. Reaction of selected groundnut genotypes against leaf spots and rust diseases of during 2002-2003 at RARS, Ishardi.

Genotype	Reaction to		Defoliation (%)	100 pod wt. (g)	*pot size	Kernel color
	Leaf spots	Rust				
259/88	MR	MR	7.33c	150.0 a	Large	Brown
262/88	MR	MR	8.00c	103.3 bc	Small	Brown
269/89	MR	MS	18.66a	116.7 bc	Small	Brown
NCAC-17090	MS	MR	10.00c	126.7abc	Medium	Purple
M-5	MS	MR	12.33abc	116.7 bc	Small	Purple
255/88	MS	MR	15.66ab	140.0 ab	Large	Purple
LSD (0.01%)	-	-	6.6	23.9	-	-

Small= up to 2.0 cm, Medium = 2.0- 2.5 cm, Large= above 2.5 cm

This study revealed that the both leaf spot and rust moderately resistant groundnut genotypes had lower percentage defoliation. It might be due to failure of fungi to successfully invade the host tissues in all infection sites, resulting low infection frequency. This low percentage of leaf damage resulted low percentage defoliation.

It may be concluded that genotypes 259/88 and 262/88 are good sources of resistance for both leaf spots and rust and may be used for developing new varieties.

REFERENCES

Bromfield, K. B. 1974. Current distribution of rust groundnut and known sources of resistance. FAO Plant Prot. Bull., 22: 29-31.

Fakir, G. A., 1980. An annotated list of seed borne diseases in Bangladesh. Agricultural Information Service. Ministry of Agriculture and Forest, Bangladesh, pp. 17.

Gibbons, R. W. 1980. Groundnut improvement, research technology for the semi-aried tropics. In: Proc. Int. Symp. Development Transfer of Technology for Rainfed Agriculture and the SAT farmer 28 August-September, 1979. ICRISAT, Panthancheru, Andra Pradesh, India, 27-37pp.

Hammons, R. O. 1977. Groundnut rust in the United Sates and the Caribbean. PANS 23: 300-304.

Mehta, P. P. and Mandal, K. K. 1978. Field Screening of groundnut cultivars against tikka and rust. Indian Phytoppath. 31: 250-260.

Mondal, M. R. I. and Wahhab. 2001. Production technology of oil crops. Oilseed Research Center, Bangladesh Agricultural Research Institute, Gazipur. p. 42.

Mcdonald, D., Subrahmanyan, P., Gibbon, R. W. and Smith, D. H. 1985. Early and late leaf spots of groundnut Information Bulletion no, 21. ICRISAT, Panthancheru, Andra Pradesh, 502324, India, 24 pp.

Smith, D. B. and Littrell, R. H. 1980. Management of peanut foliar diseases with fungicides. Plant disease 64: 356-361.

Subrahmanyam, P., Williams, J. H., McDonald, D. and Gibbons, R. W. 1984. The Influence of foliar diseases and their control by selective fungicides on a range of Groundnut (Arachis hypogaea L.) genotypes. Annals of Applied Biology. 104: 467-476.

Subrahmanyam, P. and Mcdonald, D. 1982. Groundnut rust its survival and carry over in India. Proceedings of the Indian Academy of Sciences (plant science). 91: 93-100.

Subrahmanyam, P. and Mcdonald, D. 1986. Diseases of rabi groundnut in India. ICRISAT, India. 23p.

Subrahmanyam, P., McDonald, D., Waliyar, F., Reddy, L. J., Nigam, S. N., Gibbons, R. W., Ramanatha Rao, V., Singh, A. K., Pande, S., Reddy, P. M., and Subba Rao, P. V. 1995. Screening methods and sources of resistance to rust and late leaf spot of groundnut. Information Bulletin no. 47. ICRISAT, Patancheru 502 324, Andhra Pradesh, India. 1-20 pp.

Subrahmanyam, P., McDonald, D., Gibbons, R. W., Nigam, S. N., and Nevill, D. J. 1982. Resistance to rust and late leaf spot disease in some genotypes of Arachis hypogaea. Peanut Science. 9:6-10.

Subrahmanyam, P., Hammons, R. O., Nigam, S. N., McDonald, D., Gibbons. R. W., Fan, M. Y. and Yeh, W. L. 1983. International Cooperative screening for resistance of peanut to rust and late leaf spot. Plant Disease. 67:1108-1111.

Paningbatan, A. 1980. Culture, morphology and pathogenic variation of Cercospora species causing leafspots of peanut (Arachis hypogaea L.). Thesis M.S. UPLB, College, Laguna.