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Screening of Groundnut Cultivars against Collar Rot (*Aspergillus niger* Van Tiegham)

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A B S T R A C T

Groundnut (*Arachis hypogaea* L.) is a member of sub-family, Papilionaceae of the family Leguminosae. Groundnut is also known as peanut, mungphalli, china badam and wonder badam. *Arachis hypogaea* mainly two type Virginia (spreading) and Spanish (bunch). The Virginia group does not produce flowers on the central branch, only on the lateral branches. The seeds show some dormancy and the crop is relatively late maturing (130–170 days). Collar rot (*Aspergillus niger* Van Tiegham) of groundnut caused by *Aspergillus niger* has become severe and wide spread in many districts of Rajasthan state resulting in huge economic losses. An experiment was conducted during *kharif* seasons of 2018 to 2019 to find out some resistance sources against collar rot disease of groundnut in sick plot condition at Agricultural Research Station, Bikaner. Evaluation of forty genotypes /varieties of groundnut were revealed that none of the entries was found free or resistance from the disease. However, five genotypes /varieties were found moderately resistant (< 20%) against collar rot disease. These were Girnor-3, HNG-69, TG-37, ICMS-6 and ICMS-28. Twenty-five genotypes/varieties were found tolerant (20-40%) against collar rot disease. These were GG-21, GG-16, RG-559, HPS-1, CSMG-2003, Malika, K-7, K-9, HNG-123, ICMS-117, HNG-123, K-4, K-6, ISL-16, ICMS-149, ICMS-142, ICMS-4, ICMS-79, ICMS-13, ICMS-26, ICMS-83, ICMS-114, ICMS-100, ICMS-32 and ICMS-101.

Introduction

Groundnut (*Arachis hypogaea* L.) is a member of sub-family, Papilionaceae of the family Leguminosae. Groundnut is also known as peanut, mungphalli, china badam and wonder badam. It is commonly called the poor man's nut. The botanical name for groundnut, *Arachis hypogaea* L. is derived from two Greek words, Arachis meaning a legume and hypogaea meaning below ground, referring to the formation of pods in the soil. *Arachis hypogaea* mainly two type Virginia (spreading) and Spanish (bunch). Groundnut is also of value as a rotation crop. India has second position in production after China.

The area under groundnut cultivation in India was about 5.3 million hectares with the total production of 9.18 million tonnes and an average yield of 1580 ka/ha during the year 2018-19 (Anonymous, 2019). Amoung oil seed crops, in India groundnut rank first position (36%) followed by soybean (28%) and rapeseed mustard (23%). It is known as king of oilseed due to 35.99 % production of total oilseed. Groundnut cultivated area in Rajasthan was 73,4556 hac, with production of 16,12,255 ton and productivity 1580 kg/ha during the year 2018-19 (Annonymous 2019). In Rajasthan, Bikaner district has grown maximum area of groundnut (2,45,062 ha), production 529065 tonnes and productivity 2159 kg/ha (Annonymous 2019).

The seeds of groundnut differ in size, shape and colour of the seed coat or testa. The testa is thin and papery. Seed size is an important economic character. Seed length ranges from 7 to 21 mm and seed diameter from 5 to 13 mm. Seed weight is also an important distinguishing character, which ranges from 0.17 to 1.24 g.

Taxonomically classified as *Arachis hypogaea*, is a legume crop grown mainly for its edible seeds. His species consists of two subspecies ssp. hypogea and ssp. fastigiata. It is widely grown in the tropics and subtropics, being important to both small and large commercial producers. It is classified as both a grain legume and, due to its high oil content, an oil crop. Groundnut is an upright or prostrate annual plant. It is generally distributed in the tropical, sub-tropical and warm temperate zones.

Grover (1981) listed more than 55 pathogens in groundnut crop. Only a few, such as early leaf spot (*Cercospora arichidicola)* late leaf spot (*Cercosporidum personata*), rust (*Puccinia arichidis*), collar rot (*Aspergillus niger* Van Tieghem), stem rot (*Sclerotium rolfsii* Sacc.) and root rot (*Macrophomina phaseolina*) are economically important in India. The collar rot (*Aspergillus niger* Van Tiegham) of groundnut (*Arachis hypogaea* L.) is important seed and soil borne disease. The *A. niger* causing collar rot disease on groundnut seedlings was first reported by Jochem (1926). However, Jain and Nema (1952) first reported the *Aspergillus* blight of groundnut caused by *A. niger* in India. This disease appears in two phases *viz*, pre-emergence and post-emergence phase.

Collar rot is a more serious problem in sandy soil (Gibson 1953; Chohan 1965). Joshi (1969) surveyed groundnut growing areas in the state of Gujarat (India) and found as high as 50 per cent seedling blight in some fields. Similarly, Ghewande *et al.,* (2002) reported that losses in terms of mortality of plants due to collar rot range from 28 to 50 per cent. Thus, among the diseases associated with groundnut, collar rot (*A. niger*) is one of the most important. Looking to the economic importance of the disease the present study was undertaken in order to find out some resistance sources of collar rot.

Materials and Methods

The experiment was conducted at Agricultural Research Station, S.K. Rajasthan Agricultural University, Bikaner during two successive crop seasons of *kharif*- 2018 and 2019, where collar rot sick plot has been developed and maintained. Forty groundnut varieties/ genotypes were evaluated for *collar rot*. The seeds of each varieties/genotypes were planted in two rows (5 m each) using 50 seeds in each row maintained with inter and intra row spacing of 30 cm x 10 cm, respectively. The single row of susceptible cheek HNG-10 was planted after two rows of each test entry with 5 meters row length under sick plot. The varieties/genotypes were planted during second week of June every year. All other

recommended package of practices for this region were followed. Disease observations were recorded from seedling stage to maturity at 15 days interval. Final disease observations in terms of the per cent disease incidence (PDI) for collar rot were recorded at 20-30 days after sowing (DAS) using the following formula:

$$PDI = \frac{\text{Number of infected plants}}{\text{Total number of plants}} X100$$

Observation on *collar rot* incidence was started after 5 days of sowing till 35 days in case of early whereas late observation recorded after 35 days of sowing till harvest of the crop.

The groundnut varieties/genotypes were grouped into different categories, *viz;* resistant (0 to 10 %); moderately resistant (10.1 to 20 %); moderately susceptible (20.1 to 40 %); susceptible (40.1 to 60 %) and highly susceptible (above 60 %) based on the pooled disease incidence (Rohtas, 2014). Data regarding *collar rot* incidence was computed.

Results and Discussion

On the basis of percent disease incidence, the genotypes were categorized as completely free, resistant, moderately resistant, susceptible and highly susceptible. The results revealed that out of forty varieties/genotypes of groundnut none of the entries was found completely free from the disease. However, five varieties /genotype were found moderately resistant (< 20%) against collar rot disease. These were Girnor-3, HNG-69, TG-37, ICMS-6 and ICMS-28. and twenty-five verities /genotype were found tolerant (20-40%) against collar rot disease. These were GG-21, GG-16, RG-559,HPS-1,CSMG-2003, Malika, K-7, K-9,HNG-123, ICMS-117, HNG-123, K-4, K-6, ISL-16, ICMS-149, ICMS-142, ICMS-4, ICMS-79, ICMS-13, ICMS-26, ICMS-83, ICMS-114, ICMS-100, ICMS-32 and ICMS-101. Ten verities /genotype *viz*; ICMS-12, HNG-10, K-8. RS-578, ICMS-124, GJG-18, ICMS-20, ICMS-17, ICMS-3 and ICMS-104 were found susceptible (40-60%) against collar rot disease. Rest of the verities /genotype found highly susceptible against reactions to the pathogen (Table 1 and 2).

Table.1 Responses of different groundnut varieties /entry against collar rot disease (*Aspergillus niger* Van Tiegham)

S. No.	Varieties /entry	Percent Disease incidence		Pooled
		2018	2019	
1	GG-21	24.40	23.60	24.00
2	GG-16	29.20	28.30	28.75
3	GIRNOR-3	16.20	18.20	17.20
4	HNG-69	16.30	18.30	17.30
5	RG-559	22.50	23.40	22.95
6	TG-37	18.30	19.60	18.95
7	HPS-1	22.50	24.20	23.35
8	CSMG-2003	22.50	23.20	22.85
9	ICMS-12	55.33	54.20	54.77
10	MALIKA	17.50	25.60	21.55
11	K-7	25.60	24.30	24.95
12	K-9	26.00	28.00	27.00

13	HNG-123	18.00	29.50	23.75
14	HNG-10	50.00	60.60	55.30
15	K-8	53.00	51.20	52.10
16	ICMS-117	41.00	38.40	39.70
17	HNG-123	27.00	29.00	28.00
18	K-4	36.40	37.40	36.90
19	RS-578	56.30	57.30	56.80
20	K-6	19.60	22.20	20.90
21	ICMS-124	44.20	43.60	43.90
22	GJG-18	46.20	40.20	43.20
23	ISL-16	23.10	18.30	20.70
24	ICMS-6	15.00	19.60	17.30
25	ICMS-28	19.00	19.20	19.10
26	ICMS-149	20.00	22.20	21.10
27	ICMS-142	25.00	26.30	25.65
28	ICMS-4	26.00	27.00	26.50
29	ICMS-79	27.00	30.00	28.50
30	ICMS-13	36.00	37.00	36.50
31	ICMS-26	34.00	38.00	36.00
32	ICMS-83	35.00	37.00	36.00
33	ICMS-20	46.00	48.00	47.00
34	ICMS-17	43.00	44.00	43.50
35	ICMS-114	30.00	43.60	36.80
36	ICMS-100	36.00	41.00	38.50
37	ICMS-32	38.00	28.00	33.00
38	ICMS-3	48.00	50.40	49.20
39	ICMS-101	37.00	38.00	37.50
40	ICMS-104	49.00	43.60	46.30

*Mean of three replications

Table.2 Screening of groundnut varieties/genotype against collar rot disease incited by *Aspergillus niger* Van Tiegham

Disease Percentage	Disease Reaction	Varieties/genotype	Total
Up to 10	Resistance	Nil	0
10.1 to 20	Moderately Resistant	Girnor-3, HNG-69, TG-37, ICMS-6, ICMS-28	5
20.1 to 40	Moderately Susceptible	GG-21, GG-16, RG-559,HPS-1,CSMG-2003, Malika, K-7, K-9,HNG-123, ICMS-117, HNG-123, K-4, K-6, ISL-16,ICMS-149,ICMS-142,ICMS-4,ICMS-79,ICMS-13,ICMS-26,ICMS-83,ICMS-114,ICMS-100, ICMS-32,ICMS-101	25
40.1 to 60	Susceptible	ICMS-12, HNG-10, K-8. RS-578, ICMS-124, GJG-18, ICMS-20, ICMS-17, ICMS-3 , ICMS-104	10
Above 60	Highly susceptible	Nil	0

The obtained findings are followed the result of Palaiah *et al.,* (2019) who screened total of 64 AICRP groundnut germplasm and 33 popular groundnut varieties were screened under sick plot condition at MARS, Raichur. Only 31 germplasm showed highly resistant to stem rot; 37 germplasm lines resistance against collar rot; and 11 germplasm showed resistant against dry root rot diseases. However, out of 33 groundnut varieties evaluated against these diseases, none of the varieties showed highly resistant and resistant against three diseases and only 18 varieties found moderately resistant against collar rot and 20 varieties against stem rot and 29 varieties for dry root rot diseases. The resistance of Spanish bunch types viz., C -421 and C- 1780 to the collar rot pathogen under field conditions (Gorbet and Shokes, 2002)

Neha Rani (2014) conducted screening of 20 entries of groundnut and the cultivar, DH-86 showed maximum root rot per cent incidence during *kharif* followed by CHICO cultivar and ICGV-07214. The variety ICGV-00338 showed maximum root rot incidence during spring followed by ICGV-02005. The minimum root rot disease incidence was recorded in the variety ICGV-07210 and similarly three breeding lines, ICGV-86699, ICGV-91114 and ICGV- 89280 lines (Divya rani *et al.,* 2018).

Keeping the results in view it can be concluded that the entries showing moderately resistant reaction can be used in crop improvement programs aimed at breeding for collar rot resistance.

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