

SURVEY FOR THE INCIDENCE AND SOURCES OF FIELD RESISTANCE AGAINST PEANUT BUD NECROSIS DISEASE OF GROUNDNUT IN NORTH EASTERN KARNATAKA

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ABSTRACT

Survey was conducted during *kharif*, 2007 and *rabi/summer* 2007-08 revealed that the peanut bud necrosis disease (PBNB) was prevalent in all groundnut fields in Upper Krishna Project (UKP) and TungaBhadra Project (TBP) areas. The disease incidence ranged from 1 to 44 during *kharif* and 1-84 per cent during *rabi/summer*. Over two seasons, the mean PBNB incidence of 21.71, 18.23, 17.42 and 11.95 per cent was recorded in Raichur, Koppal, Gulbarga and Bellary districts, respectively. A diverse genetic material was screened against PBNB at 'hot spot' centre during *kharif*, 2007 and *rabi/summer*, 2007-08. Thirteen entries *viz.*, ICG-442, ICG-1668, ICG-7906, ICG-9842, ICG-10185, ICG-11687, ICG-12000, ICG-12189, CS-92, CS-107, CS-205, R-2001-2 and R-2001-3 showed consistent resistant reaction against the disease.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is considered as poor man's badam, due to its dual qualities *viz.*, high oil (48%) and protein (26%) content. It is an important oilseed, food and fodder crop which is one of the five most important oil seed crops of the world. In India, groundnut is grown in an area of 5.47 million ha with a production of 5.51 million tones (Anon, 2010). More than 55 pathogens have been reported to affect groundnut crop (Ghewande *et al.*, 2002). Among them, peanut bud necrosis disease (PBNB) caused by peanut bud necrosis virus (PBNV) vectored by *Thrips palmi* Karny (Vijayalakshmi *et al.*, 1995) is a major disease of groundnut in South East Asia especially in India causing a yield loss of 89 million US dollars (Anon, 1992). The incidence of peanut bud necrosis disease of groundnut ranges from 5 to 80 per cent in different parts of the country and reported to cause yield loss up to 50 per cent (Ghanekar *et al.*, 1977). The yield loss due to PBNB in groundnut mainly depends on the time of infection. If the infection occurs on young plants (Before 60 days) pod yield loss will be 100% (Gopal and Upadhyaya, 1988). If infection occurs after the plants start to produce pods, losses are minimal. On the basis of severity of PBNV incidence, a number of "hot-spots" such as Mainpuri (Uttar Pradesh), Rajendranagar, Kadiri and Palem (Andra Pradesh), Latur (Maharashtra), Tikamgarh (Madhya Pradesh) and Raichur (Karnataka) have been identified (Basu, 1995). In north eastern Karnataka, PBNB is an important disease during both *kharif* and *rabi/summer* seasons, causing yield losses from 30 to 90 per cent (Patil, 1993). Thus, PBNB has become a major

threat to groundnut cultivation, especially in the Thungabhadra project (TBP) and Upper Krishna Project (UKP) areas. In Karnataka, the incidence of disease has been on the increase in all the cropping seasons (Siddaramaiah *et al.*, 1980). Intensive survey to know the incidence of disease in different parts of the region is very important to devise suitable control measures. Host plant resistance is an economical as well as desirable component in the management of viral diseases. Since, PBNB is destructive disease, identification of genotypes that can resist/tolerate the disease during early stages of crop growth are useful in minimizing yield loss due to the disease. Keeping this in view, an intensive and systemic survey was conducted in TBP and UKP areas of North eastern Karnataka, to identify the resistant sources, the some of the elite groundnut lines were screened at Raichur, one of the 'hot spots identified for PBNB.

MATERIALS AND METHODS

Survey of peanut bud necrosis disease of groundnut

Groundnut is one of the important oilseed crop of Northern Karnataka grown under both rainfed and irrigated conditions. The most commonly grown genotypes of groundnut in these areas are *viz.*, TMV-2, KRG-1, R-8808, R-9251 and more recently R-2001-2. An intensive survey was carried out in the area to know the incidence and severity of peanut bud necrosis disease during *kharif* 2007 and *rabi/summer* 2007-08. The survey was conducted in different taluks of Raichur, Koppal, Gulbarga and Bellary districts to know the incidence of peanut

bud necrosis disease. Farmers fields in different villages of Deodurga, Lingasgur, Manvi and Raichur of Raichur district; Gangavati and Koppal taluks of Koppal district; Gulbarga, Shahapur, Aland and Shorapur taluks of Gulbarga district; Siruguppa, Hospet and Bellary taluks of Bellary district were covered under survey programme by following rowing survey method (Kannaiyan *et al.*, 1984). In each taluk, five villages were selected for the survey programme and survey was conducted in the fields located on both sides of the road and 90 to 100 days old groundnut crop was assayed for peanut bud necrosis disease.

To record the incidence of PBNB, the area of 10m² was selected in each field. The total number of plants were actually counted and among them observation on number of healthy and diseased plants were recorded. Similar observations were made at four different spots in each field. Later the per cent PBNB was calculated by using following formula.

$$\text{Per cent disease (\%)} = \frac{\text{Number of PBNB plants}}{\text{Total number of plants}} \times 100$$

Screening of genotypes to identify resistant sources against the peanut bud necrosis disease

The experiment was conducted during *kharif*, 2007 and *rabi/summer*, 2007-08, at Regional Agricultural Research Station, Raichur, to find out the resistant sources for PBNB. A total of 141 entries were collected from National research for Groundnut (NRCC), Junagadh. Each entry was sown in single row of five-meter length and at every 4th row, a susceptible check KRG-1 was planted with a spacing of 30cm between rows and 10cm between plants (Plate 1). The crop was raised as per the recommended package of practices except for the plant protection measures against PBNB. The screening was done under natural disease incidence condition and final observation on reaction of genotype to PBNB was recorded one week before harvest of the crop. The plants affected with PBNB were counted and expressed in terms of per cent incidence. The entries have been grouped into different categories following standard disease rating scale (0-5).

Scale	Per cent incidence	Disease reaction
0	0 to 1% infection	Highly resistant
1	1.1 to 5% infection	Resistant
2	5.1 to 10%	Moderately resistant
3	10.1 to 25%	Moderately susceptible
4	25.1 to 50%	Susceptible
5	50.1 % and above	Highly susceptible

RESULTS AND DISCUSSION

During the survey the PBNB was recorded in all the groundnut fields visited in different villages of four districts. The incidence varied from 1 to 44 per cent during *kharif* season. The highest incidence of 22.36 per cent was recorded from the field of RARS farm (Raichur taluk and Raichur district) during *kharif*, 2007 (Table 1). Further, the incidence varied from 1.00 to 84 per cent during *rabi/summer*, season. The highest disease incidence was 39.45 per cent recorded in RARS farm (Raichur taluk and Raichur) district during *rabi/summer* 2007-08 also (Table 2).

During the study [2007-08], mean peanut bud necrosis disease



Plate 1: Infector row method of screening of groundnut entries against peanut bud necrosis disease

incidence of 21.71 per cent was in Raichur district followed by Koppal (18.23), Gulbarga (17.42) and Bellary (11.95). From two seasons study, it is clear that Raichur district can be "a hot spot" for PBNB which recorded 43.40 and 56.20 per cent disease incidence in *kharif*, 2007 and *rabi/summer*, 2007-08, respectively (Table 3). These observations are in agreement with the reports of Chohan (1958) and Ghanekar *et al.* (1977), who reported the incidence of PBNB to be between 5 to 80 per cent in various parts of the country.

The present investigation also indicated that the incidence of PBNB was comparatively higher in Raichur districts (21.71%) irrespective of seasons indicating that PBNB prefers dry climatic conditions for its proper expression of symptoms. Reddy *et al.* (1991) also opined that peanut bud necrosis symptom was common on crops grown in dry seasons in India indicating that the disease symptoms were probably associated with high temperatures. Kulkarani (1996) reported that the incidence of bud necrosis viral disease in Karnataka ranged from 2.4 to 25.40 per cent in different parts of state. The incidence was found to be more in *kharif* season (12.91%) than in summer season (10.50%). Raichur district recorded

Table 1: Incidence of peanut bud necrosis disease in different district during *kharif*, 2007

District	Taluk	No. of villages	No. of fields	Mean incidence (%)	Range (%)
Raichur	Raichur	5	28	22.36	5-44
	Deodurga	6	31	12.65	1-19
	Lingasugur	3	26	10.73	5-15
	Manvi	4	33	13.60	4-22
Mean	18	117	14.83	1-44	
Bellary	Siruguppa	6	34	14.81	7-23
	Hospet	4	28	08.60	3-17
	Bellary	5	32	08.10	3-13
Mean	15	94	10.50	3-23	
Gulbarga	Gulbarga	6	35	10.08	5-19
	Aland	4	31	10.55	4-19
	Shahapur	5	34	15.07	6-28
	Shorapur	6	34	14.80	4-27
Mean	22	134	12.62	4-28	
Koppal	Koppal	6	31	13.41	7-25
	Gangavati	5	28	16.16	9-25
Mean	11	59	14.78	7-25	

Table 2: Incidence of peanut bud necrosis disease in different district during rabi/summer, 2007-2008

District	Taluk	No. of villages	No. of fields	Mean incidence (%)	Range (%)
Raichur	Raichur	6	23	39.45	15-84
	Deodurga	4	25	23.37	5-36
	Lingasugur	4	26	16.02	1-28
	Manvi	4	29	35.50	26-45
Mean	18	103	28.58	1-84	
Bellary	Siruguppa	6	23	20.40	9-28
	Hospet	4	24	9.60	1-22
	Bellary	4	23	10.20	3-18
Mean	14	70	13.40	1-28	
Gulbarga	Gulbarga	4	22	14.00	8-26
	Aland	5	25	11.50	6-19
	Shahapur	4	24	32.60	14-42
	Shorapur	5	25	30.77	6-62
Mean	18	96	22.21	6-62	
Koppal	Koppal	5	22	22.40	11-35
	Gangavati	4	20	20.97	6-34
Mean	9	42	21.68	6-35	

comparatively higher disease incidence (17.10%). A survey was conducted in Anantapur district of Andhra Pradesh in the second fortnight of July, September and October month during Kharif 2007, the mean incidences of PBNB were 3.1 per cent and ranged from 0.0 to 8.0 per cent (Anon, 2007).

Management of PBNB through host plant resistance is also important for effective management of the disease. Considering the overall performance of genotypes over two seasons, none of the entries exhibited highly resistant or immune reaction, while 13 showed resistant reaction (1.1-5%), 20 genotypes moderately resistant (5.1-10%), 97 moderately susceptible (10.1-25%) and 10 showed susceptible (25.1-50%) reaction. Thirteen resistant genotypes are ICG -442, ICG-1668, ICG-7906, ICG-9842, ICG-10185, ICG-11687, ICG-12000, ICG-12189, CS-92, CS-107, CS-205, R-2001-2, R-2001-3 and 20 moderately resistant genotypes are ICG-76, ICG-532, ICG-1399, ICG-2772, ICG-4670, ICG-4684, ICG-

Table 3: Mean incidence of peanut bud necrosis disease during kharif, 2007 and rabi/summer, 2007-2008

District	Taluk	Per cent disease incidence		Mean
		Kharif -2007	Rabi/summer 2007-08	
Raichur	Raichur	22.26 (1-44)	39.45 (1-84)	30.90
	Deodurga	12.65 (1-19)	23.37 (5-36)	18.01
	Lingasugur	10.73 (5-15)	16.02 (1-28)	13.37
	Manvi	13.60 (4-22)	35.50 (26-45)	24.55
Mean	14.83	28.58	21.71	
Bellary	Siruguppa	14.81 (7-23)	20.40 (9-28)	17.60
	Hospet	08.60 (3-17)	09.60 (1-22)	09.10
	Bellary	08.10 (1-17)	10.20 (3-18)	9.15
Mean	10.50	13.40	11.95	
Gulbarga	Gulbarga	10.08 (4-19)	14.00 (8-26)	12.04
	Aland	10.55 (4-19)	11.50 (6-19)	11.02
	Shahapur	15.07 (6-28)	32.60 (6-62)	23.83
	Shorapur	14.80 (4-27)	30.77 (14-42)	22.78
Mean	12.62	22.21	17.42	
Koppal	Koppal	13.40 (7-25)	22.40 (11-35)	17.90
	Gangavati	16.16 (9-25)	20.97 (6-34)	18.56
Mean	14.78	21.68	18.23	
Grand Mean		13.18	21.37	

* Figure in the brackets indicates range of peanut bud necrosis disease

4911, ICG-9666, ICG-9905, ICG-11109, ICG-12625, ICG-12921, ICG-14523, ICG-15287, M-13, CS-85, NRCG (PBNB)-13129, R-8808, R-9214 and R-9251 (Table 4).

Of the 141 genotypes screened against peanut bud necrosis disease at MARS farm over two seasons, 13 entries viz., ICG -442, ICG-1668, ICG-7906, ICG-9842, ICG-10185, ICG-11687, ICG-12000, ICG-12189, CS-92, CS-107, CS-205, R-2001-2 and R-2001-3 showed consistent resistant reaction by recording less than 5 per cent PBNB. These entries offer promising sources of resistance to be used for further resistant breeding programme. Kulkrani *et al.* (1993) who reported R-8808, R-8806, ICGV-86029, ICGV-86031, ICGV-86600 and ICGS-11 were found promising and exhibiting PBNB below 10 per cent. Further, these resistant lines were subjected to

Table 4: Reaction of groundnut genotypes against peanut bud necrosis disease of groundnut during kharif, 2007 and rabi/summer, 2007-08

S. No.	Disease score /grade (% incidence)	Germplasm / cultivars
1.	Highly resistant (0 to 1%)	-Nil -
2.	Resistant (1.1 to 5%)	ICG -442, ICG-1668, ICG-7906, ICG-9842, ICG-10185, ICG-11687, ICG-12000, ICG-12189, CS-92, CS-107, CS-205, R-2001-2 and R-2001-3 (13 genotypes)
3.	Moderately resistant	ICG-76, ICG-532, ICG-1399, ICG-2772, ICG-4670, ICG-4684, ICG-4911, ICG-9666, ICG-9905, ICG-11109, ICG-12625, ICG-12921, ICG-14523, ICG-15287, M-13, CS-85, NRCG(PBNB)-13129, R-8808, R-9214 and R-9251 (20 genotypes)
4.	Moderately susceptible	ICG-332, ICG-334, ICG-434, ICG-721, ICG-862, ICG-928, ICG-1137, ICG-1274, ICG-1415, ICG-2106, ICG-2511, ICG-4389, ICG-4527, ICG-4543, ICG-4598, ICG-4729, ICG-4746, ICG-4955, ICG-4998, ICG-5195, ICG-5236, ICG-5327, ICG-5494, ICG-5663, ICG-5745, ICG-5779, ICG-5827, ICG-6263, ICG-6402, ICG-8517, ICG-8490, ICG-9037, ICG-9249, ICG-9418, ICG-9507, ICG-9777, ICG-10384, ICG-10479, ICG-10890, ICG-12370, ICG-12672, ICG-12682, ICG-12697, ICGS-44, ICG-12921, ICG-12988, ICG-13491, ICG-13723, ICG-13787, ICG-13856, ICG-14008, ICG-14118, ICG-14466, ICG-14475, ICG-14482, ICG-14630, ICG-14710, ICG-15190, ICG-15419, CS-37, CS-78, CS-83, CS-083, CS-86, CS-87, CS-97, CS-171, CS-186, CS-187, CS-192, CS-195, CS-203, CS-205, CS-10886, NRCG(PBNB)-13065, 17019, 13067, 13172, 13004, 13071, 13033, 135, 14303, 25, 13122, 1030, 3586, 5007, 11611, 11511, 13064, 11212, 5011, 1301, 15192, 13020, 11340, GPBD-4 and R-9227 (97 genotypes)
5.	Susceptible (25.1 to 50%)	ICG-14705, CS-192, NRCG (PBNB)-30079, NRCG (PBNB)-13048, NRCG (PBNB)-9225, NRCG (PBNB)-13170, JL-24 and KRG-1 (10 entries)
6.	Highly susceptible (50.1 and above)	—

rigorous screening and to study the genetic polymorphism among resistant and susceptible lines.

Gururaj Sunkad *et al.* (2001) who also recorded seven genotypes viz., DRG-18, ICG-7812, ICG-10, ICGV-80325, JSSP-3, KGN-22 and PI-393516 were found highly resistant to peanut bud necrosis disease by recording less than 5 per cent PBNB. Thakare *et al.* (2002) tested 44 lines and found six highly resistant, eight resistant and 14 moderately resistant to the disease. Four genotypes viz., Nos: 10807, 10808, 11187 and 11428 recorded below 5 per cent incidence of PBNB (Anon, 2004). Fourteen genotypes viz., 13444, 10784, 11118, 11206, 11185, 11187, 11429, 11432, 11433, 13521, 11262, 11162 and 11313 were promising to PBNB by recording less than 5 per cent incidence as against 28 per cent on susceptible check (KRG-1) (Anon, 2005). Similarly, three entries viz, CS-085, R-2001-1 and R-2001-3 were highly resistant to PBNB by recording less than 5 per cent incidence against 46 per cent in susceptible check (KRG-1) (Anon., 2006). Four entries viz., 13006, 13040, 13169 and 4212 highly resistant to PBNB by recording less than 5 per cent incidence against 46 per cent in susceptible check (KRG-1) (Anon., 2006).

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