

Original Research Article

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Survey of Collar Rot, Stem Rot and Dry Root Rot Disease Incidence of Groundnut in Parts of Karnataka, India

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ABSTRACT

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A roving survey was carried out during *Kharif* 2017 in different groundnut growing districts of Karnataka to ascertain the major soil borne diseases of groundnut *viz.*, collar rot, stem rot and root rot disease incidences in Chikkaballapura, Tumkur, Chitradurga, Bellary, Raichur, Yadgiri, Koppal and Kalburgi districts of Karnataka. The average highest collar rot incidence was noticed in Kalaburgi (16.00 %), dry root rot incidence in Koppal (25.25%) followed by Tumkur (24.37%), stem rot incidence in Chitradurga (22.72%) followed by Tumkur (21.22%) districts of Karnataka. The information generated could be useful for making the ecosystem specific management strategy to reduce the impact of soil borne diseases of groundnut in different districts of Karnataka.

Introduction

Groundnut (*Arachis hypogea* L.) is a major edible oil seed crop of tropical and subtropical region of the world and it is popularly called as poor men's cashew nut, peanut, monkey nuts and pig nuts. It belongs to the family of *Fabaceae*, subfamily *Papilionaceae* and it contains the valuable source of all nutrients.

In India it's grown under rainfed as well as irrigated conditions. The crop grown well drained light sandy loams, red, yellow and black soils. It is commercially grown between 40°N and 40°S latitude. Globally, the crop is

raised on 26.4 million hectares with a total production of 37.1 million MT. The average productivity is 1400 kg/ha. The annual global export of groundnuts is of two million MT valued at 2,600 million US \$. Globally, with annual all-season coverage of about 70 lakh hectares India ranks first in acreage and with an output of about 85 lakh MT of in shell groundnuts, second in production.

India also happens to be one of the largest exporters in the world and competes closely with Argentina, USA and China by commanding a share of 20- 25% in global markets (Anon, 2017).

In Karnataka, it is grown both under *kharif* and *rabi* seasons. Soil borne diseases have been recognized as one of the major factors limiting groundnut yield, area production. Among soil borne pathogens, *Aspergillus niger* Van Tieghem, *Sclerotium rolfsii* Sacc, and *Rhizoctonia bataticola* Taub have been reported to be major limitations. The crop have been reported to cause severe seedling mortality resulting patchy crop and reduced yield ranging from 25–40 per cent (Ghewande *et al.*, 2002).

These pathogens attack groundnut plants at all stages and cause pre emergence rotting in seeds, soft rot in emerging seedlings and collar rot, stem rot and dry root rot in mature plants.

Keeping in this view an attempt was made to conduct roving survey for disease incidence against three diseases in major groundnut growing regions of the Karnataka.

Materials and Methods

Roving survey was conducted in major groundnut growing districts *viz.*, Chikkaballapura, Tumkur, Chitradurga, Bellary, Raichur, Yadgiri, Koppal and Kalaburgi districts of Karnataka during July to October 2017 at different stage of crop to study the incidence of collar rot, stem rot and dry root rot.

In each districts major groundnut growing taluks were selected and in each taluk three villages and in each village three fields were selected for the study of disease incidence. Eighteen taluks namely., Chintmani, Gowribidanur and Sidlaghatta of Chikkaballapur district, Sira and Pavagoda of Tumkur district, Hiriyur, Hosadurga, Challakere and Molkalmoru of Chitradurga district, Kudligi and Hadagali of Bellary district, Raichur local and Lingsur of Raichur district, Shorapur, Shahapur and Yadgiri local

of Yadgiri district, Koppal local in Koppal District and Chittapur taluk of Kalaburgi districts were surveyed. In each Taluk three fields of different villages were selected randomly and the disease incidence was calculated in a square metre area at five different places in a field. The per cent disease incidence in these areas was calculated using following formula

$$\text{Per cent Disease Incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Results and Discussion

Generally the collar rot affected seeds showed the blackish testa, rotted internal tissue. In case of emerging hypo-cotyledons, affected seedlings showed yellow colour and rotten cotyledons. Infection in mature plants showed wilting and rotting of the tissue just below the ground level. The affected portion turned dark, shrunken and later covered by black spores of the pathogen.

The groundnut stem rot affected plants showed symptoms such as yellowing and drying of leaves and association of white mycelia threads along with brown mustard seed like sclerotial bodies on the affected groundnut plant parts leads death of plants.

The dry root rot affected plants were identified in the field based on key symptoms like withering and drying of plants. When such plants were pulled out showed blackening of tap root, shredding of bark coming out in the form of flakes and devoid of lateral and finer roots.

Soil borne diseases in groundnut often cause significant yield losses. This is true in groundnut crop growing areas of Karnataka. Comprehensive knowledge on the incidence and severity of collar rot, dry root rot and stem

rot diseases is essential in devising area-wise control measures to manage diseases.

Collar rot (*Aspergillus niger*)

The surveyed results indicate, that disease incidence of collar rot in major groundnut growing area mentioned in the Table 1. The collar rot incidence varied from 5.30 per cent in Gauribidanur of Chikkaballapur district to 16.33 per cent in Challakere of Chitradurga district. The average collar rot incidence was highest in Kalburgi district (16.00%) followed by Chitradurga (13.44 %), Yadgir (12.00 %), Bellary (11.41%), Tumkur, Koppal (11.25%), and Raichur (10.18%) where at least collar rot disease was observed in Chikkaballapur district (6.20%). The maximum collar rot disease incidence (16.00%) was observed in Chittapur taluk in Kalburgi district.

In Chikkaballapur district the disease incidence ranged from 5.30 per cent (Gouribidanur) to 7.19 per cent (Sidlaghatta), wherein Tumkur district the disease incidence ranged from 10.0 per cent (Sira) to 12.50 per cent (Pavagoda), whereas, in Chitradurga incidence ranged from 8.40 per cent (Hosadurga) to 16.33 per cent (Challakere) followed by Hiriyur (13.91%) and Molkalmuru (15.13%). In Bellary district ranges from 11.38 (Kudligi) to 11.45 (Hadagali) per cent., Raichur district ranges from 9.91 to 10.46 per cent. Yadgiri district ranges from 10.63 per cent (Shahapur) to 13.22 (Shorapur) per cent. Whereas in koppal district disease incidence was 11.25 per cent.

Dry root rot (*Rhizoctonia bataticola*)

Among the different locations surveyed Koppal district registered the maximum dry root rot incidence (25.25 %) followed by Tumkur with 24.37 per cent, wherein Raichur with 23.74 per cent and Yadgiri with 22.24 per cent. The other locations *viz.*, Chitradurga

(20.20%), Bellary (17.43) and least root rot disease incidence was observed in Chikkaballapur (11.28) District.

In Chikkaballapur district dry root rot incidence ranged from 10.50 per cent (Gouribidanur) to 12.00 % (Chintamani taluk). The root rot incidence ranged from 15.50 per cent in Hiriyur taluk to 26.76 per cent in challakere taluk followed by Molakalur (21.50%) and Hosadurga (17.06%) taluk of Chitradurga district. Similarly in Yadgiri district the disease incidence ranged from 20.33 % (Shorapur) to Shahapur 21.81 %, of the yadgiri local recorded highest (24.60 %) dry root rot incidence. Wherein, Raichur district the stem rot disease ranged from 20.66 % (Lingsugur) to 26.83% (Raichur). Whereas in Hadagali 13.16 % and Kudligi 21.71% of Bellary district and 21.23 per cent in Chittapur of kalaburgi District. Rest of other districts *viz.*, Koppal 25.25 per cent and Sira 22.25 per cent to 26.50 per cent of dry root rot disease incidence in Tumkur district.

Stem rot (*Sclerotium rolfsii*)

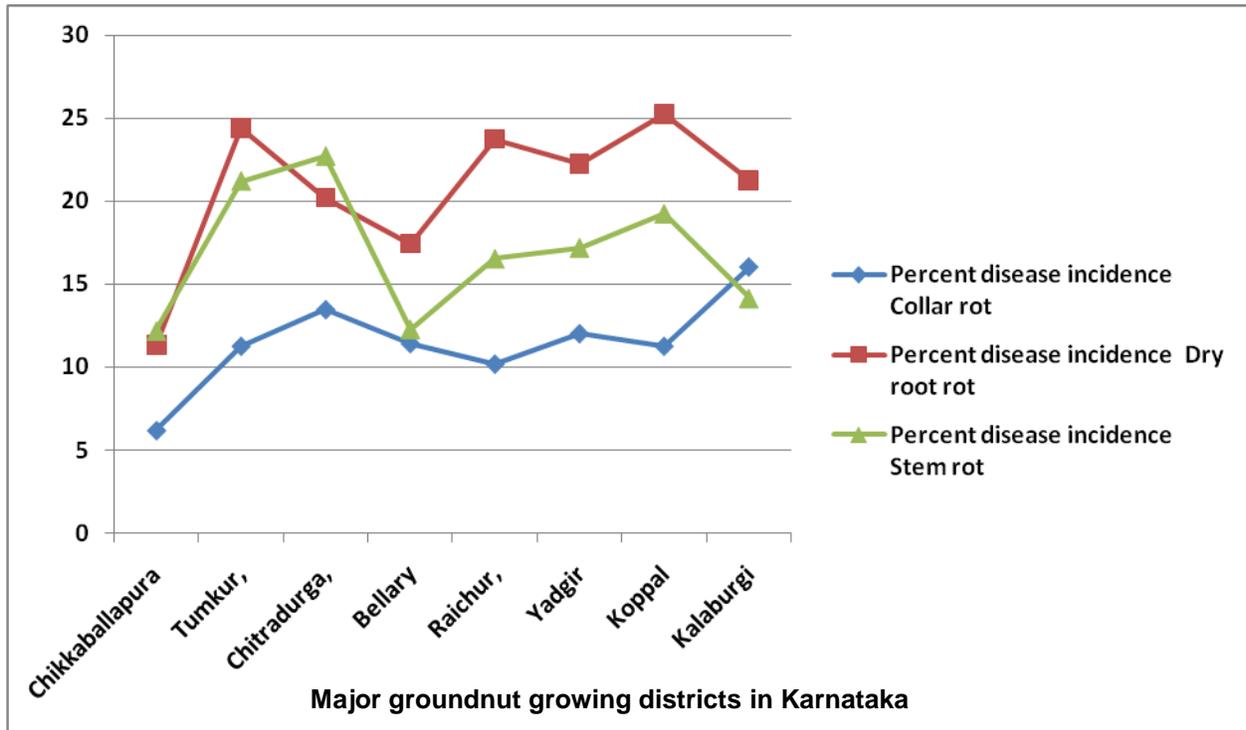
The results of the present study indicated that the average disease incidence of the stem rot incidence ranged from 12.30 per cent (Bellary district) to 22.72 % (Chitradurga district). The stem rot disease incidence was high in Chitradurga (22.72 %) district followed by Tumkur district (21.22%), Koppal (19.25%), Yadgiri (17.20%), Raichur (16.54 %), Kalaburgi (14.15%), Bellary (12.30 %) and least incidence (12.19%) was observed in Chikkaballapur district.

The maximum stem rot disease incidence (28.33%) was observed in Challakere taluk of Chitradurga district followed by 27.33 per cent in Pavagoda taluk of Tumkur district. Whereas least stem rot disease incidence (11.00 %) observed in Sidlaghatta followed by Kudligi (12.30%) taluk of Bellary district.

Table.1 Survey on occurrence and distribution of collar rot, dry root rot and stem rot in major groundnut Growing areas of Karnataka

Sl no	Districts	Talukas	No of plots visited	Percent disease incidence			Soil type	Situation Rain fed /irrigated	Variety
				Collar rot	Dry root rot	Stem rot			
1	Chikkaballapura	Chintamani	3	6.20	12.00	13.08	Red Sandy	Irrigated	KCG-2
		Gauribidanur	3	5.30	10.50	12.51	Red Loamy	Rain fed	Kadari-6
		Sidlaghatta	3	7.10	11.35	11.00	Red Sandy	Rain fed	TMV-2
			Mean	6.20	11.28	12.19			
2	Tumkur	Sira	3	10.00	22.25	15.11	Red sandy	Rain fed	TMV-2
		Pavagoda	3	12.50	26.50	27.33	Red gravelly	Rain fed	TMV-2
			Mean	11.25	24.37	21.22			
3	Chitradurga	Hiriyur	3	13.91	15.5	21.33	Red sandy	Rain fed	TMV-2
		Hosadurga,	3	08.40	17.06	18.73	Red loamy	Rain fed	TMV-2
		Challakere	3	16.33	26.76	28.33	Red sandy	Rain fed	TMV-2
		Molakalmuru	3	15.13	21.50	22.50	Red sandy	Rain fed	GPBD-4
			Mean	13.44	20.20	22.72			
4	Bellary	Kudligi	3	11.45	21.71	12.30	Red sandy	Rain fed	TMV-2
		Hadagalli	3	11.38	13.16	13.70	Red loamy	Rain fed	TMV-2
			Mean	11.41	17.43	12.30			
5	Raichur	Lingsugur	3	9.91	20.66	15.00	Red loamy	Rainfed	TMV-2
		Raichur	3	10.46	26.83	18.08	Mixed Red black	Irrigated	K-9
			Mean	10.18	23.74	16.54			
6	Yadgir	Shorapur	3	13.22	20.33	16.63	Red sandy	Rain fed	TMV-2
		Shahapur	3	10.63	21.81	21.56	Mixed Red black	Rain fed	TMV-2
		Yadgiri	3	12.17	24.60	13.41	Red loamy	Irrigated	K-9
			Mean	12.00	22.24	17.20			
7	Koppal	Koppal	3	11.25	25.25	19.25	Red loamy	Rain fed	TMV-2
			Mean	11.25	25.25	19.25			
8	Kalaburgi	Chittapur	3	16.00	21.23	14.15	Medium black	Irrigated (Sprinkle irrigation)	TMV-2
			Mean	16.00	21.23	14.15			
			Grand mean	11.45	20.72	16.95			

Graph.1 Disease incidence (%) of collar rot, stem rot and dry root rot in major groundnut growing districts of Karnataka



Usha Rani *et al.*, (2009) reported that root rot in groundnut caused by *Macrophomina phaseolina* causes serious economic losses ranging from 20 to 30 per cent under dry warm conditions. In Ananthapur district the highest average collar rot disease incidence was recorded in Bukkarayasamudram mandal (17.5%), while the lowest average collar rot disease incidence (8.0%) was recorded in Gandlapenta mandal. The highest average stem rot incidence was recorded in Nallacheruvu mandal (13.5%), while the lowest average stem rot incidence was recorded in Atmakur mandal (7.5%). Highest dry root rot incidence was recorded in Kadiri mandal (22.0%), and least dry root rot disease incidence was recorded in Raphthadu mandal (10.0%).

The field survey was conducted at Junagadh to study the loss of yield of groundnut due to dry root rot. The maximum plant mortality of 29.3 per cent due to *M. phaseolina* with

highest yield loss of 435 kg ha⁻¹ was found in Keshod tehsil of Junagadh district of Saurashtra region (Moradia and Khandar, 2011). In the previous field survey carried out by Kadam *et al.*, (2011) in the Marathwada region of Maharashtra during 2003 to determine the prevalence of stem rot disease on various groundnut cultivars. Results indicated that the disease incidence was highest in Renapur Tahsil (17.80%), followed by Udgir (16.70%), Ausa (14.70%) and Latur (14.3%) whereas lowest disease incidence was recorded in Nilanga (8.9%). Among the cultivars, JL-24 showed the maximum per cent disease incidence compared to others.

Raja Mohan and Balabaskar (2012) surveyed in different locations of Cuddalore district of Tamil Nadu and revealed the endemic nature of dry root rot disease (31.68%) in Vengatakuppam location. The disease was more in improved cultivars like, VRI2 and JL24 and the disease incidence was more in

sandy loam soils with rainfed conditions. A roving survey was conducted for the occurrence of collar rot in groundnut growing villages of Tirupati and surrounding mandals of Chittoor district of Andhra Pradesh during 2012. The collar rot incidence was highest in Srikalahasti mandal (11.21%), whereas Chandragiri mandal recorded least incidence of 6.47 per cent (Nandeesh *et al.*, 2013).

Divya Rani *et al.*, (2016) conducted survey in major groundnut growing areas of Andhra Pradesh during 2012 & 2013 to assess the distribution and the incidence of collar rot and stem rot diseases. The highest incidences of stem rot and collar rot were observed in Chittoor district of Andhra Pradesh. Whereas, lowest incidences of stem rot and collar rot were observed in Mahaboobnagar and Warangal districts respectively.

Our survey revealed that higher levels of collar rot disease incidence was observed in TMV-2 groundnut variety in Chittapur tq of Kalaburgi district under (sprinkler) irrigation condition than flood and rainfed crop may be due to inoculum load of previous crop and the sprinkler water splashes may spread the disease incidence followed by Challakere tq of Chitradurga district (under) rainfed condition mainly due to mono cropping system over years. The dry condition prevalent in the rainfed conditions might have favored the dry root rot and stem rot pathogen which could be attributed as the reason for the higher level of disease incidence in Challakere tq of Chitradurga district (dry root rot 26.76% and stem rot 28.33%) followed by Pavagoda of Tumkur district (dry root rot 26.50% and stem rot 27.33%).

In general, the crop grown under rainfed conditions showed dry root rot incidence when compared with the crops grown under irrigated conditions. In respect of soil type, red gravelly to red sandy soil. The local

groundnut TMV-2 recorded comparatively more root rot and stem rot incidence than other cultivars *viz.*, KCG-2, Kadari-6, Kadari-9 and GPBD-4

The collar rot disease is a serious problem in sandy loam and medium black soils of Chittapur taluk of Kalaburgi district and it was also observed that this disease is more prevalent during Kharif season. Since soil borne pathogens activity depends on available free oxygen in soil. A competition between plants and microorganisms arises during seed germination. Sandy soils with more number of macro pores have the capacity to hold adequate air though they are poor in water holding capacity (Baver *et al.*, 1962) compared to clay and loamy soil. This might be the probable reason for high percentage of soil borne disease incidence in sandy soil.

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