



Changing Scenario of Groundnut Stem and Collar Rot Diseases in Major Groundnut Growing Areas of Telangana

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Abstract

A roving survey was carried out in major groundnut-growing regions of Telangana state during *kharif* 2020 and *kharif* 2021 season aimed to assess the incidence of stem rot (*Sclerotium rolfsii*) and collar rot (*Aspergillus niger*) disease. The study revealed varying disease incidences at different stages and locations. The highest per cent disease incidence of stem rot from vegetative stage (22.05%) was recorded in Kalvapalle village of Mahabubabad district while maximum collar rot incidence (10.57%) was recorded in Choppadandi village of Karimnagar district. Lowest stem rot (7.81%) and collar rot (3.27%) incidence was recorded in Varkal village of Nalgonda district and Chakalpalle village of Wanaparthy district. Conversely at harvest stage maximum stem rot incidence (9.04%) was observed in Venkatapur village of Warangal district and maximum collar rot incidence (4.31%) was observed in Gundyala village of Mahabubnagar district. Lowest stem rot incidence (1.41%) was recorded in Gurthur village of Mahabubabad district while Collar rot incidence (1.69%) was recorded in Kondapur village of Nalgonda district.

Keywords: Groundnut, collar rot, stem rot, survey, disease incidence

1. Introduction

Groundnut (*Arachis hypogaea* L.) is a versatile and economically significant legume crop cultivated globally in tropical, sub-tropical and warm temperate climates. Commonly known as peanuts, groundnuts are highly valued for their nutritional richness serving as a source of protein, healthy fats and various essential nutrients. In the Telangana region, they are cultivated in both *kharif* and rabi seasons. This resilient crop adapts to diverse climates making it staple in many agricultural systems. With a wide range of applications from culinary uses to industrial products like oils, groundnut cultivation plays a crucial role in ensuring global food security and economic sustainability. Groundnut kernels contain 48-50% of edible oil and 26–28% protein and are rich in dietary fibre, minerals and vitamins (Leona et al., 2020).

Seed and soilborne diseases have been recognized as one of the major factors limiting groundnut production. Among them, *Sclerotium rolfsii* and *Aspergillus niger* are majorly responsible for pod yield in groundnut.

Stem rot pathogen attacks groundnut plant at all crop growth stages. The pathogen attacks almost all parts of the plants,

but stem infection is more serious. Diseased plants turn yellow necrotic and ultimately wilt. Diseased tissues develop yellowish brown mustard like sclerotia mixed with white cottony mycelium. Collar rot pathogen causes rotting of the seeds in the soil later the disease is characterised by wilting and death of seedlings accompanied by a rotting of hypocotyl region and development of black lesions.

Collar rot tends to be found in soils with low moisture content and high temperatures, approximately 30°C (Kishore et al., 2019) and annual yield loss is more than 10% (Pande and Rao, 2015). Groundnut plants were mostly infected near the soil surface and reach up to pods causing severe damage to pods and pegs (Haveri et al., 2017). Keeping this in view an attempt was made to conduct survey for incidence of occurrence of stem and collar rot in all major groundnut growing areas of Telangana state.

2. Materials and Methods

A systematic roving survey was conducted to assess the disease incidence of stem and collar rot in major groundnut growing districts of Telangana state viz., Mahabubnagar,



Nagarkurnool, Jogulamba Gadwal, Wanaparthy, Nalgonda, Jagtial, Karimnagar, Warangal and Mahabubabad on the basis of visual symptoms. The survey involved five major groundnut growing mandals, from each district. From each mandal, two villages were chosen and from each village, two fields situated in different geographical directions were selected. During survey, 45 major groundnut growing mandals of representing 90 villages and a total of 180 farmers' fields were visited and the results are presented in Table 1. One square meter area was marked in the center of field and four corners leaving the border rows. Survey was conducted twice during *kharif*, 2020 and *kharif*, 2021. The crop growth stages at the time of surveys were vegetative stage and again at harvesting stage. The number of wilted/dead/necrotized seedlings/plants were counted and the per cent disease incidence was calculated by counting the diseased and the total number plant spot⁻¹.

The Per cent Disease Incidence (PDI) was calculated as per the following formula

$$\text{PDI} = \frac{\text{No. of infected plants}}{\text{Total No. of plants observed}} \times 100$$

3. Results and Discussion

In order to ascertain the distribution and incidence of stem rot and collar rot disease survey was undertaken during *kharif*, 2020 and *kharif*, 2021 in major groundnut growing areas of Telangana were presented in Table 1. The diseases observed during our surveys were stem rot, collar rot, tikka leaf spot, rust, bud necrosis and root rot. Groundnut is grown as a sole crop in most of the areas and in some locations, it was also intercropped with redgram (*Cajanus cajan*), sorghum (*Sorghum bicolor*), greengram (*Vigna radiata*) and maize (*Zea mays*). These inter crops were sown after every 10–25 rows. Delayed sowings were observed in most of the villages due to delayed onset of rains.

Table 1: Disease scenario of stem rot and collar rot incidence in major groundnut growing districts of Telangana during *kharif*, 2020 and *kharif*, 2021

District	Mandal	Village	Location	Disease incidence (%)			
				<i>kharif</i> , 2020 and <i>kharif</i> , 2021			
				Vegetative stage		Harvest stage	
Stem rot	Collar rot	Stem rot	Collar rot				
Wanaparthy	Gopalpet	Buddharam	Location 1	20.68	9.42	6.24	2.46
			Location 2	15.66	8.59	2.31	3.39
		Chakalpalle	Location 1	12.79	4.14	7.00	2.73
			Location 2	23.33	2.40	4.49	2.90
	Peddamandadi	Pamireddipalle	Location 1	14.51	3.12	5.32	1.66
			Location 2	20.07	6.10	2.84	2.77
		Veeraipalle	Location 1	17.85	3.82	2.98	2.56
			Location 2	11.97	7.62	4.31	3.70
	Revally	Shanaipalle	Location 1	27.13	7.90	3.11	1.76
			Location 2	13.47	4.01	2.60	2.62
		Thalpunur	Location 1	17.14	4.79	3.96	1.91
			Location 2	16.05	7.37	2.62	2.90
	Pangal	Mallaipalle	Location 1	18.11	7.46	2.95	2.38
			Location 2	12.53	6.28	4.89	2.12
		Chinthakunta	Location 1	11.90	4.02	3.23	2.49
			Location 2	16.51	7.47	5.63	1.73
Pebbair	Pebbair	Location 1	21.84	4.71	1.86	2.92	
		Location 2	19.37	11.82	1.62	3.64	
	Ramapur	Location 1	19.82	5.15	1.87	4.92	
		Location 2	19.03	5.51	3.05	3.29	
Mahabubabad	Maripeda	Location 1	21.20	5.97	1.45	2.17	
		Location 2	20.36	8.53	1.89	3.63	

Table 1: Continue...

District	Mandal	Village	Location	Disease incidence (%)				
				<i>kharif</i> , 2020 and <i>kharif</i> , 2021				
				Vegetative stage		Harvest stage		
				Stem rot	Collar rot	Stem rot	Collar rot	
Mahabubnagar	Chinnagudur	Dharmaram	Location 1	14.76	5.25	3.30	3.92	
		Dharmaram	Location 2	21.68	4.84	3.46	2.79	
		Chinnagudur	Location 1	15.26	4.20	3.26	2.23	
		Chinnagudur	Location 2	11.29	5.81	1.76	3.50	
		Gunnapalle	Location 1	16.63	6.40	2.19	3.15	
		Gunnapalle	Location 2	19.05	8.83	2.10	2.96	
		Dhanthalapalle	Peddammupparam	Location 1	13.57	8.48	2.72	3.77
			Peddammupparam	Location 2	11.64	6.71	1.38	2.59
	Kalvapalle		Location 1	17.77	5.44	1.95	2.94	
	Kalvapalle		Location 2	26.33	7.66	4.31	3.55	
	Narsimhulapet	Jayapuram	Location 1	21.26	8.24	1.75	2.69	
		Jayapuram	Location 2	18.45	8.20	2.32	4.02	
		Narsimhulapet	Location 1	12.08	4.07	2.90	2.16	
		Narsimhulapet	Location 2	22.01	6.95	2.36	4.05	
	Thorur	Khanapur	Location 1	13.05	5.91	2.80	2.13	
		Khanapur	Location 2	20.04	6.66	2.26	1.73	
		Gurthur	Location 1	10.64	7.47	1.15	3.17	
		Gurthur	Location 2	10.97	5.12	1.66	2.82	
	Mahabubnagar	Mahabubnagarrural	Kodur	Location 1	16.44	7.73	1.85	3.88
			Kodur	Location 2	20.33	9.36	3.03	1.46
			Dharmapur	Location 1	12.08	8.82	2.12	2.67
			Dharmapur	Location 2	12.13	5.96	1.91	1.98
		Hanwada	Gundyala	Location 1	11.06	10.53	1.25	2.14
			Gundyala	Location 2	14.21	10.02	2.88	6.47
			Hanwada	Location 1	10.65	6.55	2.69	2.12
			Hanwada	Location 2	13.36	5.24	1.42	2.23
		Jadcherla	Polepalle	Location 1	15.15	6.64	2.56	2.86
			Polepalle	Location 2	22.32	5.57	1.57	3.44
			Narsullabadh	Location 1	13.61	5.34	1.43	2.54
			Narsullabadh	Location 2	12.68	6.25	1.78	2.45
		Nawabpet	Pomal	Location 1	12.80	10.92	2.25	2.81
			Pomal	Location 2	17.73	6.39	3.83	2.30
Kamaram			Location 1	10.70	5.91	2.35	3.23	
Kamaram			Location 2	11.15	7.71	5.07	3.13	
Bhoothpur	Annasagar	Location 1	14.77	7.07	3.31	2.44		
	Annasagar	Location 2	9.07	7.05	6.79	3.66		
	Tadparthy	Location 1	16.90	6.82	5.19	2.66		
	Tadparthy	Location 2	17.71	9.93	3.02	2.35		

Table 1: Continue...



District	Mandal	Village	Location	Disease incidence (%)				
				<i>kharif</i> , 2020 and <i>kharif</i> , 2021				
				Vegetative stage		Harvest stage		
				Stem rot	Collar rot	Stem rot	Collar rot	
Nagarkurnool	Achampet	Chandapur	Location 1	16.69	5.63	1.57	3.74	
		Chandapur	Location 2	11.00	10.26	2.28	1.74	
		Rangapur	Location 1	16.66	5.17	2.77	2.27	
		Rangapur	Location 2	16.11	8.53	2.05	2.60	
	Amrabad	Laxmapur	Location 1	20.42	8.94	2.56	2.69	
		Laxmapur	Location 2	15.56	11.61	1.81	2.28	
		Chitlamkunta	Location 1	19.37	8.08	2.05	2.15	
		Chitlamkunta	Location 2	12.59	7.10	2.79	2.86	
	Kalwakurthy	Thotapalle	Location 1	18.41	12.97	2.24	1.82	
		Thotapalle	Location 2	11.65	7.52	2.01	2.73	
		Gundur	Location 1	18.60	5.45	4.52	1.17	
		Gundur	Location 2	14.32	5.88	3.79	2.96	
	Kollapur	Ramapur	Location 1	10.84	10.43	5.08	2.36	
		Ramapur	Location 2	15.70	5.91	5.28	1.60	
		Somasila	Location 1	12.87	5.72	7.77	2.40	
		Somasila	Location 2	11.40	11.99	7.73	1.58	
	Charakonda	Charakonda	Location 1	14.66	5.33	3.93	1.29	
		Charakonda	Location 2	11.91	8.70	5.95	2.19	
		Kamalapur	Location 1	13.88	7.62	4.34	1.67	
		Kamalapur	Location 2	16.25	10.57	8.25	2.17	
	Jagtial	Jagtial	Dharur	Location 1	19.91	5.36	6.60	1.79
			Dharur	Location 2	22.79	10.49	6.05	2.71
			Thippannapeta	Location 1	13.54	6.04	7.72	2.40
			Thippannapeta	Location 2	16.83	3.91	8.45	2.06
Sarangapur		Potharam	Location 1	22.46	4.20	3.87	3.11	
		Potharam	Location 2	14.04	8.89	7.10	1.88	
		Konapur	Location 1	14.83	7.07	4.80	2.21	
		Konapur	Location 2	13.47	5.29	8.28	2.21	
Dharmapuri		Arepalle	Location 1	19.67	9.56	5.99	2.85	
		Arepalle	Location 2	13.34	5.24	6.43	1.95	
		Thimmapur	Location 1	16.09	6.44	4.16	2.74	
		Thimmapur	Location 2	18.67	8.72	3.37	2.71	
Gollapalle		Chilvakodur	Location 1	14.75	9.84	5.54	2.29	
		Chilvakodur	Location 2	17.16	6.38	3.58	1.60	
		Laxmipur	Location 1	9.78	4.02	6.41	2.49	
		Laxmipur	Location 2	6.85	6.09	7.38	2.28	
Raikal		Itkylal	Location 1	13.70	3.04	8.50	1.65	
		Itkylal	Location 2	9.30	7.24	7.92	2.79	

Table 1: Continue...



District	Mandal	Village	Location	Disease incidence (%)			
				<i>kharif</i> , 2020 and <i>kharif</i> , 2021			
				Vegetative stage		Harvest stage	
				Stem rot	Collar rot	Stem rot	Collar rot
Warangal	Nekkonda	Veerapur	Location 1	14.82	8.26	4.95	1.89
		Veerapur	Location 2	14.15	6.84	5.91	1.78
		Nekkonda	Location 1	8.86	6.51	7.50	2.56
		Nekkonda	Location 2	13.93	6.39	9.03	1.68
		Venkatapur	Location 1	10.25	6.39	10.03	1.24
		Venkatapur	Location 2	13.41	8.75	8.05	2.78
	Khanapur	Rangapur	Location 1	11.09	5.63	7.17	2.69
		Rangapur	Location 2	10.89	9.12	8.52	1.52
		Khanapur	Location 1	13.82	7.88	4.71	2.54
		Khanapur	Location 2	9.41	7.23	9.33	1.36
	Nallabelly	Ramapuram	Location 1	9.43	8.71	5.85	2.13
		Ramapuram	Location 2	12.14	7.06	7.60	1.84
		Kondapur	Location 1	10.70	3.13	4.94	2.80
		Kondapur	Location 2	17.37	9.64	9.50	3.24
	Narsampet	Narsampet	Location 1	13.98	8.65	7.17	1.30
		Narsampet	Location 2	10.11	7.58	6.45	2.21
		Ramavaram	Location 1	13.81	12.16	6.07	1.82
		Ramavaram	Location 2	15.43	6.30	9.47	2.78
	Duggondi	Laxmipur	Location 1	18.17	4.56	3.56	1.10
		Laxmipur	Location 2	14.88	6.30	6.89	2.98
Polaram		Location 1	11.43	5.58	9.99	1.95	
Polaram		Location 2	10.14	3.35	7.55	1.54	
Karimnagar	Huzurabad	Singapur	Location 1	11.30	6.14	8.66	2.79
		Singapur	Location 2	18.77	6.92	6.57	1.63
		Sirsapalle	Location 1	18.54	6.97	4.99	1.74
		Sirsapalle	Location 2	10.66	3.11	4.70	2.88
	Jammikunta	Korapalli	Location 1	14.72	4.47	4.00	1.51
		Korapalli	Location 2	10.68	6.36	6.15	2.13
		Madipalli	Location 1	9.10	2.64	4.01	1.86
		Madipalli	Location 2	16.54	8.47	3.70	2.40
	Choppadandi	Choppadandi	Location 1	11.00	10.70	7.31	2.11
		Choppadandi	Location 2	13.31	10.44	6.95	1.70
		Bhupalapatnam	Location 1	17.59	8.52	7.83	2.81
		Bhupalapatnam	Location 2	16.33	11.58	4.48	1.24
Thimmapur	Mallapur	Location 1	13.84	7.39	5.91	2.07	
	Mallapur	Location 2	21.46	6.47	5.29	1.44	
	Thimmapur	Location 1	12.65	5.82	7.50	2.63	
	Thimmapur	Location 2	9.23	8.44	5.54	1.67	

Table 1: Continue...



District	Mandal	Village	Location	Disease incidence (%)			
				<i>kharif</i> , 2020 and <i>kharif</i> , 2021			
				Vegetative stage		Harvest stage	
				Stem rot	Collar rot	Stem rot	Collar rot
Jogulamba Gadwal	Shankarapatnam	Dharmaram	Location 1	14.48	6.33	4.78	2.52
		Dharmaram	Location 2	13.15	6.40	7.27	2.73
		Kannapur	Location 1	13.58	7.85	5.47	1.95
		Kannapur	Location 2	19.44	4.13	4.00	1.59
	Gadwal	Atmakur	Location 1	9.94	8.50	3.02	2.51
			Location 2	12.50	5.24	4.80	2.30
		Pudur	Location 1	13.37	8.85	2.63	2.21
			Location 2	14.31	5.04	4.28	2.45
	Itikyala	Itikyal	Location 1	12.37	3.36	4.23	2.18
			Location 2	17.44	5.79	7.24	1.82
		Chagapur	Location 1	10.14	3.88	5.71	2.95
			Location 2	15.22	6.73	3.09	1.69
	Ghattu	Ghattu	Location 1	16.61	5.69	2.46	1.57
			Location 2	11.75	8.53	5.15	2.69
		Macherla	Location 1	13.74	2.92	3.35	1.73
			Location 2	11.96	8.10	5.31	1.99
	Alampur	Bairampalle	Location 1	11.64	7.68	3.09	2.83
			Location 2	15.08	3.80	4.79	1.35
		Sultanpur	Location 1	10.75	5.25	7.52	2.14
			Location 2	15.97	6.27	3.00	2.08
Rajoli	Thummella	Location 1	10.32	4.97	4.62	2.41	
		Location 2	15.87	5.06	2.87	2.53	
	Nasnur	Location 1	17.28	6.67	1.76	1.61	
		Location 2	17.02	4.05	3.64	2.23	
Nalgonda	Chandur	Chandur	Location 1	14.71	7.78	6.11	2.21
		Chandur	Location 2	6.97	6.68	5.54	2.22
		Kondapuram	Location 1	8.34	9.66	2.32	1.45
		Kondapuram	Location 2	8.91	7.19	5.84	2.92
	Devarakonda	Kacharam	Location 1	10.96	5.16	4.38	2.24
			Location 2	12.04	6.62	4.97	1.21
		Devarkonda	Location 1	8.09	6.46	2.67	2.46
			Location 2	13.23	6.40	6.90	1.65
	Chandampeta	Chitriyala	Location 1	10.00	4.39	5.43	1.72
			Location 2	6.16	5.93	6.99	2.63
		Pogilla	Location 1	10.56	4.49	3.10	2.68
			Location 2	5.38	8.35	8.13	1.73
	Gurrampode	Kondapur	Location 1	10.59	5.20	5.34	1.36

Table 1: Continue...



District	Mandal	Village	Location	Disease incidence (%)			
				<i>kharif, 2020 and kharif, 2021</i>			
				Vegetative stage		Harvest stage	
				Stem rot	Collar rot	Stem rot	Collar rot
		Kondapur	Location 2	8.73	3.57	4.93	2.02
		Mailapur	Location 1	10.02	5.27	6.71	1.96
		Mailapur	Location 2	6.57	7.23	3.94	1.60
	Chinthapalle	Kurmapalli	Location 1	9.25	3.96	3.72	2.43
		Kurmapalli	Location 2	9.63	7.00	5.47	1.43
		Varkal	Location 1	10.20	5.83	7.47	2.20
		Varkal	Location 2	5.43	5.95	2.50	1.38

Village wise pooled analysis data of two years of surveys at vegetative to pod formation stage revealed that the disease incidence of stem rot ranged from 8.31 to 22.05% and collar rot incidence was ranged from 4.61 to 10.57% (Table 2). Highest per cent disease incidence of stem rot was recorded in Kalvapalle village of Mahabubabad district (22.05%) while the highest incidence of collar rot was recorded in Choppadandi village of Karimnagar district (10.57%). The lowest incidence of stem rot (7.81%) was recorded in Varkal village of Nalgonda

district and lowest collar rot incidence (3.27%) was recorded in Chakalpalle village of Wanaparthy district respectively. On the other hand, at harvest stage maximum stem rot incidence (9.04%) was observed in Venkatapur village of Warangal district and maximum collar rot incidence (4.31%) was observed in Gundyala village of Mahabubnagar district. Lowest stem rot incidence (1.41%) was recorded in Gurthur village of Mahabubabad district while, lowest collar rot incidence (1.69%) was recorded in Kondapur village of Nalgonda district .

Table 2: Pooled data analysis of two years for stem rot and collar rot diseases at vegetative and harvest stage of groundnut in farmers' field during *kharif, 2020 and kharif, 2021* surveys in Telangana state

District	Mandal	Village	Disease incidence (%)			
			<i>kharif, 2020 and kharif, 2021</i>			
			Vegetative stage		Harvest stage	
			Stem rot	Collar rot	Stem rot	Collar rot
Wanaparthy	Gopalpet	Buddharam	18.17	9.01	4.27	2.92
		Chakalpalle	18.06	3.27	5.75	2.82
	Peddamandadi	Pamireddipalle	17.29	4.61	4.08	2.22
		Veeraipalle	14.91	5.72	3.64	3.13
	Revally	Shanaipalle	20.30	5.96	2.85	2.19
		Thalpunur	16.59	6.08	3.29	2.41
	Pangal	Mallaipalle	15.32	6.87	3.92	2.25
Chinthakunta		14.21	5.75	4.43	2.11	
Pebbair	Pebbair	20.6	8.26	1.74	3.28	
	Ramapur	19.43	5.33	2.46	4.11	
Mahabubabad	Maripeda	Anepur	20.78	7.25	1.67	2.90
		Dharmaram	18.22	5.05	3.38	3.35
	Chinnagudur	Chinnagudur	13.28	5.01	2.51	2.86
		Gunnepalle	17.84	7.61	2.14	3.06
	Dhanthalapalle	Peddammupparam	12.61	7.60	2.05	3.18
		Kalvapalle	22.05	6.55	3.13	3.25
	Narsimhulapet	Jayapuram	19.85	8.22	2.03	3.35

Table 2: Continue...

District	Mandal	Village	Disease incidence (%)				
			<i>kharif</i> , 2020 and <i>kharif</i> , 2021				
			Vegetative stage		Harvest stage		
			Stem rot	Collar rot	Stem rot	Collar rot	
Mahabubnagar	Thorrur	Narsimhulapet	17.04	5.51	2.63	3.11	
		Khanapur	16.55	6.29	2.53	1.93	
		Gurthur	10.80	6.29	1.41	2.99	
	Mahabubnagarrural	Kodur	Kodur	18.38	8.55	2.44	2.67
			Dharmapur	12.11	7.39	2.02	2.33
		Hanwada	Gundyala	12.63	10.28	2.06	4.31
			Hanwada	12.01	5.89	2.05	2.18
	Jadcherla	Polepalle	18.74	6.11	2.06	3.15	
		Narsullabadh	13.15	5.79	1.61	2.50	
	Nawabpet	Pomal	15.27	8.65	3.04	2.56	
Kamaram		10.93	6.81	3.71	3.18		
Nagarkurnool	Bhoothpur	Annasagar	11.92	7.06	5.05	3.05	
		Tadparthy	17.30	8.37	4.11	2.51	
	Achampet	Chandapur	13.84	7.94	1.93	2.74	
		Rangapur	16.39	6.85	2.41	2.44	
	Amrabad	Laxmapur	17.99	10.27	2.18	2.49	
		Chitlamkunta	15.98	7.59	2.42	2.50	
	Kalwakurthy	Thotapalle	15.03	10.24	2.12	2.27	
		Gundur	16.46	5.67	4.15	2.06	
	Kollapur	Ramapur	13.27	8.17	5.18	1.98	
		Somasila	12.14	8.85	7.75	1.99	
Jagtial	Charakonda	Charakonda	13.29	7.01	4.94	1.74	
		Kamalapur	15.06	9.10	6.30	1.92	
		Dharur	21.35	7.92	6.32	2.25	
	Jagtial	Thippannapeta	15.19	4.98	8.08	2.23	
		Sarangapur	Potharam	18.25	6.54	5.49	2.50
		Konapur	14.15	6.18	6.54	2.21	
	Dharmapuri	Arepalle	16.50	7.40	6.21	2.40	
		Thimmapur	17.38	7.58	3.76	2.73	
	Gollapalle	Chilvakodur	15.95	8.11	4.56	1.94	
		Laxmipur	8.31	5.06	6.90	2.39	
Raikal	Itkyal	11.50	5.14	8.21	2.22		
	Veerapur	14.48	7.55	5.43	1.84		
Warangal	Nekkonda	Nekkonda	11.40	6.45	8.26	2.12	
		Venkatapur	11.83	7.57	9.04	2.01	
	Khanapur	Rangapur	10.99	7.37	7.84	2.11	
		Khanapur	11.61	7.55	7.02	1.95	
	Nallabelly	Ramapuram	10.78	7.88	6.72	1.98	

Table 2: Continue...



District	Mandal	Village	Disease incidence (%)				
			<i>kharif, 2020 and kharif, 2021</i>				
			Vegetative stage		Harvest stage		
			Stem rot	Collar rot	Stem rot	Collar rot	
Karimnagar	Narsampet	Kondapur	14.04	6.38	7.22	3.02	
		Narsampet	12.05	8.11	6.81	1.76	
		Ramavaram	14.62	9.23	7.77	2.3	
	Duggondi	Laxmipur	16.52	5.43	5.22	2.04	
		Polaram	10.79	4.46	8.77	1.74	
	Huzurabad	Singapur	15.03	6.53	7.61	2.21	
		Sirsapalle	14.60	5.04	4.84	2.31	
	Jammikunta	Korapalli	12.70	5.41	5.07	1.82	
		Madipalli	12.82	5.55	3.86	2.13	
	Choppadandi	Choppadandi	12.15	10.57	7.13	1.91	
		Bhupalapatnam	16.96	10.05	6.15	2.02	
	Thimmapur	Mallapur	17.65	6.93	5.60	1.76	
		Thimmapur	10.94	7.13	6.52	2.15	
	Shankarapatnam	Dharmaram	13.82	6.36	6.02	2.62	
		Kannapur	16.51	5.99	4.74	1.77	
Jogulamba Gadwal	Gadwal	Atmakur	11.22	6.87	3.91	2.41	
		Pudur	13.84	6.95	3.45	2.33	
	Itikyala	Itikyal	14.90	4.58	5.73	2.00	
		Chagapur	12.68	5.30	4.40	2.32	
	Ghattu	Ghattu	14.18	7.11	3.80	2.13	
		Macherla	12.85	5.51	4.33	1.86	
	Alampur	Bairampalle	13.36	5.74	3.94	2.09	
		Sultanpur	13.36	5.76	5.26	2.11	
	Rajoli	Thummella	13.10	5.01	3.74	2.47	
		Nasnur	17.15	5.36	2.70	1.92	
	Nalgonda	Chandur	Chandur	10.84	7.23	5.82	2.22
			Kondapuram	8.63	8.42	4.08	2.18
		Devarakonda	Kacharam	11.50	5.89	4.68	1.73
			Devarkonda	10.66	6.43	4.78	2.06
		Chandampeta	Chitriyala	8.08	5.16	6.21	2.17
Pogilla			7.97	6.42	5.62	2.20	
Gurrampode		Kondapur	9.66	4.39	5.14	1.69	
		Mailapur	8.29	6.25	5.32	1.78	
Chinthapalle		Kurmapalli	9.44	5.48	4.59	1.93	
		Varkal	7.81	5.89	4.98	1.79	

Stem rot caused by *Sclerotium rolfsii* was invariably present in all fields, irrespective of the locations and cropping system followed by the farmers. The disease incidence from vegetative stage was higher compared to the harvest stage which is mentioned in the Table 3 and was ranged from 8.02 to 20.02% in Telangana districts. Among the mandals, mean stem rot incidence was highest (20.02%) in Pebbair mandal of Wanaparthy district followed by Maripeda mandal of Mahabubabad district (19.50%), Narsimhulapet mandal of Mahabubabad district (18.45%) and Revally mandal of Wanaparthy district (18.45%) whereas, the lowest stem rot incidence (8.02%) was observed in Chandampeta mandal of Nalgonda district followed by Chinthapalle mandal of Nalgonda district (8.63%), Gurrampode mandal of Nalgonda district (8.97%) and Chandur mandal of Nalgonda district (9.73%).

Table 3: Mandal wise pooled data of stem rot and collar rot incidence during *kharif*, 2020 and *kharif*, 2021 in major ground nut growing areas of Telangana state

District	Mandal	Disease incidence (%)			
		<i>kharif</i> , 2020 and <i>kharif</i> , 2021			
		Vegetative stage		Harvest stage	
		Stem rot	Collar rot	Stem rot	Collar rot
Wanaparthy	Gopalpet	18.12	6.14	5.01	2.87
	Peddmandadi	16.10	5.17	3.99	2.67
	Revally	18.45	6.02	3.07	2.30
	Pangal	14.76	6.31	4.17	2.18
	Pebbair	20.02	6.80	2.10	3.69
Mahabubabad	Maripeda	19.50	6.15	2.52	3.13
	Chinnagudur	15.56	6.31	2.32	2.96
	Dhanthalapalle	17.33	7.07	2.59	3.21
	Narsimhulapet	18.45	6.87	2.33	3.23
	Thorrur	13.67	6.29	1.97	2.46
Mahabubnagar	Mahabubnagarrural	15.25	7.97	2.23	2.50
	Hanwada	12.32	8.09	2.06	3.24
	Jadcherla	15.94	5.95	1.83	2.83
	Nawabpet	13.10	7.73	3.38	2.87
	Bhoothpur	14.61	7.72	4.58	2.78
Nagarkurnool	Achampet	15.11	7.40	2.17	2.59
	Amrabad	16.99	8.93	2.30	2.49
	Kalwakurthy	15.74	7.95	3.14	2.17
	Kollapur	12.70	8.51	6.46	1.98
	Charakonda	14.17	8.06	5.62	1.83
Jagtial	Jagtial	18.27	6.45	7.20	2.24
	Sarangapur	16.20	6.36	6.01	2.35
	Dharmapuri	16.94	7.49	4.98	2.56
	Gollapalle	12.13	6.58	5.73	2.16
	Raikal	12.99	6.35	6.82	2.03
Warangal	Nekkonda	11.61	7.01	8.65	2.07
	Khanapur	11.30	7.46	7.43	2.03
	Nallabelly	12.41	7.13	6.97	2.50
	Narsampet	13.33	8.67	7.29	2.03
	Duggondi	13.65	4.95	7.00	1.89



District	Mandal	Disease incidence (%)			
		<i>kharif</i> , 2020 and <i>kharif</i> , 2021			
		Vegetative stage		Harvest stage	
		Stem rot	Collar rot	Stem rot	Collar rot
Karimnagar	Huzurabad	14.82	5.79	6.23	2.26
	Jammikunta	12.76	5.48	4.46	1.98
	Choppadandi	14.56	10.31	6.64	1.97
	Thimmapur	14.30	7.03	6.06	1.95
	Shankarapatnam	15.16	6.18	5.38	2.20
JogulambaGadwal	Gadwal	12.53	6.91	3.68	2.37
	Itikyala	13.79	4.94	5.07	2.16
	Ghattu	13.51	6.31	4.07	2.00
	Alampur	13.36	5.75	4.60	2.10
	Rajoli	15.12	5.19	3.22	2.20
Nalgonda	Chandur	9.73	7.82	4.95	2.20
	Devarakonda	11.08	6.16	4.73	1.89
	Chandampeta	8.02	5.79	5.91	2.19
	Gurrapode	8.97	5.32	5.23	1.73
	Chinthapalle	8.63	5.68	4.79	1.86

Conversely at harvest stage, the average stem rot incidence was highest (8.65%) in Nekkonda mandal of Warangal district followed by Khanapur mandal of Warangal district (7.43%) followed by Narsampet mandal of Warangal district (7.29%) and Jagtial mandal of Jagtial district (7.20%) whereas, least stem rot disease incidence (1.83%) was observed in Jadcherla mandal of Mahabubnagar district followed by Thorrur mandal of Mahabubabad district (1.97%) followed by Hanwada mandal of Mahabubnagar district (2.06%) and Pebbair mandal of Wanaparthy district (2.10%).

Groundnut cultivation is hampered by collar rot caused by *Aspergillus niger* in all groundnut growing areas. The recent survey results of the present study indicated that the average disease incidence of the collar rot from vegetative to pod formation stage ranged from 4.94 to 10.31%. The collar rot disease incidence was high in Choppadandi mandal of Karimnagar district (10.31%) followed by Amrabad mandal of Nagarkurnool district (8.93%) followed by Narsampet mandal of Warangal district (8.67%) and Kollapur mandal of Nagarkurnool district (8.51%) whereas, least collar rot disease incidence (4.94%) was observed in Itikyala mandal of Jogulamba gadwal district followed by Duggondi mandal of Warangal district (4.95%) followed by Peddamandadi mandal of Wanaparthy district (5.17%) and Rajoli mandal of Jogulamba Gadwal district (5.19%).

On the other hand, at harvest stage, the average collar rot incidence was highest (3.69%) in Pebbair mandal of

Wanaparthy district followed by Hanwada mandal of Mahabubnagar district (3.24%) followed by Narsimhulpet mandal of Mahabubabad district (3.23%) and Dhanthalapalle mandal of Mahabubabad district (3.21%) whereas, least collar rot disease incidence (1.73%) was observed in Gurrapode mandal of Nalgonda district followed by Charakonda mandal of Nagarkurnool district (1.83%) followed by Chinthapalle mandal of Nalgonda district (1.86%) and Duggondi mandal of Warangal district (1.89%).

The variance in disease incidence can perhaps be attributed to different environmental conditions viz., temperature, soil moisture content, humidity, different crop varieties grown and different cropping patterns viz., groundnut-groundnut, redgram-groundnut, greengram-groundnut, maize-groundnut and sorghum-groundnut. Higher incidence may be due to continuous cultivation of groundnut which lead to build-up of pathogen inoculum and it could also be attributed to the evolution of variants in pathogen population. This findings are consistent with those of Divya *et al.* (2017) who carried out a survey in *kharif* 2012-2013 in the major groundnut growing areas of Andhra Pradesh to determine the occurrence and distribution of stem rot and collar rot diseases.

According to them, the highest incidences of stem rot and collar rot were observed in Chittoor district of Andhra Pradesh while lowest incidences of stem rot and collar rot were observed in Mahabubnagar and Warangal districts respectively. 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 the year 2012. The collar rot incidence was highest in Srikalahasti mandal (11.21%), whereas Chandragiri mandal recorded least incidence of 6.47% (Nandeesh et al., 2013).

According to Kumar et al. (2018) stem rot disease occurs in all groundnut growing states in India with the most severe cases occurring in Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Orissa and Tamil Nadu with annual yield losses ranging from 10 to 25%. The disease prevalence can reach up to 80% during stem rot outbreaks which correspond with moist meteorological conditions at pod filling (Eslami et al., 2015).

3.1. Principal component analysis

From the principal component analysis, per cent disease

incidence evaluated in different districts of Telangana on the basis of different components (district, mandal, village, soil type, crop variety, time of sowing, crop density, crop protection, previous crop, PDI of stem rot and PDI of collar rot) were shown in the form of Eigen values (Table 4).

Scree plot (Figure 1) graphs the Eigen value against the components described above. The ideal pattern is steep curve followed by a bend and then a straight line. Flat line from the fourth component onwards suggests that each successive component is accounting for smaller and smaller amounts of the total variance. The results from the principal component analysis of recorded survey data was shown in the form of Eigen values, which shows that the highest Eigen value was recorded at district level indicates greater variability with regard to geographical location.

Table 4: Principal component analysis of stem rot and collar rot incidence in different districts of Telangana

Component	Eigen values	Proportion	Cumulative proportion	Component	Eigen values	Proportion	Cumulative proportion
a) Vegetative stage during <i>kharif</i>, 2020				c) Vegetative stage during <i>kharif</i>, 2021			
District	581.587	0.215	0.215	District	558.405	0.203	0.203
Mandal	427.586	0.158	0.374	Mandal	456.152	0.166	0.369
Village	342.302	0.127	0.5	Village	360.318	0.131	0.5
Soiltype	313.926	0.116	0.617	Soiltype	333.578	0.121	0.622
Crop variety	255.353	0.095	0.711	Crop variety	254.804	0.093	0.715
Time of Sowing	217.122	0.08	0.792	Time of sowing	234.049	0.085	0.8
Crop density	190.227	0.07	0.862	Crop density	154.133	0.056	0.856
Crop protection	106.636	0.039	0.901	Crop protection	125.851	0.046	0.902
Previous crop	103.124	0.038	0.94	Previous crop	111.101	0.04	0.942
Stem rot	91.104	0.034	0.973	Stem rot	93.446	0.034	0.976
Collar rot	72.016	0.027	1	Collar rot	65.165	0.024	1
b) Harvest stage during <i>kharif</i>, 2020				d) Harvest stage during <i>kharif</i>, 2021			
District	520.461	0.193	0.193	District	543.151	0.2	0.2
Mandal	481.033	0.179	0.372	Mandal	477.588	0.176	0.375
Village	339.7	0.126	0.498	Village	364.6	0.134	0.51
Soiltype	308.172	0.115	0.613	Soiltype	321.521	0.118	0.628
Crop variety	265.225	0.099	0.711	Crop variety	264.547	0.097	0.725
Time of sowing	234.848	0.087	0.799	Time of Sowing	204.302	0.075	0.8
Crop density	192.241	0.071	0.87	Cropdensity	182.688	0.067	0.868
Crop protection	116.575	0.043	0.914	Crop protection	115.95	0.043	0.91
Previous crop	89.307	0.033	0.947	Previous crop	100.299	0.037	0.947
Stem rot	79.013	0.029	0.976	Stemrot	79.265	0.029	0.976
Collar rot	64.438	0.024	1	Collarrot	64.47	0.024	1



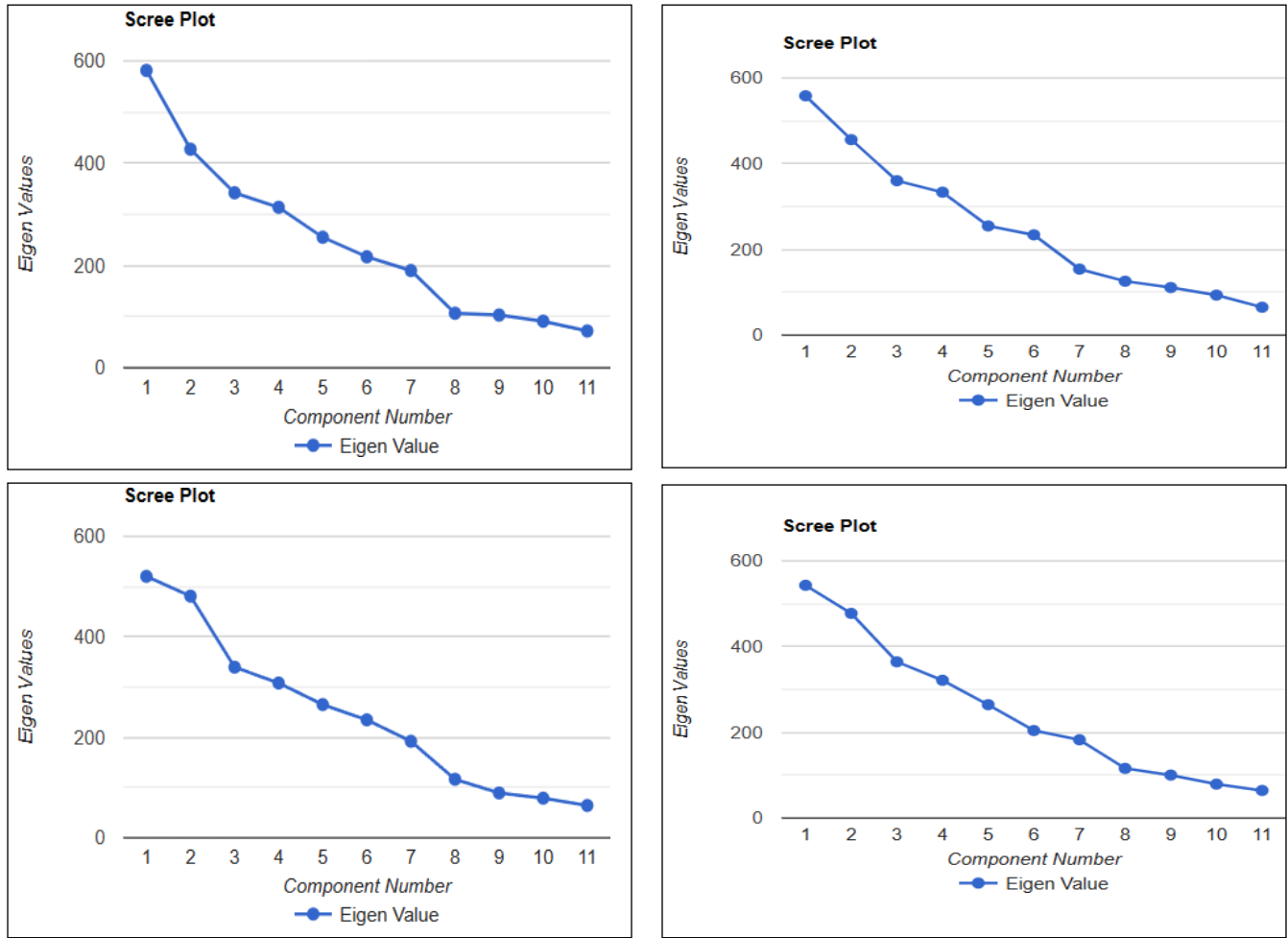


Figure 1: Scree plot for survey data of erstwhile in different districts of Telangana by using principal component analysis

4. Conclusion

The roving survey conducted during *kharif*, 2020 and *kharif*, 2021 revealed the incidence of stem rot and collar rot in major groundnut areas of Telangana ranged from 8.02 to 20.02% While, at harvesting stage it ranged from 1.83 to 8.65%. The average stem rot incidence at vegetative stage was highest in Pebbair mandal of Wanaparthy district (20.02%). The average incidence of collar rot at vegetative stage ranged from 4.94 to 10.31% and at harvesting ranged from 1.73 to 3.69%. The highest incidence of collar rot observed was in Choppadandi mandal of Karimnagar district (10.31%).

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