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Survey for the incidence of soil borne fungal diseases of groundnut in Bapatla and Prakasam districts of Andhra Pradesh

K Kiranmai, V Manoj Kumar, V Prasanna Kumari and D V Sai Ram Kumar
Department of Plant Pathology, Acharya N.G. Ranga Agricultural University ,
Agricultural College, Bapatla - 522101, Andhra Pradesh, India.

ABSTRACT

Groundnut is an important oil seed and self-pollinating leguminous crop. Soil borne diseases in groundnut often cause significant yield losses. Among the soil borne diseases, collar rot (*Aspergillus niger*) and stem rot (*Sclerotium rolfsii*) affect in many stages of crop and cause heavy yield losses. Hence, roving survey was conducted to assess the incidence of the above two soil borne diseases of groundnut in Bapatla and Prakasam districts of Andhra Pradesh during *rabi* 2023-24. In each district, three mandals were selected *viz*., Chirala, Karlapalem, Cherukupalli, Naguluppalapadu, Talluru, Kothapatnam respectively and in each mandal two villages were surveyed to record the disease incidence. Randomly five quadrants of one square meter were examined in each farmer's field. In *rabi* 2023-24, the highest mean stem rot disease incidence was 7.79 per cent in talluru mandal of prakasam district and lowest mean stem rot was 6.15 per cent in chirala mandal of bapatla district. Whereas highest mean collar rot incidence was noticed in karlapalem of bapatla district with 7.70 per cent and the lowest mean collar rot incidence in naguluppalapadu mandal of prakasam district with 6.17 per cent.

Keywords: *Collar rot, Disease incidence, Groundnut, Soil borne diseases, Survey and Stem rot.*

Groundnut (*Arachis hypogaea* L.)is an important oil seed, self-pollinating leguminous crop, belongs to family Fabaceae. It is called as the 'King of oilseeds' (Aycock, 1966). It is one of the most important food and cash crops of our country and a low priced commodity with valuable source of all the nutrients. Groundnut seeds are valued for oil (40-48%), protein (22-26%), carbohydrates (26%), fats (3%) and also contains high calcium, thiamine and niacin contents, which make a substantial contribution to human and animal nutrition. Groundnut is also known by other local names such as poor men's cashew nut, manila nut, pygmy nut, pig nut, monkey nut. It is generally distributed in the tropical, sub-tropical and warm temperate zones of the world in over 100 countries.

Globally, Groundnut is grown on an area of 29.92 m.ha, yielding 55.30 MT with a productivity of 185 kg/ha (FAOSTAT, 2020-21). In India, groundnut is grown on an area of 4.90 m.ha with a production of 10.2 MT and with an average productivity of 2075 kg/ha (INDIASTAT, 2022-23). India is the second largest producer of groundnut in the world holding 15 per cent of the global production after China (37%)

Major groundnut growing states in India are Gujarat, Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Rajasthan and Maharashtra constituting about 80 per cent of the total area and production of groundnut. Gujarat is the largest producer in India, accounting for 33% of total groundnut production, followed by Rajasthan (21%), and Tamil Nadu (14%). Andhra Pradesh accounts for seven per cent of overall groundnut production and Telangana accounting for five per cent. Anantapuram district in Andhra Pradesh is the biggest groundnut producing area, with 3.44 lakh tones production and 4.09 lakh ha area, followed by Chittoor and Kurnool. Groundnut productivity is highest in Nellore district, with 4072 kg/ha. (Agricultural Market Intelligence Centre, ANGRAU, Lam).

Soil borne diseases have been recognized as one of the major factors limiting groundnut production. Stem rot (*Sclerotium rolfsii* Sacc.) and crown/collar rot (*Aspergillus niger*) are considered threats to groundnut cultivation which can cause yield losses up to 50% (Joshi *et al*., 2020) and collar rot was reported to cause losses in yield up to 40% in India (Chohan, 1965).

Among the soil borne pathogens, *Aspergillus niger* and *Sclerotium rolfsii* are the most important fungi reported to be major limitations in groundnut production (Ghewande *et al*., 2002) and attack groundnut plants at all stages and cause pre-emergence rotting in seeds, soft rot in emerging seedlings and collar rot, stem rot in mature plants.

Stem rot disease is caused by *S. rolfsii*, an ubiquitous, polyphagous soil-borne pathogen that causes destructive plant diseases of different crop species and results in severe yield losses. The wide host range of *S. rolfsii* due to its prolific growth and ability to produce persistent sclerotia contribute to the large economic losses associated with this disease (Cilliers *et al*., 2003). Collar rot disease is caused by *Aspergillus niger*, seen during the early stages of crop growth, results in seedling mortality at higher rates and manifested as a pre and post-emergence damping-off of the affected seedlings.

The stem rot symptoms incited by *Sclerotium rolfsii* (teleomorph: *Athelia rolfsii*) was noticed at near crop maturity stage. Under field conditions, the symptoms of stem rot (Fig.2) on groundnut plants included drying of leaves and wilting of individual branches (or) the whole plant and presence of cottony white mycelial mat extended above the soil line up to the stem, rotting of the stem region and poor root development. Numerous tan to brown about mustard seed size, spherical sclerotial bodies attached around the infected stem region in later stages of infection.

The collar rot caused by the *Aspergillus niger* was observed up to maturity stage but it was more prevalent in the seedling stage. Field growing groundnut crop plants infected with collar rot disease (Fig.3) exhibited typical symptoms such as: initially, seedling rotting was appeared in the cotyledon and hypocotyl regions after germination, followed by drying and wilting of lateral branches and whole plant died. In survived plants, affected stems become shredded. Greyish white mycelium and blackish powdery mass fructifications (conidiophores and conidia) of the pathogen appeared at the entire collar region of plants finally leading to death of the crown portion.

MATERIAL AND METHODS

Roving survey was conducted to assess the incidence of soil borne fungal diseases of groundnut in Bapatla and Prakasam districts of Andhra Pradesh .during *rabi* 2023-2024.Six mandals *viz.,* Chirala, Karlapalem, Cherkupalle, Naguluppalapadu, Talluru and Kothpatnam were surveyed. In each mandal two villages were selected and in each village, two fields were surveyed at random to record the disease incidence. Randomly five quadrants of one square meter were examined in each farmer's field. Number of diseased plants and healthy plants were counted per meter square The per cent disease incidence was calculated using following formula

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

RESULTS AND DISCUSSION

During *rabi* 2023-2024, results of the survey revealed that, in Bapatla district, the highest mean stem rot incidence (7.00%) was recorded in Karlapalem mandal, followed by Cherukupalli mandal (6.73%) while the lowest average stem rot incidence was recorded in Chirala mandal (6.15%). The overall district mean for stem rot was observed to be 6.57%. Whereas, the highest average collar rot disease incidence was recorded in Karlapalem mandal (7.7%), followed by Cherukupalli mandal (7.39%) while the lowest mean collar rot disease incidence (6.68 %) was recorded in Chirala mandal with the overall district mean of 7.26%.(Table 1 and Fig 1)

In Prakasam district during *rabi* 2023-2024 the highest average stem rot incidence was recorded in Talluru mandal (7.79%), followed by Kothapatnam mandal (7.37%) while the lowest mean stem rot incidence was recorded in Naguluppalapadu mandal (6.76%) with overall district mean incidence of 7.31%. Whereas, the highest mean collar rot disease incidence was recorded in Kothapatnam mandal (7.33%), followed by Talluru mandal (6.52%) while the lowest mean collar rot disease incidence (6.17%) was recorded in Naguluppalapadu mandal with overall district mean incidence of 6.67% (Table 2 and Fig 1).

Similarly, Rani *et al*. (2016) conducted a roving survey in major groundnut growing areas of Andhra Pradesh during *kharif* 2012 and in Telangana during *rabi* 2012-13. In their study the groundnut cultivar Kadiri 6 was the prominent in all the surveyed districts. The highest incidence of stem rot and collar rot were observed in Chittoor district of Andhra Pradesh. Whereas, lowest incidences of stem rot and

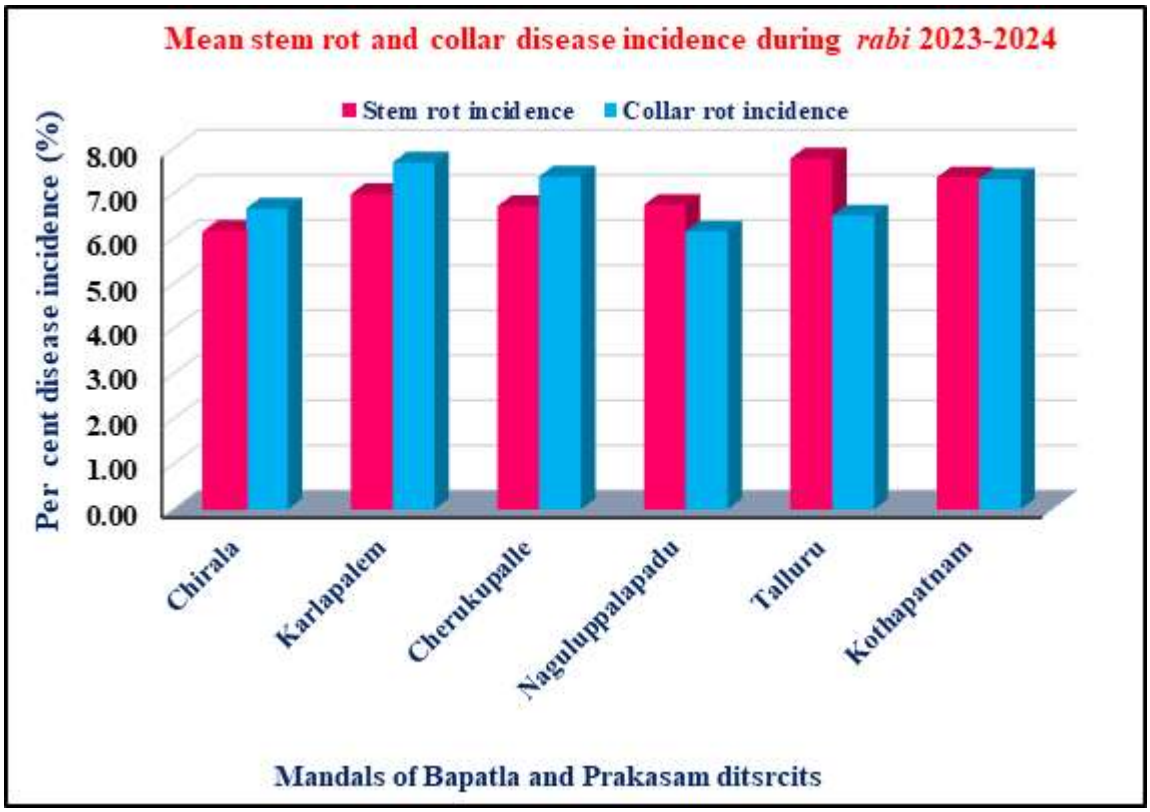

Fig. 1 Mean incidence of stem rot and collar rot diseases of groundnut in various mandals of Bapatla and Prakasam districts of Andhra Pradesh during *rabi* 2023-2024

collar rot were observed in Mahbubnagar and Warangal districts respectively.

Durga Prasad *et al*. (2009) conducted roving survey in Chittoor and Kadapa districts of Rayalaseema region of Andhra Pradesh and reported that the incidence of stem rot disease caused by *S. rolfsii* ranged from 1-85 per cent in different parts of these districts.

Nandeesha *et al*. (2013) who conducted a roving survey for the occurrence of collar rot disease in groundnut growing areas around tirupati in Andhra Pradesh and reported the highest average per cent (11.21%) of disease incidence in Srikalahasti and least (6.47%) incidence in Chandragiri.

CONCLUSION

A roving survey was conducted during *rabi* 2023-24 to assess the incidence of soil borne fungal diseases of groundnut *viz*., the stem rot and collar rot diseases in various mandals of Bapatla and Prakasam districts of Andhra Pradesh.

Results revealed that stem rot incidence was maximum in Prakasam district (7.31%) and collar rot incidence was maximum in Bapatla district (7.26%).

From the survey it was found that TAG-24 groundnut cultivar was grown predominantly in all the surveyed locations and stem rot disease incidence was noticed at near crop maturity stage whereas, collar rot was observed upto maturity stage but it was more prevalent in the seedling stage.

The occurrence of these diseases were noticed more in the sandy loamy soils when sprinkler irrigated and in majority of the surveyed areas, monocropping of groundnut is practiced resulting in high incidence of stem rot and collar rot diseases.

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Table 1. Disease prevalence of stem rot and collar rot incidence in Bapatla district of Andhra Pradesh during *rabi* 2023-2024

District	Mandal	Village	Field no.	GPS coordinates	Variety	Soil type	Situation Rainfed/Irrigated	Stage of the crop	Preceding crop	Major pre dominant weeds	Per cent Disease Incidence		Mean Disease Incidence (%) of	
											Stem rot	Collar rot	Stem rot	Collar rot
Bapatla	Chirala	Gavinivaripalem	1	15.84754N	TAG-24	Sandy loam	Irrigated	Pegging stage	Groundnut	*Parthenium hysterophorus, Celosia argentena,Amaranthus viridis,Cynodon dactylon,and Physalis minima*	6.16	7.23	5.77	6.41
				80.42781E				Pegging stage						
			2	15.84748N				Pegging stage			5.38	5.59		
				80.42783E				Pegging stage						
		Pittuvaripalem	1	15.83253N	TAG-24	Sandy loam	Irrigated	Pegging stage	Groundnut		6.68	7.18	6.52	6.96
				80.41930E				Pegging stage						
			2	15.83288N				Maturity stage			6.36	6.74		
				80.41933E				Maturity stage						
											Mandal mean		**6.15**	**6.68**
	Karlapalem	Yazali	1	15.97016N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		6.9	8	7.16	7.84
				80.57787E				Maturity stage						
			2	15.96548N				Maturity stage			7.42	7.69		
				80.60788E				Maturity stage						
		Dundivaripalem	1	15.97782N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		6.76	9.22	6.83	7.57
				80.57041E				Maturity stage						
			2	15.97744N				Maturity stage			6.89	5.91		
				80.56953E				Maturity stage						
											Mandal mean		**7**	**7.7**
	Cherukupalli	Rajole	1	16.04480N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		6.52	7.02	6.92	7.36
				80.71870E				Maturity stage						
			2	16.04491N				Maturity stage			7.32	7.7		
				80.71849E				Maturity stage						
		Anaganivaripalem	1	16.04546N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		6.29	8.49	6.54	7.42
				80.70999E				Maturity stage						
			2	16.04539N				Maturity stage			6.8	6.34		
				80.71004E				Maturity stage						
											Mandal mean		6.73	7.39
											District mean		6.57	7.26

Table 2. Disease prevalence of stem rot and collar rot incidence in Prakasam district of Andhra Pradesh during *rabi* 2023-2024

District	Mandal	Village	Field no.	GPS coordinates	Variety	Soil type	Situation Rainfed/ Irrigated	Stage of the crop	Preceding crop	Major predominant weeds	Per cent Disease Incidence		Mean Disease Incidence (%) of village	
											Stem rot	Collar rot	Stem rot	Collar rot
Prakasam	Naguluppalapadu	Kaniparthi	1	15.58335N	TAG-24	Sandy loam	Irrigated	Pod filling stage	Groundnut	*Parthenium hysterophorus*, *Celosia argenetena* *Amaranthus viridis*, *Cynodon dactylon*, *Physalis minima.* and *Cleome viscosa*	7.23	5.55	7.02	6.35
				80.21631E				Pod filling stage						
			2	15.58337N				Pod filling stage			6.80	7.14		
				80.21645E				Maturity stage						
		Kukkalavaripalem	1	15.60776N	TAG-24	Sandy loam	Irrigated	Pod filling stage	Groundnut		6.00	6.64	6.51	6.00
				80.21771E				Maturity stage						
			2	15.60783N				Maturity stage			7.02	5.35		
				80.21788E				Maturity stage						
											Mandal mean		**6.76**	**6.17**
	Talluru	Lakkavaram	1	15.71396N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		8.24	6.71	8.74	6.80
				79.78874E				Maturity stage						
			2	15.71372N				Maturity stage			9.25	6.90		
				79.78903E				Maturity stage						
		Bellamkondavaripalem	1	15.70361N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		7.15	5.46	6.83	6.25
				79.80684E				Maturity stage						
			2	15.70337N				Maturity stage			6.52	7.03		
				79.80723E				Maturity stage						
											Mandal mean		**7.79**	**6.52**
	Kothapatnam	Padarthi	1	15.47403N	TAG-24	Sandy loam	Irrigated	Maturity stage	Groundnut		7.80	9.02	7.25	7.40*
				80.19427E				Maturity stage						
			2	15.47410N				Maturity stage			6.70	5.78		
				80.19431E				Maturity stage						
		Kothapatnam	1	15.43503N	TAG-24	Sandy loam	Irrigated	Podding stage	Groundnut		6.65	8.50	7.49	7.26
				80.15879E				Maturity stage						
			2	15.44107N				Maturity stage			8.33	6.02		
				80.16635E				Maturity stage						
											Mandal mean		7.37	7.33
											District mean		7.31	6.67

Fig 2. Symptoms of stem rot infected plants showing white mycelial mat at collar region and presence of sclerotial bodies.

Fig 3. Symptoms of collar rot infected plants showing black mass of conidia at collar region

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