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Changing Scenario of Groundnut Diseases in Andhra Pradesh, Karnataka, and Tamil Nadu States of India

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The states of Andhra Pradesh, Karnataka, and Tamil Nadu are among the largest producers of groundnut (*Arachis hypogaea)* in India. Groundnut is an important food, fodder and cash crop for small-holder farmers in these states. However, the yields are very low, up to 0.9 tha^{-1} (Government of India 1995). Among several biotic and abiotic constraints of groundnut production, diseases are the major cause for poor yields in these states. Informal surveys and casual observations of researchers and farmers have indicated an increased incidence of soilborne diseases and shift in the appearance of foliar diseases. To confirm these observations, systematic structured surveys on the incidence and severity of diseases of groundnut were conducted in selected villages in these three groundnut-growing states during 1999 rainy season.

A total of 85 farmers' fields in five districts (Mahbubnagar, Kurnool, Anantapur, Cuddapah, and Chittoor) in Andhra Pradesh, 44 fields in two districts (Kolar and Raichur) in Karnataka, and 10 fields in one district (Dharmapuri) in Tamil Nadu were selected for these surveys. Each field was visited thrice during the 1999 crop season. The crop growth stages at the time of survey were: (1) seedling, (2) flowering and pod formation, and (3) physiological maturity. Data on diseases were recorded on a questionnaire schedule form. Soilborne diseases such as collar rot and stem rot, and a viral disease called bud necrosis disease (BND) were recorded as number of plants dead and calculated as the percentage of killed plants. The foliar diseases, early leaf spot (ELS), late leaf spot (LLS), and rust were scored on a 1-9 rating scale where 1 = no disease and 9 = maximum disease (Subrahmanyam et al. 1995).

Majority of the farmers grew groundnut as a sole crop in these states. A few farmers intercropped groundnut with pigeonpea (*Cajanus cajan),* pearl millet *(Pennisetum glaucum),* cowpea *(Vigna unguiculata),* or lablab bean *(Lablab purpureus).* These crops were sown after every 5-20 rows of groundnut. During the 1999 rainy season, sowings were delayed in most of the villages because of late arrival of rains. Generally groundnut crop suffered from drought from seedling to pod formation stage. The diseases observed during our surveys were collar rot, stem rot, ELS, LLS, rust, and BND in different districts of these states. The incidence and severity of these diseases is further discussed.

Collar rot. Collar rot caused by the soilborne fungus *Aspergillus niger* was observed in all the fields surveyed. The mean incidence was up to 10% in the seedling stages and up to 6% at maturity stage of the crop. More than 10% collar rot was observed in the districts of Kolar and Raichur in Karnataka and Kurnool in Andhra Pradesh (Table l).

Stem rot. Stem rot caused by *Sclerotium rolfsii* was invariably present in all fields, irrespective of the cultivar and intercropping followed by the farmers. It was found to be a potentially important disease of groundnut. The mean incidence was low (up to 4%) in the seedling stage, moderate to high (up to 16%) during flowering and pod formation stage, and very high (21%) at maturity stage of the crop. The highest disease incidence (29%) was observed in Raichur district and lowest (10%) in Chittoor district (Table l).

Bud necrosis disease. Bud necrosis disease caused by peanut bud necrosis virus (PBNV) transmitted by thrips was observed in all the farmers' fields surveyed. The disease incidence was low (up to 5%) in seedling stage and reached maximum (up to 19%) at maturity. It was 25% in Chittoor and Cuddapah districts of Andhra Pradesh and 20% in Kolar district of Karnataka (Table 1).

Early leaf spot. Early leaf spot caused by *Cercospora arachidicola,* as its name implies, appears first or in early growth stage of the crop among the foliar diseases. The mean ELS severity was low (up to 3 rating) in the seedling

Table 1. The scenario of soilborne diseases at seedling, flowering and pod-filling, and near-maturity stages of groundnut in farmers' fields during 1999 rainy season surveys in Andhra Pradesh, Karnataka, and Tamil Nadu states of India.

District	No. of fields observed	Disease incidence[1] (range %)								
		CR			SR			BND		
		SS	FP	NM	SS	FP	NM	SS	FP	NM
Andhra Pradesh										
Mahbubnagar	12	3-9	5-9	5-6	0-4	1-10	5-18	0-5	1-6	4-16
Kurnool	16	3-10	4-7	4-5	2-9	4-16	3-27	1-5	3-9	6-15
Anantapur	21	2-8	2-5	2-6	0-2	2-18	2-15	0-4	2-8	3-18
Cuddapah	16	3-8	4-9	4-5	0-2	3-18	3-25	0-4	6-9	10-25
Chittoor	20	2-9	3-9	3-4	1-4	2-8	2-10	1-7	3-15	4-25
Karnataka										
Raichur	18	2-12	3-8	3-6	0-4	2-25	2-29	0-9	7-12	11-19
Kolar	26	2-14	2-8	2-6	0-3	2-16	3-23	0-5	3-10	5-20
Tamil Nadu										
Dharmapuri	10	2-9	2-8	2-8	0-3	2-14	3-24	0-4	4-12	6-19
Mean		2-10	3-8	3-4	0-4	2-16	3-21	0-5	4-10	6-19

1. CR = Collar rot; SR = Stem rot; BND = Bud necrosis disease; SS = Seedling stage; FP = Flowering and pod-filling stage; NM = Near-maturity stage.

stage and moderate (up to 5 rating) in the flowering and pod formation stage in all the districts (Table 2). It was found associated with defoliation at early growth stages of the crop and was not observed at later stages of crop growth. With the onset of favorable weather for foliar diseases, ELS was masked by LLS.

Late leaf spot. Late leaf spot caused by *Phaeoisariopsis personata* was commonly observed in all the farmers' fields at all the growth stages in all the three states. The disease progressed slowly in the beginning and its epidemic reached up to 8 rating at maturity in most of the farmers' fields. Its mean severities were around 2 rating during seedling stage, up to 4 rating in the flowering and pod filling stage, and high (up to 7) in near-maturity growth stage (Table 2).

Rust. Rust caused by *Puccinia arachidis* was observed in all the districts surveyed. Disease severity was low (2 to 3 rating) in the seedling stage except in Raichur and Mahbubnagar districts where the severity was rated 4 to 5. The higher severity of rust in the seedling stage in these two districts was due to early infection from an irrigated summer (March-April sown) crop. It appeared that the summer crop acted as an inoculum reservoir of ELS, LLS, and rust for infection and spread these diseases to rainy season crop. In general the mean severity of rust in other surveyed fields was moderate (up to 5 rating) during the flowering and pod formation stage and high (up to 8 rating) towards maturity (Table 2). The highest rust severity (9 rating) was recorded in the districts of Anantapur, Raichur, and Dharmapuri (Table 2).

Among soilborne diseases, collar rot appeared to be the predominant seedling disease and caused seedling mortality which resulted in poor plant stand. Though stem rot occurred in the seedling stage, its incidence increased as the crop grew older and reached maximum at maturity. It caused death of the plants as well as rotting of pods. Collar rot and stem rot diseases were earlier considered less important, but were now found to be potential constraints to groundnut production. During these surveys, the two diseases were found to cause substantial yield losses. Farmers considered stem rot as a disease of growing concern of groundnut. Among the foliar diseases, ELS appeared in the early growth stage to flowering and pod formation stage of the crop and later masked by LLS and rust. Hence it was not observed at later stages. LLS and rust generally appeared during the flowering and pod formation stage and continued to increase till maturity causing severe defoliation (up to 90%) and withering of

Table 2. The scenario of foliar diseases at seedling, flowering and pod-filling, and near-maturity stages of groundnut in farmers' fields during 1999 rainy season surveys in Andhra Pradesh, Karnataka, and Tamil Nadu states of India.

District	No. of fields observed	Disease score[1] (range)							
		ELS		LLS			Rust		
		SS	FP	SS	FP	NM	SS	FP	NM
Andhra Pradesh									
Mahbubnagar	12	1-3	2-4	1-2	3-4	4-8	2-4	3-7	5-8
Kurnool	16	1-3	2-4	1-2	2-3	4-7	2-3	2-6	4-7
Anantapur	21	1-2	2-5	1-3	1-3	4-7	1-3	1-4	4-9
Cuddapah	16	1-2	3-4	1-2	2-3	5-7	1-2	2-3	5-7
Chittoor	20	1-3	3-5	1-2	1-3	2-6	1-3	1-4	2-7
Karnataka									
Raichur	18	1-3	3-6	1-2	3-6	5-7	2-5	5-8	7-9
Kolar	26	1-3	2-4	1-3	1-5	4-8	1-2	1-5	4-8
Tamil Nadu									
Dharmapuri	10	1-2	2-4	1-2	2-4	6-8	1-2	2-4	6-9
Mean		1-3	2-5	1-2	2-4	4-7	1-3	2-5	5-8

1. Rating on 1-9 scale where 1 = no disease, and 9 = maximum disease.
ELS = Early leaf spot; LLS = Late leaf spot; SS = Seedling stage; FP = Flowering and pod-filling stage; NM = Near-maturity stage.

foliage in the susceptible groundnut cultivars commonly grown by farmers. The intercropping pattern currently followed by the farmers, irrespective of the crop species involved, did not have any influence on the incidence and severity of diseases of groundnut. However, groundnut rows adjacent to the intercropped row had more disease than the groundnut crop farthest from the intercropped row.

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Evaluation of Wild *Arachis* Germplasm Accessions for In Vitro Seed Colonization and Aflatoxin Production by *Aspergillus flavus*

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A high level of stable resistance to aflatoxin contamination (infection by *Aspergillus flavus* and production of aflatoxin) has not been identified in cultivated groundnut (*Arachis hypogaea),* although several genotypes are reported to possess resistance to seed colonization, seed invasion and/or aflatoxin production (Mehan 1989, Waliyar et al. 1994, Upadhyaya et al. 1997). ICRISAT has a collection of 413 accessions of wild *Arachis* spp, the majority of which, have not been evaluated for resistance to aflatoxin contamination. Previously 16 species (9 belonging uniformly to section *Arachis,* 3 to *Erectoides,* 2 to *Rhizomatosae,* and one each to *Extranervosae* and *Triseminatae)* were