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Current Distribution of Groundnut Rust in India*

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Summary. Groundnut rust (*Puccinia arachidis*), which has long been considered as endemic to the Western Hemisphere, has spread to many countries in Asia, Australia and Africa in recent years. In India it was first observed in 1969 in Punjab State and subsequently in many other groundnut growing states. In our surveys we observed severe damage to the crop in Tamilnadu, Andhra Pradesh and parts of Karnataka and Maharashtra States. The pathogen is very well established in these States probably because of extensive and continuous cropping. Although we noted rust in Gujarat State the damage to the crop was negligible. This is the first report of groundnut rust in Gujarat. The disease was not found by us in Punjab State. Only uredospores were noticed on specimens collected from different parts of India.

Introduction

India is the world's largest producer of groundnuts (*Arachis hypogaea* L.) and in 1977 some 6.95 million hectares were planted and 6.5 million tonnes were harvested at an average yield of 935 kg/ha (Anon., 1977a). The States of Gujarat, Andhra Pradesh, Maharashtra, Tamilnadu and Karnataka contribute approximately 80% of the total production (Anon., 1977b). The crop is mostly grown under rainfed (Kharif) conditions and few groundnuts are grown in the dry (Rabi) season (Anon., 1977b).

Loss due to diseases is one of the most important factors contributing to low yields. Leaf spots (*Cercosporidium personatum*) (Berk. & Curt.), Deighton and *Cercospora arachidicola* Hori), stem rot (*Sclerotium rolfsii* Sacc.), crown and collar rot (*Aspergillus niger* van Tieghem), seed rots (species of *Rhizopus, Rhizoctonia, Pythium* and *Fusarium*), root rots (species of *Pythium* and *Rhizoctonia)* are regarded as important in India (Chohan, 1974).

Groundnut rust caused by *Puccinia arachidis* Speg. has long been regarded as endemic to the Western Hemisphere (Bromfield, 1971). However, the disease was also recorded in USSR (Jaczewski, 1912), Mauritius (Stockdale, 1914) and the mainland of China (Tai, 1937). Commercial production of groundnut is restricted in the Caribbean islands and Central America because of rust and leaf spots. However, rust is not regarded as a serious problem in the USA (Hammons, 1977).

In recent years it had spread to many countries in Asia and Oceania including Thailand, Japan, Malaysia, Brunei, Korea, Philippines, Papua New Guinea, Indonesia (Bromfield, 1974), India (Mayee *et al.*, 1977), Australia (O'Brien, 1977) and African countries such as Rhodesia, Botswana, Kenya, Malawi, Mozambique, Republic of South Africa, Tanzania, Uganda, Zambia and Nigeria (Rothwell, 1975; Raemaekers and Preston, 1977; McDonald and Emechebe, 1978).

The present paper deals with the current distribution of groundnut rust in India and its importance in various States. The information presented in this report was obtained during surveys in all the major groundnut growing States during 1976 to 1978 and also through personal contacts with scientists working on groundnut diseases.

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Reports on rust occurrence in India

Chahal and Chohan (1971) reported finding rust in July 1969 on plants growing in a glasshouse (not on a field crop) at Punjab Agricultural University, Ludhiana, in the far north of India. This was the first report of rust outside the Western Hemisphere in nearly three decades. Chahal and Chohan recorded only teliospores on the diseased leaves but did not give details of spore morphology. In personal communications the junior author (J. S. Chohan) stated that the morphology of teliospores was similar to that described by Arthur (1934). It is important to note that this was the first published report of the occurrence of teliospores of groundnut rust on *A. hypogaea* since Spegazzini's original description of the fungus in 1884. Since 1969 only Hennen *et al.* (1976) have reported teliospores of *P. arachidis* on *A. hypogaea.* In this case, the teliospores were found within uredinia on cv. 'Tatu' of *A. hypogaea* and this was after artificial inoculation in the glasshouse.

In 1971, four independent observations were made simultaneously on the occurrence of groundnut rust from widely different areas in India. During July—August rust was found in the Maduravoyal field laboratory of the Botany Department, University of Madras in Tamilnadu State (Bhama, 1972). In October it was observed in the field and also in the glasshouse at the S. V. Agricultural College, Tirupati, Andhra Pradesh State (Ramakrishna and Subbayya, 1973), which is located about 100 miles from Madras. In November rust was noticed on the Central Farm of the Tamilnadu Agricultural University, Coimbatore, located in the southwest of Tamilnadu (Shanmugam *et al.*, 1972) and also in the glasshouse of the State Agricultural Research Institute in Calcutta on the Ganges in West Bengal State (Sharma and Mukerji, 1972).

In subsequent years a number of reports appeared on the occurrence of groundnut rust from different States. During May 1972 rust was observed on potted plants at the Regional Research Station, Dharwar, and also recorded on a field crop in Bijapur and Belgaum districts which constitute the important groundnut production areas in Karnataka State (Puranik *et al.*, 1973). In October 1973 rust was recorded on experimental plants at the College of Agriculture, Indore, Madhya Pradesh (Khosla *et al.*, 1974) and in October 1974 it was also recorded in Jabalpur (Sharma and Kulkarni, 1974) which is close to Indore. Rust was noticed in Rahuri, Maharashtra State in 1973 (Shinde and More, 1975) and a severe outbreak of groundnut rust was reported over almost all areas under groundnut cultivation in Marathwada region (Parbhani, Nanded, Osmanabad, Bhir and Aurangabad districts) of Maharashtra State during 1975 (Garud *et al.*, 1976). It was also reported as a serious disease in Jalgaon, Maharashtra State (Anon., 1976). Rust was also recorded in Dholi (Misra and Misra, 1975) and Ranchi (Singh, 1977) areas in Bihar State. Considerable damage to the groundnut crop due to rust was noticed in Gauhati, Assam State (Goswami, 1974). Rust was also recorded from Uttar Pradesh in 1975 (Yadav *et al.*, 1975).

Groundnut rust quickly became pandemic in South India. In 1973 the disease caused much destruction of the crop in all key groundnut growing districts of Andhra Pradesh (Anantapur, Kurnool, Chittoor and Cuddapah) (Subrahmanyam, unpublished). It was also reported to be a serious disease in Visakhapatnam (Mallaiah, 1976), Karimnagar, Hyderabad and Kadiri (Anon., 1976) areas of Andhra Pradesh.

In all the above reports only the presence of uredospores was recorded. Mayee *et al.* (1977) have recently reviewed the rust problem in India and conclude that the trend to continuous cultivation of groundnuts in parts of India has contributed to the increasing economic importance of this disease. They point out that at present no suitable control measures exist and serious epidemics may be expected.

ICRISAT surveys in India

As already stated the major groundnut production in India is from Gujarat, Andhra Pradesh, Maharashtra, Tamilnadu and Karnataka States. A systematic roving survey was made during 1976—78 growing seasons to get a picture of the situation of groundnut rust in these States. At the same time, as the first report on the occurrence of groundnut rust was from Punjab, we also surveyed important groundnut growing areas in Punjab State. Fields located adjacent to the road were surveyed at about six widely different areas in each district and the overall situation is shown on the map (Fig. 1). The size of the fields varied from 0.5 to 5 ha and the crops observed were in the pod-forming stage to near maturity. Samples of diseased specimens were collected from each location for laboratory examination.

Severe damage was observed in 1976, 1977 and 1978 in Anantapur, Cuddapah, Kurnool, Chittoor, Medak, Mahboobnagar, Khammam, Hyderabad, Nalgonda, Nellore, Prakasam, Guntur and Krishna districts of Andhra Pradesh. On the kharif crop in many fields only withered stems were observed due to heavy defoliation caused by rust in combination with leaf spots (Figs. 2 and 3).

Fig. 1. Distribution map of groundnut rust in India 1976–1978.

Fig. 2. Rust of groundnut caused by *Puccinia arachidis* (larger lesions are *Cercospora* leaf spot).

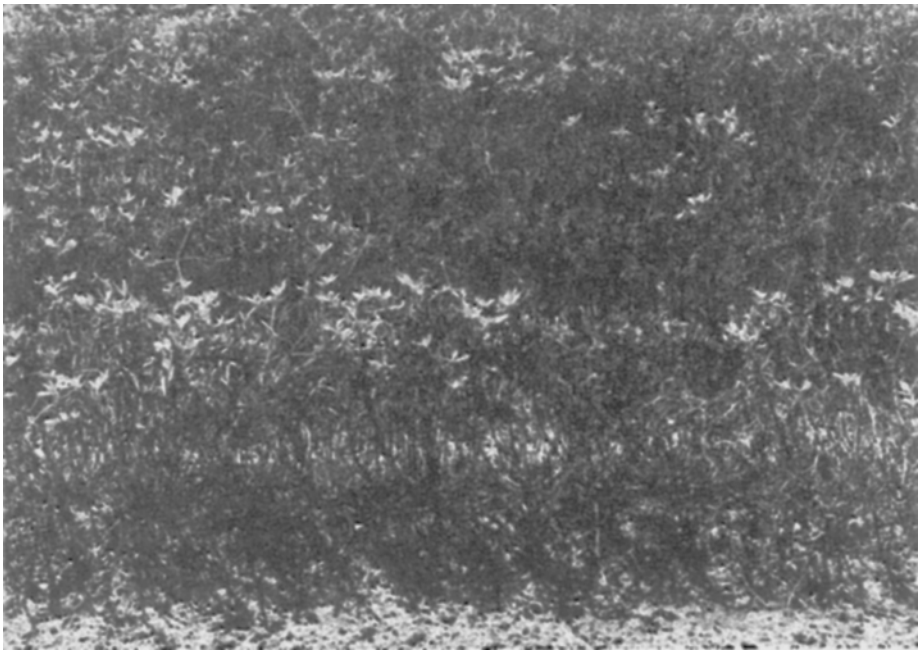

Fig. 3. Groundnut crop damaged by rust and leaf spot on ICRISAT farm during the 1977 rainy season. Note the severe leaf shed and also death of plants.

Rust was found to be destructive in North Arcot, South Arcot, Chingleput, Pudukkottai, Tiruchirapalli, Madurai, Ramnathapuram, Coimbatore, Salem, Dharmapuri and Tanjavoor districts of Tamilnadu and also in Pondicherry during the 1976 kharif season. In Karnataka it was noticed in serious proportions in Bangalore, Tumkur, Chitradurga, Bijapur, Bidar, Bellary, Kolar and Mysore districts during the 1977 kharif season.

In the 1977 kharif season two survey trips were made to Ludhiana and Kapurthala districts of Punjab State. The second trip was made when the crop was nearing maturity. No groundnut rust was found in Punjab during either of these survey trips.

Our disease surveys in Maharashtra and Gujarat States during the 1977 rainy season revealed some interesting facts about rust. Rust was noticed in Parbhani, Aurangabad, Dhule and Pune districts of Maharashtra in varying severity. It was found to be highly destructive in Ahmednagar, Satara, Kolhapur, Sangli, Sholapur and Osmanabad districts. Although rust was present in Sabarkantha and Dang districts of Gujarat State it was not serious. It was also noticed in the Satpura mountains of Gujarat State where groundnut is grown in small isolated pockets by local tribes. These observations represent the first record of groundnut rust occurrence in Gujarat, the largest groundnut producing State of India.

Groundnut rust has not yet been observed in Junagadh, Rajkot, Surendranagar, Ahmedabad, Vadodara, Surat and Valsad districts of Gujarat State, Nasik district of Maharashtra State and Shimoga, South Kanara, Hassan and Coorg districts of Karnataka State although it is present in the neighbouring districts. According to P. K. Patel and S. M. Jani (personal communication) rust was found in Junagadh district in the 1974 rainy season but it has not been evident since then.

At present rust is very destructive in Andhra Pradesh, Tamilnadu and parts of Karnataka and Maharashtra. The pathogen is very well established in these States probably because of extensive and continuous cropping. Microscopic examination of rust specimens collected from different parts of India revealed only the presence of uredospores.

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