
REVIEW OF
LITERATURE

Groundnut rust :

Occurance of Rust outside India :

The rust of groundnut caused by Puccinia arachidis Speg. has been known to Mycologist since 1884 from specimens on cultivated groundnut plants collected in Caaguazu paraguay (Spegazzini, 1884). Since then rust was recorded from Jamaica on groundnut crop nearing maturity (Hansford, 1924), Ciferri (1926) recorded the rust from Haina Dominican Republic for the first time and identified pathogen as Uredo arachidi. It was recorded from French colonies especially in West Africa and identified as Uredo arachidis (Maublanc, 1924).

West (1931) from Gainesville florida detected the rust in the uredinial stage and named it as Bullaria arachidis (Speg.) Arthur & Mains. His belief was that the fungus was introduced from Brazil through seeds.

In the first decade of the present century, rust was reported from the Island of Mauritius in the Indian ocean by Wiehe (1948). However, recent reports indicated that the diseases was not found on the Island since 1930 (Bhama, 1972). Bromfield (1974) documented the report of this disease in U.S.S.R. and in 1937 in China. Kern (1938) recorded the rust for the first time from Venezuelan South America. Ward (1940 and Larter, et al., 1940) simultaneously

noted the occurrence of rust in isolated areas in Jamaica. Kenknight (1941) observed that rust in several selections in experimental fields in Wilson country early in October and by the end of October. The disease was present in Frio country. This appeared to be first record from Texas. The rust was reported in distribution map of plant diseases in CMI by Bavendram (1948). Castellani (1958) reported rust from Dominican Republic. Litzenberger & Stevenson (1951) reported rust from Nicaragua and Toler et al., (1959) recorded it for the first time in Panama alongwith two Cercospora spp. In early 1971 rust was reported in the prefectures of Oita, Kumamoto and Kagoshima in Kyushu and in Chiba and Ibaragi prefectures, about 1000 Km. to the east of Kyushu (Bromfield, 1971).

The rust was also observed on groundnut planting at the Federal Experimental station, Kaula Lumpur, Malaysia by Said and Sharom (1971). In the same year the disease was first reported from Brunei where it was observed early in the year in trial planting made by the Department of Agriculture and in a farmers crop planted 4 to 5 weeks after the station. This appeared to be the first report in the South East Asia and Pacific region introduced from groundnut imported for consumption but used for planting (Paregrine, 1971).

Rust was found near Suwon, Korea in summer 1972 (Anonymous, 1973) and in experimental plots of the University of Philippines near Los Banos (Bromfield, 1974). Further, to the South the first observation of rust in Indonesia was made in the special territory of Jogiakarta, Java in 1972 (Triharsa, 1972). Rust was observed in Western Java and other Indonesian Island Bali, Kalimantan Lombok and Sumaira (Kanlong et al., 1971).

Gibson and Waller (1973) reported the spread of P.arachidis throughout South East Asia and recorded in Japan, Thailand, Malasia, Brunei and India. Peregrine (1973) observed rust in the experimental field in Brunei and he stated that its effect on yield appeared to be linked with planting time. Pitkethley (1973) reported the disease for the first time from Northern Territory where its eradication was attempted.

Shaw & Layton (1975) observed the rust in December, 1972 in Pupa New Guinea and rust was present in all the localities inspected in the Eastern Highland and Markham valley. Rothwell (1975) recorded the rust in March, 1974 in Rhodesia and apparently this was the first record from Malavi in mid March of 1975 (Anonymous, 1975) and it was recorded for the first time from sarawak (Anonymous, 1976). Reddy (1976) observed the rust in Malavi and he suspected

that the disease had been introduced one year ago and had spread over the whole country. Kejwani and Ondieki (1976) reported the occurrence of rust from Kenya and Tanzania. O'Brien (1977) observed the rust in April, 1973 from Adelaide River district, Atherton, Tableland, Queensland. Raemaekers and Preston (1977) reported the rust in mid March of 1975 for the first time at four different places of Zambia. It was reported from Somalia by Castellani *et al.*, (1977) and from Taiwan in 1970 by Fang (1977). Mc Donald and Emechebe (1978) observed the rust in October, 1976 in Nigeria for the first time in Gwoza Borne State. They observed that the disease was wide spread but the infection was light. The rust was more common in the East and South of the area surveyed than it was in the North and West. Seif (1979) observed rust in 1974 in Kenya in two localities of coastal belt.

Occurance in India :

Mayee (1978 a) briefly summarised the work done on rust in India. In July 1969 the rust was observed in an experimental field at Punjab Agricultural University, Ludhiana. The rust caused severe defoliation of the host during the early period of growth but new leaves remained free from infection till the maturity of the crop (Chahal and Chohan, 1971). Subsequently in July, August, 1971 the rust infection was observed in the Maduravoyal field laboratory of the Botany

Department of University of Madras by Bhama (1972). During November, 1971 rust was observed on 45 days old plants grown in plots in the green house of the State Agricultural Research Institute, Calcutta, West Bengal by Sharma and Mukherji (1972). It was also observed in November 1971 on a plant grown in small pot at maturity stage on the Central Farm of Tamil Nadu Agricultural University, Coimbatore by Shanmugam et al., (1972).

In October, 1971 several groundnut plants in the greenhouse at S.V.Agricultural College, Tirupati, Andhra Pradesh were found affected by leaf rust (Ramkrishna and Subbayya, 1973). During May 1972 rust was observed on potted plants at Regional Research Station, Dharwad and it was also recorded on four field crops in Bijapur and Belgaum districts, which constituted the important groundnut producing areas in Karnataka State by Puranik et al., (1973). Rust was also reported during Kharif 1972 on 50 to 90 days old plants grown at Dharwad (Krishnaprasad and Siddaramaiah, 1977). During October, 1973 the SB-XI variety of groundnut grown at College of Agriculture, Pune was found the affected by leaf rust along with Cercospora leaf spot (Patil and Kalekar, 1974). In the first week of October, 1973 severe outbreak of groundnut rust was also observed at Central campus, Mahatma Phule Agricultural University, Rahuri (Shinde and More, 1975).

During the routine check up for the outbreak of Tikka the rust was observed at Gauhati in the month of December. This appeared to be the first record for Assam (Goswami, 1974), Khosla et al., (1974) and Sharma and Kulkarni (1974) noted the rust in Madhya Pradesh. In Western Maharashtra rust was reported by Chavan and Bakare (1974) and it was reported from Dholi Bihar by Misra and Misra (1975). During 1975 the rust was first time reported in an experimental plot of T 64 variety of groundnut at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur in Uttar Pradesh by Yadhav et al., (1975) severe outbreak of rust was reported over almost all the areas of groundnut cultivation in Marathwada region viz. Parbhani, Nanded, Osmanabad, Bhid and Aurangabad district of Maharashtra (Garud et al., 1976). The cultivar AK-12-24 was found to have been suffered severely by rust at Agricultural College, Ranchi, Bihar (Singh, 1978). The occurrence of rust was for the first time reported from Haryana (Tripathi and Kaushik, 1978). Where as the rust was reported from Hyderabad by Ranchar et al., 1978. The rust was noticed in Sabarkantha and Dang districts of Gujrat State by Subrahmanyam et al., (1979) but it was not serious. The rust was observed on matured plant at G.B.Pant University of Agriculture & Technology, Pantnagar, Uttar Pradesh (Kolte & Awasthi, 1979), in their preliminary survey conducted during 1980-81. Chewande and Misra (1981) observed severe proportions of rust at Shardagram near Junagadh (Gujrat) and coastal region of Orisa in April, 1981.

Physiological change in Groundnut plant due to Rust :

Subrahmanyam et al., (1976) reported that total soluble sugar and amino nitrogen were accumulated in leaves infected by P.arachidis. Total nitrogen and chlorophyll contents decreased with age in infected leaves. A small increase in carbon incorporation and starch accumulation was found in the early stage of the infection but a decrease occurred later. Reddy and Rao (1977) observed that glutamic acid and threonine were gradually eliminated. The protein amino acid α -x-1-3 increased the infected during various stages of disease development. Further, { Subramanyam et al., (1978-b) from ICRISAT observed that water losses from groundnut leaves infected with P.arachidis were significantly lower than those of uninfected control during the early stage of the disease, but increased rapidly after the pustules were well developed owing to rupture of epidermis } Siddaramaiah et al., (1979) reported that there was remarkable increase in protein content and water soluble sugar in the severely infected leaves, while there was decrease in ascorbic acid, chlorophyll and slightly phosphorus content. Mali et al., (1980) observed that peanut mottle virus and rust, single or in combination did not have any adverse effect on shoot length. However, rust alone reduced significantly the fresh and dry weight of shoot and fresh weight of root. Kenjale (1979) noted that groundnut leaf

infection caused adverse effect on nodulation, chlorophyll content dry matter weight of shoot, roots and oil content.

Rust on Castor :

The rust on castor was described in 1815 by A. De Bivona-Bernardi as Uredo ricini occurring in Sicily, later on it was described as Coeoma sicini by Von Schlechtendahl in "fungerum novorum descriptorum illustratione publican", in Linnaea, Vol.1, p.162, 1826, the uredosori being apparently taken for aecidia of the coeoma type. In 1878 again it was named as Melampsora ricini (Biv-Bern) Pass. by G. Passerini in Baglietto F. de cesati V. and de Notaris G. "Erbario Criptogamico Italiano" Ser.II, Fasc. XIV No.684. The name was yet again changed by de Toni in Saccardo's Sylloge, Vol.II p.596 to Melampsorella ricini. It was still doubtfully referred to the genus Melampsorella, presumably on account of the similarity of its uredo stage to that of Melampsorella caryophyllacerum (D.C.) Schroet.

Till 1912 only uredo stage was known, although search had been made for other stages by Ajarekar in India for two years, who described the fungus in detail which was occurring in India.

He examined fresh uredospores in distilled water it was possible to distinguish between two kinds of uredospores. One

with thick walls and other with thin walls, there are no gradations between them. His observations recall a similar one recorded for Melampsorella aspidatus in Englar and Prantl's *Naturlichen Pflanzenfamilien I-Teil I-Abteilung*, p.45. At first he believed these really represented two distinct kinds of uredospores and that the thicker walled spores were of the nature of amphispores, which (according to Arthur quoted in MacAlpines "The rusts of Australia") "which are developed in arid or sub-arid regions, being provided with thickened walls to enable them to withstand unfavourable conditions, just like teliospores". But his further observations on this matter were with considerable doubt. He observed that if the spores from the leaves kept dry in the herbarium for a month or two and are examined, proportion of thick walled spores to thin walled ones appreciably increased suggesting that the thin walled spores might have developed into thick walled later on under certain conditions. He also observed that after treatment with lactic acid the disintegration between thin walled and thick walled spores practically disappeared, and thin walls were swelling almost to the size of thick walls. So he stated that the difference in the appearance of the spores examined fresh is so striking that it is considered worth recording. Ajarekar also tried germination of these spores and reported that the fresh spores germinate in distilled water, readily in month of January February. The germination

was poor earlier in the seasons. The two kinds of spores germinate alike, more than one germ tube are generally protruded but only one grows out finally, the other becoming disorganised. He was able to observe the largest no of germ tubes was five, four, being the commonest number. The largest number of germ pores was six. Ajarekar reported that no spore form has been observed till that time an aecidium was found on some bringal plants growing in neighbourhood of castor plants on the Agricultural College Farm Poona, which was identified provisionally by Butler as Aecidium. He tried inoculation experiments with such aecidiospores on castor plants which gave negative results and there was clew to answer the question whether the rust on castor has any other spore forms or whether it is one of those rust fungi whose life cycle is restricted to the uredo stage only.

Before Ajarekar (1912) the rust on castor in India was reported by Cooke (1874), Butler (1905) and Sydow and Butler (1906), Butler (1911) especially from localities Poona, Nagpur (Maharashtra) and Coimbatore from Tamil Nadu. After Ajarekar, Ravindranath and Narahary (1964) reported the telial stage of Castor rust from Hyderabad, Andhra Pradesh. Similarly Rangaswami et al., (1970) recorded it from Bangalore (Mysore). These are the only few studies in this rust and which are only taxonomical nature. So an attempt has been made to study the

effect of Castor rust infection on the biochemistry and anatomy of the infected castor leaves.

Rust on Cassia :

During the course of study (1981-84) of fungal flora of this region the author came across the Cassia sophera plants growing in west fields in and around city of Kolhapur infected with member of rust fungus. By referring standard host indices it was found that there is no record of any rust member occurring on Cassia sophera L. So this material was brought in laboratory and studied in detail microscopically. These studies revealed that it is a species of Uromyces. On the basis of morphological characters it was not accomodating in any of the present species of Uromyces. So on the basis of host specificity and morphological characters it is being described as new species. As it is a new fungus growing on wild fast growing weed it was thought to study the effect of rust infection on the physiology of host plant and anatomical changes on the infected portion i.e. leaves.