

Effect of Different Dates of Sowing of Groundnut on Rust Development in Karnataka

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The rust (*Puccinia arachidis* Speg.) of groundnut appeared on the first date of sown crop 56, 51, 43 and 55 days after sowing during 1975, 1976, 1977 and 1978 respectively. The disease index (%) increased gradually and reached maximum on the third date of sown crop in all the four years tested where as the percentage disease index decreased from fourth date of sown crop. Continuous dry period with high temperature ($>26^{\circ}\text{C}$) and less relative humidity ($<70\%$) delayed the rust occurrence and severity. Intermittent rainfall, more than 80% relative humidity, and 20-26°C temperature helped speedy development of the disease. The disease incidence and severity of rust on groundnut sown in the first fortnight of June was very less and thus helped the crop to escape from the damage caused by the rust disease.

Key Words: Groundnut, Rust, *Puccinia arachidis*, Kharif, Disease Index

Introduction

Groundnut (*Arachis hypogaea* L.), one of the main oilseeds crops in Karnataka, occupies about 9,57,900 ha. It is generally cultivated in *kharif* season (June-October) as rainfed crop and also in summer where minimum irrigation facilities are available. The crop suffers from quite a number of foliar diseases, of which the rust disease caused by *Puccinia arachidis* Speg. is a threat to groundnut cultivation in the northern districts of Karnataka (Anonymous 1979). Fekin (1973) reported that the rust disease was distributed throughout the world. In India it was recorded for the first

time from Punjab (Chahal & Chohan 1971) in telial stage. In subsequent years, the rust disease occurrence was recorded from Tamil Nadu (Bhama 1972), West Bengal (Sharma & Mukerjee 1972), Andhra Pradesh (Rama-krishna & Subbayya 1973) and Karnataka (Puranik et al. 1973) in the uredial stage. The actual loss in yield by rust disease alone was recorded as 19% and 29% during 1975 and 1976 respectively at Dharwar (Siddaramaiah et al. 1978). Harrison (1972) indicated that early infection on young seedlings in field conditions during 1971 had resulted in severe outbreak of rust epidemic in South

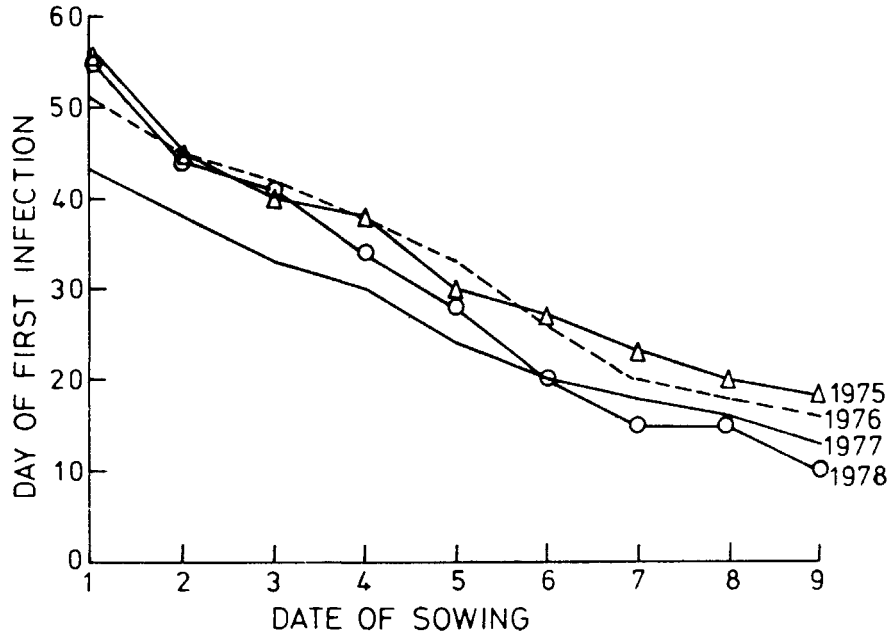


Figure 1 Appearance of first symptoms of groundnut rust under different dates of sown crop

Texas, Puranik et al. (1973) reported the rust disease between 60th and 70th day of *Kharif* Crop, thereby reducing the chances of rust epidemics. Lingaraju et al. (1979) stated that the uredospores could remain viable for 42, 51 and 39 days during summer, *Kharif* and winter respectively and survived either on debris or self-sown crop.

Not much is known about the effect of different dates of sowing on the disease incidence in India. Such a study was attempted by us over 4 *Kharif* seasons under natural conditions at Regional Research Station, Dharwar, Karnataka and the relationship of epidemiological factors to the disease incidence and its development was established.

Materials and Methods

SB-11 a bunch groundnut variety which is highly susceptible to rust was sown in four replications with a spacing of 30 cm × 15cm

in an experimental plot measuring 3 Ohm × 1.8m, during the *Kharif* season, beginning 2nd week of June up to the end of August, at an interval of ten days with nine dates of sowings during all the four years. The plots were regularly sprayed with the insecticide Rogar (10 ml. in 18 lit. of water) and Bavistin (0.05%) for controlling insects and *tikka* respectively and continuously observed for the first symptoms of rust appearance in all the treatments. The disease incidence was recorded on the 8th day in 10 randomly selected plants in each replicate, based on the following grading:

- 0, Leaves free from infection
- 1, 1-5% leaf area affected
- 2, 6-20% leaf area affected
- 3, 31-40% leaf area affected
- 4, 41-70% leaf area affected
- 5, 71-100% leaf area affected

The percentage disease index was calculated by the formula,

$$\%DI = \frac{\text{Class rating} \times \text{Class frequency}}{\text{Total number of leaves graded} \times \text{Maximum grading i.e. 5}} \times 100$$

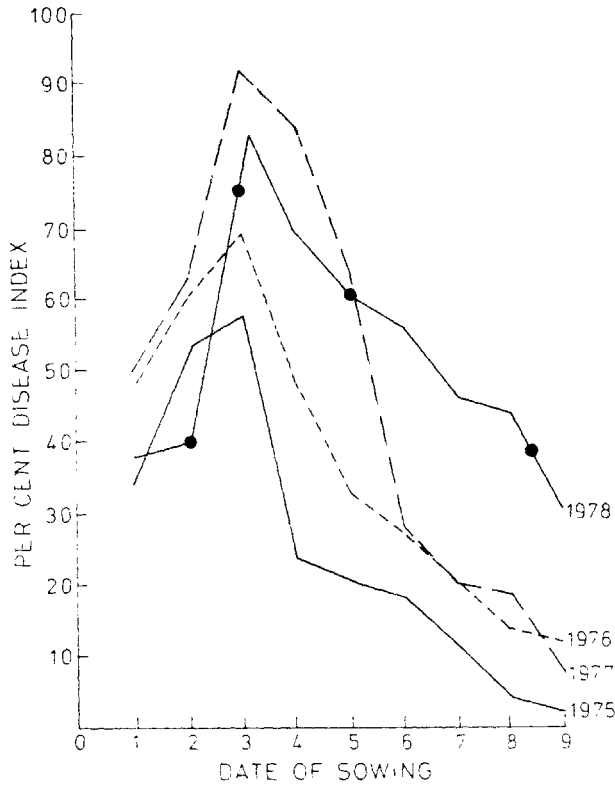


Figure 2 Development and severity of rust of groundnut under different dates of sown crop

The weekly weather data with respect to temperature ($^{\circ}\text{C}$), relative humidity (%) and rainfall (mm) were collected during the entire cropping period to understand the relationship between weather factors and disease incidence.

Results and Discussion

The rust of groundnut appeared on the first date of sown crop 56, 51, 43 and 55 days after sowing during 1975, 1976, 1977 and 1978 respectively. In subsequent sown crops for expression of first symptom, the days required were gradually reduced and minimum days were 18, 18, 13 and 10 during 1975, 1976, 1977 and 1978 respectively (figure 1). The percentage disease index of

first sown crop was 34.0, 50.0, 48.0 and 38.75, in last date of sown crop was 2.60, 12.0, 12.0 and 30 and maximum percentage disease index was 58.80, 92.20, 69.00 and 76.66 during 1975, 1976, 1977 and 1978 respectively. The maximum and minimum percentage disease index in each year was as follows: 58.80 and 2.60, 92.20 and 12.00, 69.00 and 12.0 and 76.66 and 30.0 for 1975, 1976, 1977 and 1978 respectively (figure 2). Considering the mean of all the four years, the incubation period varied from 51-14 days and the average percentage disease index varied from 74.16 to 14.15.

The percentage disease index increased gradually and reached maximum in the third date of sown crop in all the four years tested (figure 1). Further, percentage disease index was gradually reduced from fourth date of sown crop to ninth date of sown crop indicating lesser incidence of rust. Rust of groundnut gradually increased year after year as evidenced in the text. It is observed from the Figure that, when there was continuous dry period i.e. high temperature ($>26^{\circ}\text{C}$) and less relative humidity ($<70\%$), the rust occurrence and serverity was delayed and reduced. The survival of uredospores of groundnut rust was influenced by humidity and temperature (Lingaraju et al. 1979). The availability of sufficient inoculum potential which is governed by climatic factors is directly responsible for the development and severe out break of the disease. It is clear from figures that intermittent rainfall, relative humidity (80% and above) and temperature ranging from $20-26^{\circ}\text{C}$ may help for speedy development of the disease. Such conditions were prevailing during the months of July and August in all the four years tested and this is in correlation with percentage disease index of third date of sown crop, i.e. 58.80, 92.20, 69.00 and 76.00 for the year 1975, 1976, 1977 and 1978 respectively.

The percentage disease index gradually

reduced from fourth date of sown crop though the disease occurrence was earlier, which is due to fluctuating relative humidity, rainfall and temperature. Harrison (1972) made a record of severe out break of rust on groundnut in Texas during which early infection on young seedlings was observed. Early infection, important from sufficient inoculum potential point of view, has a relation to severe out break of disease. The rust occurrence during 60th and 70th days of the crop reduces the chances of rust epidemics as revealed by Puranik et al. (1973). The availability of adequate inoculum in early stage of the crop with favourable climatic factors such as humidity temperature and rainfall may lead to the severe out break of groundnut rust. Though the sufficient inoculum was present in the field, severity of the disease was less wherein the disease index in 7th, 8th and 9th date of sown crop was 14.00, 20.00, 20.00 and 46.07; 9.60, 14.80, 19.60 and 44.50; and 2.60, 12.00, 12.00 and 30.00 during 1975, 1976, 1977 and 1978 respectively because of unfavourable climatic conditions such as

the temperature which ranged from 16.9 to 28.6, 17.6 to 36.7, 17.9 to 30.90 and 19.6 to 28.9°C; Relative humidity ranged from 33.7 to 77.9, to 49.5 to 70.4, 56.8 to 65.7 and 59.8 to 77.84, and rainfall was prevailing up to October, and it was scanty. This clearly indicates that the favourable climatic factors play an important role in the occurrence and speedy development of rust disease than the age of the crop.

The above studies indicated that with continuous dry period i.e. high temperature (>26°C) and less relative humidity (<70%), there was drastic delay in severity and out-break of the groundnut rust. Further, the occurrence of rust on groundnut sown in the first fortnight of June was considerably delayed thereby the extent of damage was reduced. Thus early sown crop will escape from the damage caused by the rust disease.

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