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# BACTERIAL WILT OF GINGER (ZINGIBER OFFICINALE ROSC)

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Ginger (*Zingiber officinale* Rosc.) is an important spice crop grown in India over an area of 26830 ha with an annual production of 43550 tonnes. It is grown both under rainfed and irrigated conditions mainly in Kerala, West Bengal, Orissa, Himachal Pradesh, Karnataka and Madhya Pradesh. Kerala State contributes 64% of the total production of the country, where it is mainly a rainfed crop.

Rhizome rot of ginger is the most important disease limiting the production in all ginger growing tracts. Though several fungal pathogens have been reported[8], the losses incurred due to *Pythium aphanidermatum* (Edson) Fitz, and *P. myriotylum* Drechs are of major importance. Bacterial association with *Pythium* infected rhizomes was reported earlier[6]. The authors noticed bacterial wilt disease of ginger for the first time during September, 1977 in one of the experimental plots at Horticultural Research Station, Ambalavayal. A bacterium was isolated and identified as *Pseudomonas* sp. and its pathogenicity established.[7]

During July-September of 1978, there was severe outbreak of bacterial wilt of ginger at Horticultural Research Station, Ambalavayal, and adjoining places of Wynad. It was also noticed in one of the experimental blocks of Central Plantation Crops Research Institute Farm at Peruvannamuzhi. The disease was noticed during late July, 1978 and maximum disease incidence was noticed during August-September period when the crop was about 3-4 months old coinciding with Souh-West monsoon, ensuring high soil moisture, relative humidity and low temperature. The spread of the disease was so rapid that within a month the standing crop in half-an-acre was completely lost. The preliminary observations of this disease are reported here.

The earliest symptoms appear as water soaked linear streaks/patches on the collar region of the pseudostems followed by yellow to bronze colouration of the margin of the lowermost leaf which gradually progresses upwards. Later the leaves become flaccid with intense yellowish bronze coloured margins and droop exhibiting typical wilt symptoms. The ligues and leaf sheaths in the infected plants appear yellowish to dull green. Finally the leaves roll up and the whole plant dries up (Fig. 1). Pseudostems come off easily with a gentle pull, a feature common to rhizome rot infection caused by *Pythium*. The affected pseudostems and rhizomes at advanced stages of infection are slimy to touch with varying degrees of tissue disintegration and give off milky bacterial exudate when pressed gently. The affected pseudostems when cut open longitudinally show dark streaks. Rhizomes in early stages of infection show moderate transluscent water soaked lesions enlarging gradually. Later these lesions spread deep into the rhizomes and show varying degrees of coalescence thus involving major part of the rhizome. When a small piece of infected rhizome is kept in water it

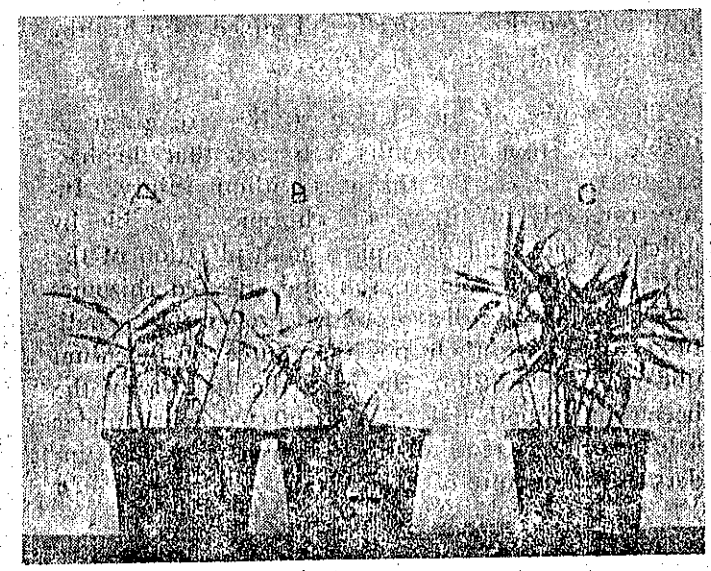


**Fig. 1 A & B Symptoms of Ginger wilt, Early and late stage of infection C. Healthy (control)**

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gives off turbid bacterial ooze, a feature distinctly different from *Pythium* affected rhizomes in early stages of infection. Maggots of *Mimigrella* sp. were also noticed in some of the infected rhizomes.

The organism was isolated on nutrient agar and ginger sprouts extract supplemented with 0.1% casein hydrolysate, 2% sucrose and 2% agar. The bacterium has been identified as *Pseudomonas Solanacearum* (Smith) Smith, Biotype III of Hayward. Further studies are under progress to identify the species. Bacterium was also isolated from the washings of the maggots collected from infected rhizomes. Pathogenicity tests were conducted with bacterial suspension inoculated to both injured and uninjured plants of six weeks old, raised in polythene beakers. Six weeks old plants raised in sterile soil were transplanted into beakers containing infected soil, sterile soil mixed with infected rhizome, sterile soil mixed with healthy rhizomes, and sterile soil alone.

The results of inoculation studies are given in Table 1. From the results it is seen that the bacterium can infect the rhizomes without injury. Injury can only predispose the rhizomes possibly by quick invasion and subsequent multiplication of the bacterium. Both infected soil and infected rhizomes could induce the disease under present test conditions, indicating their possible source of inoculum under field conditions. However, the viability of the bacterium in both the soil and infected debris under field conditions requires further investigation to understand the nature of its survival.

Out of 15 isolates tested, 10 isolates gave positive pathogenicity. Based on the time taken for the earliest symptom development and severity of the disease, the isolates showed considerable degree of variation in virulence. Out of the five isolates from the maggots' washings, two were pathogenic to ginger. This indicates the possible role of maggots in the disease spread and requires critical study. The role of insects in spread of bacterial plant pathogens is well known.[1]

Thin hand sections of the infected tissues showed dark brown vessels and also greater concentrations of bacteria in xylem and xylem parenchyma, as compared to surrounding ground tissue.

Agrimycin 1000 ppm, streptocycline 1000 ppm, 1% Bordeaux mixture and 1% bleaching powder when applied to 3 × 1 m beds @ 10 litres/bed did not check the disease spread under field conditions.

Ginger isolates could infect turmeric also. Many of the cultivated types in the germplasm collection were affected. The varieties will be further screened by artificial inoculations to assess the relative degree of tolerance. Identifying a resistant/tolerant variety will be a major solution and the all India germplasm collections will be further screened.

*Pseudomonas solanacearum* (Smith) Smith has been reported as the causal agent of bacterial wilt of ginger in Queensland[2], Hawaii[5]. The Philippines[4] and Mauritius[3]. Biotypes III & IV of *P. Solanacearum* have been reported from Queensland. We are recording the bacterial wilt of ginger caused by *Pseudomonas* sp. for the first time in India.


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Table 1

*Inoculation studies*

| S. No. | Treatment | No. of plants infected/ treated | Time taken for first symptom development |
|---|---|---|---|
| | | | days |
| 1. | Plants inoculated with injury | 13/16 | 7—9 |
| 2. | ,, without injury | 11/16 | 8—10 |
| 3. | Control | 0/16 | .. |
| 4. | Sprouts transplanted in infected soil | 6/16 | 10—13 |
| 5. | Sprouts transplanted in sterile soil + infected rhizomes | 8/16 | 8—14 |
| 6. | Sterile soil + healthy rhizomes | 0/8 | .. |
| 7. | Sterile soil alone | 0/8 | .. |

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**Plastic Hawk to scare birds**

*A hovering plastic hawk protects a field of late straw berries from bird damage. This British-made bird scarer-an authentically-coloured hen-harrier-has been produced to help protect both grain and fruit crops from the extensive damage caused by birds in many parts of the world. The makers of the 'Chartwell Harrier' claim that it can be effective over a ten-acre area as it hovers and glides on the end of a 14 foot flexible pole. Even the mildest wind will activate the 'bird' into movement.*

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