

## Studies on the *Alternaria* Blight Disease of Gingelly

by

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In recent years, the *Alternaria* blight disease has become a menace to the gingelly cultivators in Tamil Nadu. No detailed investigations of this serious disease have been made either in India or elsewhere, ever since the disease was recorded in North Caucasus (Kvashina, 1928). Hence studies were undertaken on various aspects of the disease and the results are presented in the paper.

**Materials and Methods:** The pathogen was brought into pure culture by single spore isolation from infected gingelly leaves collected at the Oilseeds Breeding Station, Coimbatore. The culture was maintained on oats agar slants. The pathogenicity tests were conducted by transferring mycelial bits to the upper surface of the leaves and covering the inoculum with cotton wool. The inoculated plants were covered with alkathene bags for 48 hours and the plants were under constant observation for the development of the disease. The pathogen was identified by comparing the various *Alternaria* isolates obtained from different hosts. All the local gingelly varieties and the types available in the germplasm at the Gingelly Research Station, Karur were screened for disease resistance. The disease intensity was assessed by grading 20 plants at random using a scale consisting of 4 grades indicating the different intensity of the disease.

A field trial was conducted to assess the efficacy of different fungicides in the control of the disease. The trial was conducted in randomised replicated design with nine fungicides as detailed in Table 2. The first spraying was given when the disease had just appeared in the field and a total of three sprayings were given at 15 days interval. Disease intensity was assessed 15 days after the final spraying and the disease incidence was expressed in category values by grading 25 plants at random in each treatment.

**Results:** *Symptomatology:* Young infected seedlings were completely blighted. The disease symptom was mainly manifested on the leaf blade as brown, round to irregular spots varying from 1 to 8 mm in diameter. In the initial stages of infection, water soaked spots appeared on the leaf blade which later turned greyish to dark brown with concentric zonations. On the under surface of the leaves, the spots were light to greyish brown. In severe infections several spots coalesced and defoliation occurred. Severely affected plants failed to produce flowers resulting in severe economic loss to the cultivators.

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*Identification of the pathogen:* The six *Alternaria* spp. shown in Table I were found to occur on different crops which were cultivated near the gingelly field. The six pathogens were brought into pure culture and they were compared with the isolate from gingelly. The spore size of the different *Alternaria* isolates is presented in Table I.

TABLE I. Comparison of different *Alternaria* spp. with gingelly isolate

Sl. No.	<i>Alternaria</i> species	Spore size in micron	
		Length	Breadth
1.	<i>Alternaria ricini</i>	47 — 96	15 — 29
2.	<i>A. macrospora</i>	24 — 71	8 — 16
3.	<i>A. solani</i>	15 — 47	10 — 15
4.	<i>A. melongena</i>	15 — 35	5 — 15
5.	<i>A. cyamopsidis</i>	60 — 140	12 — 18
6.	<i>Alternaria</i> sp. from bhendi	15 — 33	5 — 13
7.	<i>Alternaria</i> sp. from gingelly	16 — 71	5 — 21

The data reveal that the *Alternaria* sp. from gingelly is different from other *Alternaria* spp. compared. The ability of all the *Alternaria* spp. isolated from the different hosts to infect gingelly was tested and found that none of them except the gingelly isolate infected gingelly. The gingelly isolate was inoculated on castor, cotton, tomato, brinjal, cluster beans and bhendi, the hosts which are commonly affected by *Alternaria* spp. But the isolate failed to infect all the above crops. These results suggest that the gingelly isolate is distinctly different from the other *Alternaria* spp. commonly occurring on the surrounding crops.

*Mode of transmission:* (i) *Through seed:* T. M. V. 3 gingelly seeds were treated with a heavy spore suspension of the pathogen and sown in the sterilized soil. All the inoculated seeds failed to germinate suggested the occurrence of pre-emergence damping-off.

(ii) *Through soil:* The pathogen was multiplied on a sand maize medium and incorporated in the sterilized soil. Surface sterilized seeds were sown in the soil and suitable controls were maintained. The plants did not show any infection throughout the growth period indicating that the disease is not soil-borne.

(iii) *Through air:* Both healthy and diseased plants were kept inside the same cage and the disease development on the healthy plants was under observation. About 28 per cent of the healthy plants were infected suggesting that the disease is air-borne.

*Varietal resistance:* Four gingelly cultivated varieties and 29 germplasm types were screened for their disease reaction and the disease intensity in category values are given below along with the varieties.

*Cultivated varieties* : 1. T.M.V. 1, Tindivanam-53, 2. T.M.V. 2, Tindivanam-40, 3. T.M.V. 3, Tindivanam-56, 4. K.R.R. 1, Karur-44.

*Germplasm types* : 5. SI 251, Tessore-51, 6. SI 866, Adikarpatti-45, 7. SI 882, Palni-50, 8. SI 909, Pattukottai-54, 9. SI 914, Palestine-44, 10. SI 921, Anakapalli-45, 11. SI 935 Hyderabad-41, 12. SI 948, Kulithalai-20, 13. SI 950, Pudur-24, 14. SI 1144, Wallajah-38, 15. SI 1159, Dusi-33, 16. SI 1158, Kaverikuppam-40, 17. SI 1500, Sudan-38, 18. SI 1728, (Pyru) Hyderabad-39, 19. SI 1729, (Pyru) Hyderabad-36, 20. SI 1810, Paramathy-33, 21. SI 1812, Paramathy-47, 22. SI 1814, Koilpatti-45, 23. SI 1815, Koilpatti-39, 24. SI 1893, Local  $\times$  Bombay-91, 25. SI 1894, Bombay  $\times$  Local-40, 26. SI 1897, Nagpur  $\times$  Local-80, 27. SI 1906, Local  $\times$  Bombay-82, 28. SI 1907, Local  $\times$  Bombay-40, 29. SI 1909, Nagpur  $\times$  Local-73, 30. SI 1925, Local  $\times$  Bombay-90, 31. SI 1926, Local  $\times$  Bombay-68, 32. SI 1927, Local  $\times$  Nagpur-83, 33. SI 1928, Local  $\times$  Kanpur-68.

All the cultivars are susceptible to the disease. In the germplasm bank, SI 948 (Kulithalai) type seems to be less susceptible while SI 1893 and SI 1923 are highly susceptible.

*Fungicidal control* : Nine fungicides were tested for their efficacy to control the disease under field condition and the data are presented in Table 2.

TABLE 2. *Fungicidal control of the disease*

Sl. No.	Treatment	Disease intensity in category values
1.	Zineb (0.10%)	32.6
2.	Ziram (0.15%)	52.6
3.	Cuman (0.15%)	39.6
4.	Dithane M. 45 (0.13%)	34.0
5.	Dithane Z. 78 (0.13%)	19.6
6.	Duter (0.15%)	32.6
7.	Miltox (0.25%)	45.3
8.	Bla-S (0.10%)	31.9
9.	Bordeaux mixture (1.00%)	13.0
10.	Control	63.0

Significant at 1% level; C.D. = 9.8

The results indicate that Bordeaux mixture and Dithane Z. 78 are statistically on a par and superior to all other fungicides in controlling the disease.

**Discussion** : The symptoms observed in the present studies were identical with those described by Kvashina (1928) and Mohanty and Behera (1958). Berry (1960) described the lesions on stems and capsules of gingelly. But infection of stem and capsules have not been observed in the present study.

The causal organism of the disease was identified only as *Alternaria* sp. by Kvaslina (1928). Kawamura (1931) described the fungus isolated from the leaves of *Sesamum indicum* in Japan and named as *Macrosporium sesamicola* Kawamura n. sp, since at that time the genera *Macrosporium* and *Alternaria* were known to be the same. Dey (1948) recorded *Alternaria* sp. for the first time in India on gingelly. Mohanty and Behera (1958) described the fungus and proposed the name *Alternaria sesami* (Kawamura) n. comb. The morphology of the present isolate resembles the one described by Mohanty and Behera (1958) and hence it is identified as *Alternaria sesami*.

All the six *Alternaria* spp. isolated from different hosts did not infect gingelly. Berry (1960) also reported that none of the five important *Alternaria* spp. from other hosts viz., *A. solani* from potato and tomato, *A. cucumerina* from musk melon and water melon, *A. gossypina* from cotton, *A. radicina* and *A. tenuis*, were pathogenic on gingelly.

The pathogen did not infect any of the six host plants tested viz., brinjal, bhendi, cotton, castor, cluster beans and tomato. Berry (1960) from U.S.A. reported that the fungus did not produce any visible symptoms on any of the 25 host plants tested.

The present studies revealed that the seed-borne infection of the pathogen resulted in pre-emergence damping-off. Berry (1960) also observed the damping-off symptoms when the pathogen attacked the young seedlings. Other *Alternaria* spp. viz., *A. ricini*, *A. brassicae*, *A. radicina* and *A. zinniae* were also reported to be seed-borne (Stevenson, 1944; Rangel, 1945; Arya and Prasada, 1952; and Beanut *et al.* 1958). The pathogen was found to be air-borne but not soil-borne.

Although all the cultivated varieties were found to be susceptible to the disease, a type culture SI 948 (Kulithalai) seems to be comparatively resistant. This type can be utilized for breeding resistant varieties. Bordeaux mixture and Dithane Z. 78 were found to be effective in controlling the disease. Galloway (1899), Mundkur (1949) and Walker (1952) have reported that the early blight disease of potato caused by *Alternaria solani* was successfully controlled by Bordeaux mixture. Vorster (1962) reported the effectiveness of Dithane Z. 78 in the control of *Alternaria* blight of potato.

**Summary:** A severe leaf blight disease was observed in gingelly in many parts of Tamil Nadu. Brown, round to irregular spots with concentric zones were observed on the leaves and the severe infection resulted in defoliation. The pathogen was identified as *Alternaria sesami*. The pathogen could not infect other hosts and *Alternaria* spp. from other hosts could not infect gingelly plants. The disease was found to be seed-borne and air-borne but not soil-borne.



All the cultivated varieties were found to be susceptible to the disease but a type culture, SI 948 was found to be comparatively resistant. The disease was found to be effectively controlled by Bordeaux mixture and Dithane Z. 78.

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