

# SCREENING OF BLACK PEPPER (*PIPER NIGRUM* L) AND *PIPER* SPP. AGAINST *PHYTOPHTHORA PALMIVORA*

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## ABSTRACT

Fortyone cultivars of black pepper and 73 wild *Piper* spp. were screened against *P. palmivora* adopting root dip inoculation technique. Narayakodi, Kalluvalli, Uthirankotta and Balankotta showed low percentage of infection as compared to others. None of the wild *Piper* spp. showed resistance.

## INTRODUCTION

Foot rot disease of black pepper is one of the limiting factors of black pepper production in all pepper growing tracts of the world. The disease takes a heavy toll when high soil moisture and low temperature prevail and is destructive where heavy rainfall continues over a period of 2-3 months as in Kerala. The nature and distribution of the disease has been reviewed (Nambiar and Sarma, 1977). Identifying the source of resistance becomes imperative for the effective and long term control of the disease. Earlier workers on foot rot of black pepper identified some resistant types. Muller (1936) found an Indonesian cultivar Belantung as resistant. In Malaysia Belantung and Djambi (Indonesian cultivars), and Uthirankotta (Indian cultivar) were found to be resistant (Holliday and Mowat, 1963). *Piper colubrinum* (Albuquerque, 1968 a, b) and *P. guineense* (Anonymous, 1977) were found to be resistant in Brazil and Ghana respectively. *P. aduncum*, *P. scabrum* and *P. trelesanum* were found to be partially resistant (Ruppel and Almeyda, 1965). Pepper cultivar Balankotta, *P. colubrinum* and *P. obliquum* var. *eximum* were found to be resistant (Turner, 1971 and 1973).

Although successful grafting of cultivars on root stocks of wild *Piper* sp. mentioned above was reported (Garner and Beakbane, 1968; Albuquerque, 1968 a, Gaskins and Almeyda, 1968) their field establishment was a failure. Development of longitudinal cracks at the graft union point involving *P. colubrinum* as the root stock and cultivars like Balankotta as scion was reported by Alconero *et al.* (1972). However, successful grafting and establishment of 'Kuching' cultivar on pink form of *P. colubrinum* has been reported (de Waard, 1979).

No work has been done in India on the screening of pepper cultivars or *Piper* spp. for resistance to *P. palmivora* earlier. The present work was taken up to fill in this lacuna.

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## MATERIALS AND METHODS

Screening of the cultivars/wild pepper types was done according to the technique of Sarma and Nambiar(1979). Inoculum was prepared as follows. Two discs (15 mm from the fast growing edges of the colony) were inoculated in light at 25°C. Each sporulating mat free from medium was blended in 100 ml of distilled water and made up to 250 ml. About 15 ml of inoculum per cutting was used. The cuttings were raised in polythene bags (16 × 25 cm) filled with potting mixture.

Four-month-old rooted cuttings were removed from the bags, the root system washed and kept in the inoculum for 48 hours. Later they were transplanted back into the soil and the inoculated cuttings were kept at 25°C. Speed of death and percentage of infection based on the number of cuttings wilted and number of cuttings inoculated were recorded 20 days after inoculation. Where the cuttings did not wilt and show partial infection they were rated as 0.5 infection. A minimum of 10 cuttings were maintained for each type and the number was increased depending upon the availability of the cuttings.

## RESULTS AND DISCUSSION

Results presented in Table 5.7 indicate that none of the cultivars and wild *Piper* spp. tested in the present study showed any reasonable degree of tolerance. As compared to others, percentage of infection was minimum in Narayakodi (40%), Kalluvally (45%),

Table 5.7. Reaction of cultivars of *Piper nigrum* L. and *Piper* spp. to *Phytophthora palmivora*

S. No.	Cultivar	No. of inoculated plants	No. of infected plants	Percentage of infection
<i>A. Piper nigrum</i>				
1.	Narayakodi	20	8	40.0
2.	Kalluvally	20	9	45.0
3.	Kalluvally PTB	20	18	90.0
4.	Kalluvally I	15	10	66.6
5.	Kalluvally II	15	12	80.0
6.	Kalluvally III	18	15	72.2
7.	Karimunda II	20	18	90.0
8.	Karimunda	15	13	86.6
9.	Uthirankotta	20	11	55.0
10.	Balankotta	20	13.5	67.5
11.	Arasinamoratta	18	16.5	93.8
12.	Arikottanadan	15	13	86.6
13.	Ceylon	20	17	85.0
14.	Karivally	15	13	86.6
15.	Kuthiravally	14	11	78.5
16.	Malligesara	15	13	86.6
17.	Munda	17	14	82.3
18.	Karivilanchi	15	13	86.6
19.	Kaniakadan	13	10	76.9
20.	Kottanadan	16	13	81.2

1	2	3	4	5
21.	Talipparamba II	20	18	90.0
22.	Talipparamba III	20	16	80.0
23.	Talipparamba IV	20	16	80.0
24.	Talipparamba V	20	17	85.0
25.	Nilgiris	15	13	86.6
26.	Shimoga	20	17	85.0
27.	Panniyur I	20	15	75.0
28.	Kumbhakodi	20	18	90.0
29.	Chumala	20	16	80.0
30.	Cheriakaniakadar	15	14	80.0
31.	Perumkodi	15	13	99.33
32.	Perumunda	15	13	86.6
33.	Munci	20	18	86.6
34.	Vally	15	14	90.0
35.	Sullia	20	14	93.3
36.	Munda I	20	20	100.0
37.	Doddigya	20	18	90.0
38.	Cheriakodi	20	16	80.0
39.	Chola	20	18	90.0
40.	Kuthiravally ARS	20	17	85.0
41.	Veluthanamban	20	15	75.0
			16	80.0

*B. Piper spp. (Accession numbers)*

1.	13	10	7	76.9
2.	37	15	13	86.6
3.	42	10	8	80.0
4.	139	15	13	86.6
5.	142	15	13	86.6
6.	145	10	9	90.0
7.	146	10	10	100.0
8.	151	15	12	80.0
9.	156	14	10	71.4
10.	157	18	16	88.8
11.	161	15	13	86.6
12.	168	14	11	78.5
13.	169	15	13	86.6
14.	170	10	8	80.0
15.	172	10	7	70.0
16.	173	15	9	60.0
17.	176	10	8	80.0
18.	177	10	7	70.0
19.	178	14	9	64.2
20.	179	13	9	69.2
21.	180	14	9	64.2
22.	184	20	17	85.0
23.	191	10	9	90.0
24.	193	10	10	100.0
25.	194	13	10	76.9
26.	196	8	8	100.0
27.	197	10	7	70.0

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1	2	3	4	5
28.	198	10	7	70.0
29.	199	10	8	80.0
30.	202	15	11	73.3
31.	206	14	12	85.7
32.	109	11	9	81.8
33.	213	12	10	83.3
34.	216	15	11	73.3
35.	219	14	10	71.4
36.	220	10	8	80.0
37.	228	10	8	80.0
38.	232	10	7	70.0
39.	238	10	6	60.0
40.	241	10	8	80.0
41.	246	10	9	90.0
42.	248	15	13	86.6
43.	252	15	11	91.6
44.	264	13	10	76.9
45.	270	10	8	80.0
46.	275	10	7	70.0
47.	281	10	6	60.0
48.	287	15	13	86.6
49.	294	13	10	76.9
50.	325	14	11	78.5
51.	356	13	10	76.9
52.	362	15	11	73.3
53.	367	10	8	80.0
54.	391	10	7	70.0
55.	475	10	6	60.0
56.	431	10	7	70.0
57.	443	10	6	60.0
58.	539	10	8	80.0
59.	663	10	7	70.0
60.	665	14	12	85.7
61.	671	15	13	86.6
62.	679	10	7	70.0
63.	435	10	7	70.0
64.	440	10	8	80.0
65.	453	15	14	93.3
66.	455	15	14	93.3
67.	455	14	13	86.6
68.	495	14	12	85.7
69.	537	10	7	70.0
70.	703	10	6	60.0
71.	735	10	8	80.0
72.	780	10	7	70.0

Uthirankotta (55%) and Balankotta (67.5%). Cultivar Sullia was highly susceptible and succumbed in about a week. Out of the four Indian cultivars tested at Sarawak, Uthirankotta showed high resistance (wilt rating 1.00) followed by Kalluvally and Balankotta (1.13) and Cheriakaniakadan (1.38) (Holliday and Mowat, 1963). However, Alconero *et al.* (1972) found Uthirankotta to be susceptible in Puerto Rico. Turner

(1973) screened four Indian cultivars and found that Balankotta was highly tolerant with a disease rating of 2.7 followed by Cheriakaniakadan (3.3), Kalluvally (3.5) and Uthirankotta (3.6). Kuching, a Malaysian type, recorded maximum incidence with disease rating 4.5. The results of the present study are in general agreement with the findings of Turner (1973) and Holliday and Mowat (1963) in that the cultivars mentioned above gave minimum percentage of infection in the present study also. Variation in the reaction of cultivars of black pepper to *P. palmivora* in different countries might be due to geographical variation in virulence and also due to climatic factors that might alter the host physiology to react differently.

Further screening of open pollinated seedling progenies of cultivars is under progress.

#### REFERENCES

- ALBUQUERQUE, F. C. 1968a. Preliminary note on the grafting of black pepper (in Spanish). *Circ. Inst. Pesqui Agropecu Norte* 14: 1-18.
- ALBUQUERQUE, F. C. 1968b. *Piper colubrinum*, a grafting rootstock for *Piper nigrum* resistant to disease caused by *Phytophthora palmivora* and *Fusarium solani piperi* (in Spanish). *Pesq. Agropec, Bras* 3: 141-145.
- ALCONERO, R., ALBUQUERQUE, F., ALMEYDA, N. AND SANTIAGO, A. G. 1972. *Phytophthora* foot rot of black pepper in Brazil and Puerto Rico. *Phytopathology* 62: 144-148.
- ANONYMOUS, 1977. Ghana—a potential producer of pepper. *Pepper News* 1(2): 4-5.
- DE WAARD P. W. F. 1979. Evaluation of the results of research on eradication of *Phytophthora* foot rot of black pepper (*Piper nigrum* L.). pp. 1-47. Circulated during the first meeting of the Asian pepper community permanent panel on Techno economic studies, 31 January-4 February, 1979, Cochin, India (Mimeographed).
- GARNER, R. J. AND BEAKBANE, B. 1968. A Note on grafting and anatomy of black pepper, *Exp. Agric.* 4: 187-192.
- GASKINS, M. H. AND ALMEYDA, N. 1968. Growth of *Piper nigrum* on root stock of other *Piper* species. Proc XVI Annual meetings of the Carribean region. *Proc. Amer. Soc. Hort. Sci.* 4: 64-65.
- HOLLIDAY, P. AND MOWAT, W. P. 1963. Foot rot of *Piper nigrum* L. (*Phytophthora palmivora*) Phytopathological paper No. 5. Commonwealth Mycological Institute, Kew Surrey, pp. 62.
- MULLER, H. R. A. 1936. *Phytophthora* foot rot of pepper (*Piper nigrum* L.) in the Dutch East Indies (in Dutch) *Meded. Inst. Pl. Tickt., Batavia* No. 88, pp. 73.
- NAMBIAR, K. K. N. AND SARMA, Y. R. 1977. Wilt disease of black pepper. *J. Plant Crops* 5: 92-103.
- RUPPEL, E. G. AND ALMEYDA, N. 1965. Susceptibility of native pepper species to the collar rot pathogen of black pepper in Puerto Rico. *Plant Dis. Repr.* 49: 550-551.
- SARMA, Y. R. AND NAMBIAR, K. K. N. 1979. A technique for screening black pepper (*Piper nigrum* L. with) *Phytophthora palmivora* (Bult.). In *Proc. PLACROSUM II, 1979* (ed. C. S. Venkataram) pp. 403-406.
- TURNER, G. J. 1971. Resistance in *Piper* species and other plants to infection by *Phytophthora palmivora* from *Piper nigrum*. *Trans. Br. mycol. Soc.* 57: 61-66.
- TURNER, G. J. 1973. Pathogenic variations in isolates of *Phytophthora palmivora* from *Piper nigrum*. *Trans. Br. mycol. Soc.* 60: 583-585.