

## Distribution of Dipteran Maggots Associated with Ginger (*Zingiber officinale* Rosc.) in Kerala\*

Ginger (*Zingiber officinale* Rosc) is prone to infestation by various pests which form a limiting factor in production. About 20 species of insect pests have been recorded on the crop in India including various species of dipteran maggots which tunnel into the rhizomes and feed on the inner contents. Though considered to be primary pests of ginger, the maggots are generally seen in rhizomes affected by rhizome rot disease caused by *Pythium* spp., *Fusarium* spp., and *Pseudomonas solanacearum*. The maggots recorded include *Calobata* sp. (Micropezidae) (Fletcher, 1914), *Chalcidomyia atricornis* Mall. and *Formosina flavipes* Mall. (Chloropidae) (Malloch, 1927), *Celyphus* sp. (Celyphidae) (Nair, 1975), *Mimegralla* sp. nr. *coeruleifrons*

Macquart (Micropezidae), *Eumerus* sp. (Syrphidae) (Anonymous, 1977) and *Eumerus albifrons* Walker (Sathiamma 1979). Premkumar, Sarma and Gautam (1982) reported the association of *Eumerus* sp. and *Mimegralla* sp. with *Pythium* infected and bacterial wilt affected ginger rhizomes; 42% of the samples examined had *Pythium*, 58% had *Pythium* and maggots and none with maggots alone.

In view of the suspected involvement of the maggots in the etiology of rhizome rot disease, a survey was undertaken in major ginger growing areas of Kerala during 1984 and 1985 to study the association and distribution of various species of maggots in ginger

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and their extent of infestation. The results of the survey are presented in this report.

The survey was carried out in Wynad, Cannanore, Pathanamthitta, Idukki, Kottayam and Ernakulam districts of Kerala during November 1984 and Quilon, Trivandrum, Malappuram, Palghat, Trichur and Calicut districts during September to December, 1985. During the survey, 195 gardens selected at random were visited and 767 samples collected for detailed study. Each sample garden was divided into four blocks and one bed from each block was selected, at random and observations on the incidence of rhizome rot and the maggots associated with them were recorded. Samples of diseased and healthy rhizomes were collected and brought to the laboratory for examination. The maggots in the samples were extracted and identified. The pathogens were isolated on potato dextrose agar and corn meal agar media and identified.

The association of dipteran maggots in the healthy and diseased rhizome samples collected from different districts is furnished in Table I. *M. coeruleifrons* and *E. pulcherrimus* were the common species recorded during the survey. An unidentified species of *Gymnonerius* (Neriidae) was also recorded in one sample collected from Wynad district. Maggots were present in 33.6 per cent of the disease-affected samples. Among the various species, *M. coeruleifrons* was the dominant species occurring in 26.4 per cent of the diseased samples. *E. pulcherrimus* alone was observed only in 1.0 per cent of the diseased samples. The

combined infestation of both the species of maggots was observed in 5.9 per cent of the diseased samples. The percentage of diseased samples with *M. coeruleifrons* was 37.5, 43.5, 50.0 and 66.7 respectively in Malappuram, Cannanore, Palghat and Trivandrum districts. In Kottayam, Ernakulam, Wynad, Pathanamthitta and Quilon districts 14.3 to 30.0 per cent diseased samples contained *M. coeruleifrons*. *E. pulcherrimus* alone was recorded only from Pathanamthitta and Quilon districts, the percentage being 5 and 10 respectively. The combined infestation by *M. coeruleifrons* and *E. pulcherrimus* ranged from 2.5 to 41.7 per cent diseased samples in various districts. In Idukki district the incidence of the disease and maggots was not observed. Though the disease incidence was very high in Trichur district, maggots were not observed. The incidence of disease was very low in Calicut district and maggots were absent in the samples collected. Infestation by *M. coeruleifrons* generally occurred first and that by *E. pulcherrimus* occurred subsequently. The diseased rhizomes yielded *Pythium aphanidermatum*, *Pseudomonas solanacearum* and *Fusarium* sp. The maggots were not observed in samples which had just taken up the disease indicating that the disease occurs first and maggots infest the diseased rhizomes later.

Radke and Borle (1982) while studying the status of *M. coeruleifrons* on ginger also reported that rotting of the rhizomes due to micro organisms began first and the flies preferred such rhizomes for laying eggs. Ghorpade, Jadav and Ajri (1983) conducted survey in Maharashtra and reported that infestation

Table I. Distribution of dipteran maggots and pathogens associated with ginger rhizomes in Kerala

District	No. of samples examined		No. and percentage of diseased samples				Pathogens isolated from diseased samples
	Total	Diseased	With <i>M. coeruleifrons</i> alone	With <i>E. pulcherrimus</i> alone	With <i>M. coeruleifrons</i> and <i>E. pulcherrimus</i>	Without maggots	
Trivandrum	28	6	4(66.7)	—	—	2(33.3)	<i>Pythium</i> spp. <i>Pseudomonas solanacearum</i>
Quilon	34	10	3(30.0)	1(10.0)	—	6(60.0)	<i>P. solanacearum</i>
Pathanamthitta	55	40	11(27.5)	2(5.00)	1(2.5)	26(65.0)	<i>Pythium</i> spp. <i>P. solanacearum</i> <i>Fusarium</i> spp. <i>Fusarium</i> spp.
Kottayam	10	7	1(14.3)	—	—	6(85.7)	<i>Fusarium</i> spp.
Ernakulam	15	13	2(15.3)	—	—	11(84.6)	<i>Pythium</i> spp.
Idukki	43	—	—	—	—	—	Nil.
Palghat	43	12	6(50.0)	—	5(41.7)	1(8.3)	<i>Pythium</i> spp. <i>P. solanacearum</i>
Trichur	105	32	—	—	—	32(100.0)	<i>Pythium</i> spp. <i>P. solanacearum</i>
Malappuram	39	16	6(37.5)	—	5(31.3)	5(31.3)	<i>Pythium</i> spp. <i>P. solanacearum</i> <i>Fusarium</i> spp.
Calicut	200	3	—	—	—	3(100.0)	<i>P. solanacearum</i> <i>Pythium</i> spp.
Wynad*	162	126	33(26.2)	—	3(2.4)	89(70.6)	<i>Pythium</i> spp. <i>P. solanacearum</i> <i>Fusarium</i> spp.
Cannanore	33	23	10(43.5)	—	3(13.0)	10(43.5)	<i>Pythium</i> spp. <i>Fusarium</i> spp. <i>P. solanacearum</i>
Total	767	288	76(26.4)	3(1.0)	17(5.9)	191(66.3)	

\* *Gymnonerius* sp. was recorded from a single sample.

by *M. coeruleifrons* was endemic in Sangli and Satara districts and that the infestation was less in light and well drained soils. The present studies indicated that maggots are associated only with rhizome rot affected ginger and they were absent in healthy ginger.

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