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RESEARCH ARTICLE

Oil Palm Bunch Refuse as a Natural Breeding Substrate of *Proutista moesta* (Westwood) (Homoptera: Derbidae) and Other Homopterans in Kerala, India

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ABSTRACT

***Proutista moesta*, the vector of phytoplasma (MLO) diseases of palms in Kerala, India has adopted Oil Palm as its most favoured food plant in recent years. Oil Palm Bunch Refuses (OPBRs) with three groups of saprophytic fungal growth were observed as important natural breeding sites of *P. moesta*. Five more Homopterans also emerged from OPBRs, among which Gen. et sp. Indet.(Achilidae) and Gen. et sp. indet. (Derbidae) are also important. All the five species were also observed feeding on oil palm and coconut. The sterilized OPBRs were predominantly colonised by *Rhizopus, Mucor, Aspergillus, Pleurotus, Volvariella, Coprinus*, etc. (Group A) and by *Neurospora* (Group B). The unsterilized and partially decomposed bunch refuse resulting from delayed harvest was usually colonised by basidiomycetous fungi like *Pleurotus, Volvariella, Coprinus* etc. (Group C). The OPBRs were exposed for 3 to 16 weeks in the field and were then caged to facilitate recording of the emergence of Homopterans. On an average, each OPBR colonised by *Neurospora* (Group B) produced 930 adults of *P. moesta*, 70 achilid and 5.6 derbid, whereas from each OPBR with Group A fungal growth, 502 *P. moesta*, 71.7 achilid and 14.43 derbid emerged. At the same time, each of the unsterilized OPBR of delayed harvest (Group C), the fruits of which were removed mechanically and then exposed in the field for three weeks, supported the development of 393.5 adults of *P. moesta*, 12.83 achilid and 6.13 derbid. On an average 21.5 *P. moesta*, 4.16 achilid and 0.93 derbid emerged from every OPBR of delayed harvest, when they were caged immediately after removing the fruits (without exposing to the field for natural oviposition), indicating small-scale breeding of these Homopterans on the fruit bunches which were left unharvested on the palms.**

The finding that *P. moesta* breeds naturally on OPBR in large numbers is highly significant and as a result of which the authors could investigate its role as a vector of phytoplasma diseases of palms, by-passing the cumbersome procedure of rearing it in the laboratory.

Key words: oil palm, plant hopper, *Proutista moesta*, breeding substrate, rearing

INTRODUCTION

Proutista moesta (Westw.) (Homoptera: Derbidae) is an important member of the sap feeding insect community associated with oil palm in Kerala State, India. Dhileepan (1991) reported it from oil palm while Nair and Menon (1963) recorded it from arecanut palm (*Areca catechu* L.) and Rajan and Mathen (1985) observed it on coconut. It was also observed feeding on the American oil palm, *Elaeis oleifera* by the authors. Besides India, the plant-hopper is distributed in Formosa, Guam, Malaysia, Philippines, Sri Lanka etc. Sugarcane is its main food plant in these countries. Wilson (1987), based on Wood (1968) and Corbett (1932) reported its presence on coconut palms. Jowar, maize and paddy are also mentioned as its food plants (Rajan and Mathen, 1985). Its role in transmitting the mosaic disease of sugarcane was investigated by Dastur (1923) and Fletcher (1928) but met with negative results. Edison (1973) found *P. moesta* transmitting the causal agent of grassy shoot disease of sugarcane in India. It is reported as the vector of

Root (wilt) disease of coconut and Yellow leaf disease of arecanut (Anonymous, 1997; Ponnamma, 1993). *P. moesta* was indicated as the common vector of Root (wilt) disease of coconut, Yellow leaf disease of arecanut and Spear rot disease of oil palm (Anonymous, 1995; Kochu Babu, 1993).

Fletcher (1914) observed the nymphs of *P. moesta* developing on rotting wood and Wood (1968) reported them breeding on the rotting fruit bunches, which are left unharvested on oil palms. A combination of male and female inflorescence has been reported as substrate for laboratory rearing of this plant hopper (Ponnamma and Karanavar, 1998). During rainy months, it builds up large populations and as many as 175 adults can be seen on an adult palm. It was important to locate the breeding substrates of *P. moesta* in oil palm agroecosystem. In the course of our search for the breeding substrates, we observed *P. moesta* emerging from oil palm bunch refuses at Bharathipuram, Kollam District. The present paper deals with the emergence of *P. moesta* and other Auchenorrhyncha, whose nymphal stages develop on rotting oil palm bunch refuses.

MATERIALS AND METHODS

Fresh Fruit Bunches of Oil Palm are sterilized in the palm oil factory under 3 kg/sq.cm pressure for one hour and after separating the fruits in the stripper, the bunch refuses (OPBRs) are discarded outside the factory. They are used for mulching the basins of oil palms and are also used as fuel in the boiler. Usually, large heaps of OPBRs, colonised by fungi, can be seen lying the vicinity of palm oil factories for several months.

During rainy season, two groups of profuse fungal growth occur on the OPBRs (Sterilized) within 3 to 7 days after removing them from the stripper. *Rhizopus, Mucor, Aspergillus, Pleurotus, Volvariella, Coprinus etc.* are the fungi in Group A. Thick mycelial growth of *Neurospora* envelop the entire OPBR in some months, especially February, March and April (Group B). Basidiomycetous fungi, such as *Pleurotus, Volvariella*, *Coprinus* (Group C) grow on the unsterilized bunch refuse obtained from delayed harvest. They are partially decomposed at the time of harvest. Fruits are removed from such bunches manually (without sterilization) with iron rods or wooden pegs. *Neurospora* was not observed on the unsterilized bunch refuses.

To find out whether *P. moesta* emerges from OPBRs, five net cages (2 x 2 x 2 m) were initially set up over heaps of OPBRs (Group A) which remained exposed in the field for 16 weeks, over an area of 20 sq.m (Table1: Expt. I). On confirming that *P. moesta* emerged in large numbers, groups of 30 one day old OPBRs (Group A & C) were exposed between rows of oil palm (arranged over 2 x 2 m area) close to the palm oil unit at NRC for Oil Palm, Regional Station, Palode, for three, eight and 16 weeks for the Homopterans to oviposit and emerge (Table 1, Expts. II and IV). On completion of the exposure period, nylon net cages (2 x 2.25 x 2 m) were erected over them with the help of wooden poles. *P. moesta* required a minimum period of 22 days for completing egg to adult cycle. The Homopterans emerged in the morning hours and rested on the top and sides of the net cages. They were collected from 9-10 a.m. The netting cages were properly secured after every entry/exit to prevent the escape of insects. The cages were not removed till emergence was almost complete.

In experiments III and IV (Table 1), the emergence of Homopterans was first recorded for six and ten weeks respectively and OPBRs were then re-exposed for another three weeks by removing the netting cages and after the expiry of three weeks, the netting cages were again placed in position to collect and record further emergence. For experiments V and VI, unsterilized bunch refuses (Category C) were used. One group of 30 bunch refuses were exposed for three weeks after removing fruits (Expt. V) while another group of 30 were immediately caged after removing fruits manually (Experiment VI), so as to get an idea on the extent of breeding of Homopterans on the fruit bunches which are left unharvested.

A different method was adopted to record

the emergence of Homopterans from bunch refuses colonised by *Neurospora* (Group B). Sixty of them were exposed in two groups ('X' and 'Y' of 30 each, side by side for three weeks, after which 'X' was caged first and recorded the emergence in the next day. Then the netting cage was removed from 'X' and 'Y' was caged (exposing 'X' for natural oviposition). Emergence from 'Y' was recorded in the subsequent day and the netting cage was removed from'Y' and 'X' was caged (exposing 'Y' for natural oviposition for a day). Thus, emergence of Homopterans was recorded from 'X' and 'Y' on the alternate days and also exposed each group for natural oviposition by the Homopterans on the alternate days. By adopting this method, a realistic assessment of the natural emergence of *P. moesta*, the achilid and the derbid from 30 OPBRs colonised by *Neurospora* could be made, the results of which are presented in Table 2.

RESULTS AND DISCUSSION

The results of the experiments are given in Table 1 and 2. The experiment I in Table 1 proved that large scale natural breeding of *P. moesta* occurs in nature and oil palm bunch refuses. The rotting bunch refuses were also found to serve as an ideal substrate for the growth of many

Table 1: Emergence of *P. moesta* and other homopterans from OPBR with group A & C fungal growth

Expt. No.	Group of fungal growth on the OPBR	Age of the OPBR used and detail of field exposure	Period of emergence in weeks	Emergence of Homopterans			Other three unidentified Homopterans
				P. moesta	Gen. et. sp. indet (Achilidae)	Gen. et. sp. indet (Derbidae)	
I	A	Several OPBR exposed in the field for 16 weeks over an area of 20 sq.m	10 (17th to 26th week)	17,103	Not recorded	286	113
II	A	30 fresh (one day old OPBR exposed for 3 weeks	15 (4th to 18th week)	14,287 (476.2 per OPBR)	1195 (39.8)	201 (6.7)	
III	A	30 fresh OPBR exposed for 8 weeks	6 (9th to 14th week)	8,747	1082	273	22
		14 weeks old OPBRs re-exposed for another 3 weeks	13 (18th to 30th week)	6,314	1068	160	109
		Total		15,061	2150	433	131
		Emergence per OPBR		502	71.7	14.43	
IV	A	30 fresh OPBR exposed for 16 weeks continuously and then caged	10 (17th to 26th week)	1,750	262	183	43
		26 weeks old OPBRs exposed for further 3 weeks	7 (30th to 36th week)	1,130	205	26	75
		Total		2,840	467	209	118
V	C	30 unsterilised bunch refuse of delayed harvest exposed in the field for 3 weeks after removing fruits manually	13 (4th to 16th week)	11,805	385	185	24
		Emergence per OPBR		393.5	12.83	6.16	0.8
VI	C	30 unsterilised bunch refuse caged immediately on removing the fruits manually	10 (1st to 10th week)	645	125	28	16
		Emergence per OPBR		21.5	4.16	0.93	0.53

saprophytic fungi which assist in their decomposition. The nymphs of derbids and achilids are thought to feed on fungi (Wilson, 1987). Experiments I and VI in Table 1 and Table 2 show that in addition to *P. moesta*, five more Auchenorrhynchans *viz.*, Genus et sp. indet. (Achilidae), Genus et sp. indet. (Derbidae) and three other undetermined Homopterans utilize bunch refuse for their breeding.

Both the derbid and the achilid which are

Table 2: Emergence of *P. moesta*, Gen. et. sp. indet. (Achilidae) and Gen. et. sp. indet. (Derbidae) from cages 'X' and 'Y' containing 30 OPBRs colonised by *Neurospora* in each cage

Month	Week	*P. moesta*	*P. moesta* population in every 4 weeks	Genus et. sp indet. Derbidae	Genus et. sp indet. Achilidae
1	4	54	54		
	5	1150			
	6	5646			
	7	6556			
2	8	5644	18,996		162
	9	3494			
	10	1554			
	11	1258			
3	12	912	7,218	16	192
	13	588			
	14	588			
	15	252			
4	16	122	1,550	104	846
	17	58			
	18	10			
	19	8			
5	20		76	30	755
	21				
	22				
	23				
	24			18	150
	No emergence beyond 24 weeks				
	Total	27,894	27,894	168	2105
	Emergence per OPBR		930	5.6	70.16

undescribed species occur abundantly, in the order described. *P. moesta* begins to emerge from OPBR, three weeks after exposure to the field followed by the achilid and then the derbid (Table 2). When *Neurospora* colonisation occurred, the entire bunch refuse, including the stalk was covered with thick, rose, mycelial mat. The Homopterans continued to emerge from *Neurospora* colonised bunch refuses from 4th to 24th week. *P. moesta* emerged between 4th and 19th week, even though the achilid and the derbid continued to emerge till 24th week. Maximum emergence of *P. moesta* occurred between 6th and 9th week.

A total of 27,894 adults of *P. moesta,* 2,105 achilid and 168 derbid emerged from 30 *Neurospora* colonised bunch refuses (Table 2), i.e., each such bunch refuse supported the emergence of 930 *P. moesta*, 70.16 achilid and 5.6 derbid. Exp. VI (Table 1) corroborates the finding of Wood (1968) that *P. moesta* breeds on the over ripe oil palm bunches which are left on the palms without harvesting. On an average, 21.5 adults of *P. moesta*, 4.17 achilid, 0.93 derbid and 0.53 adults of other Homopterans emerged from such OPBR (Table 1, Expt. VI). All the five unidentified Homopterans that emerged from the OPBRs were observed feeding on the foliage of oil palm and coconut subsequently.

The major constraint in conducting transmission experiments is the rearing of the probable vectors in adequate numbers in the laboratory. The finding that *P. moesta* breeds naturally on OPBRs colonised by different groups of fungi, especially those colonized by *Neurospora,* in large numbers, helped the authors to conduct transmission experiments on phytoplasma diseases of palms. The precise role of fungi which colonise the OPBRs in relation to the oviposition and development of *P. moesta* and other Auchenorrhynchans is yet to be determined.

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REFERENCES

Anonymous. 1995. *Research Highlights* 1994-95, Central Plantation Crops Research Institute, Kasaragod, Kerala, pp.26.

Anonymous. 1997. *Annual Report for 1996-97,* Central Plantation Crops Research Institute, Kasaragod, Kerala, India, pp. 208.

Corbett, G.H. 1932. *Insects of coconut in Malaya*, Department of Agriculture, Straits settlements and Federated Malaya States, Bulletin No. **10**: 1-106.

Dastur, F.J. 1923. The mosaic disease of sugarcane in India. *Agric. J. India,* **18** : 505-509.

Dhileepan, K. 1991. Insects associated with oil palm in India. *FAO Plant Prot. Bull.*, **39**: 94-99.

Edison, S. 1973. Investigations on the grassy shoot disease of sugarcane, Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.

Fletcher, T.B. 1914. *Some South Indian Insects*, Government Press, Madras, pp. 563.

Fletcher, T.B. 1928. *Report of the Imperial Entomologist. Sci Rep. Agric. Res. Inst., Pusa,* 1926-27, pp. 57-67.

Kochu Babu, M. 1993. Investigations on spear rot complex of oil palm (*Elaeis guineensis* Jacq.), Ph.D. Thesis, Mangalore University, Mangalore, Karnataka, 178 p.

Nair, R.B. and Menon, R. 1963. Major and minor pests of arecanut crop, *Areca catechu Linn. Arecanut J.*, **14**: 139-147.

Ponnamma, K.N. 1993. Studies on *Proutista moesta* (Westwood):Population dynamics, control and role as a vector of Yellow leaf disease of arecanut, Ph.D.thesis,Kerala University, Kerala.

Ponnamma, K.N. and Karanavar, G.K. 1998.

Biology, Bionomics and Control of *Proutista moesta* (Westwood) (Hemiptera :Derbidae) a vector of Yellow leaf disease of areca palms In: *Developments in Plantation Crops Research* (Eds.Mathew N.M. and Kuruvilla Jacob, C.), Allied publishers Ltd., New Delhi, pp. 264-272.

Rajan, P. and Mathen,K. 1985. *Proutista moesta* (Westwood) and other additions to insect fauna on coconut palm. *J.Plantn. Crops,* **13** : 135-136.

Wilson, M. R. 1987. The Auchenorrhyncha (Homoptera) associated with palms. In: *Proceedings of the Second International Workshop on leaf hoppers and plant hoppers of economic importance* held at Provo Utah,U.S.A., 28th July to 1st Aug., 1986 (Eds. Wilson, M.R. and Nault, R.L.), Commonwealth Institute of Entomology, London, pp. 327-342.

Wood, B.J. 1968. *Pests of oil palms in Malaysia and their control,* Incorporated Society of Planters, Kuala Lumpur, 222p.