

RPF-III

**PROFORMA FOR SUBMISSION OF FINAL
REPORT OF RESEARCH PROJECTS**

Part-I : General Information

800 Project Code

8001 Institute Project Code No. : Ent. XI (813)

8002 ICAR Project Code No. : -

801 Name of the Institute and Division8011 Name & address of Institute : Indian Institute of Spices Research
P. B. No. 1701, Marikunnu P. O., Calicut-673 012
Kerala.

8012 Name of Division / Section : Crop Protection / Entomology

8013 Location of the Project : Indian Institute of Spices Research, Calicut.

**802 Project title : Bioecology and management of mealybugs
infesting black pepper****803 Priority area :**

8031 Research approach

Applied Research	Basic Research	Process or Technology Development	Transfer of Technology
<u>01</u>	02	<u>03</u>	04

804 Specific area : Agricultural Entomology**805 Duration of Project : 5 years**

8051 Date of start : April 1998

8052 Date of completion : March 2003

806 Total cost / Expenditure incurred :

(Give reasons for variation, if any from original estimated cost)

Total cost : Rs. 10, 38,000/-

807 Executive summary :

Surveys conducted in Wynad District during 1998 revealed that 20%-80% of black pepper vines were infested by root mealybug *Planococcus* sp. during monsoon period. Surveys conducted in Calicut District during 2000 showed that root mealybug infestation was negligible in the areas surveyed. Out of 39 gardens surveyed in Madikeri District of Karnataka, 13 gardens showed mild level and 3 gardens medium level of infestation by root mealybug. The presence of root mealybug was noticed on main roots as well as on secondary and tertiary roots of black pepper and were found to be present even upto a depth of 2 feet below the soil on the roots. Many of the vines having root mealybug infestation were also affected by *Phytophthora* foot rot disease and such vines exhibited yellowing, defoliation and wilting. Studies on biology of *Planococcus* sp. indicated that the life span from crawler to adult ranged from 32 to 36 days. Out of 7 host materials tested for mass culturing, pumpkins and squash were most ideal. Field control trials conducted in farmers fields with insecticides showed that chlorpyrifos 0.075% was the most effective in suppressing root mealybug population.

808 Key words : Mealybug, *Planococcus* sp., chlorpyrifos, black pepper.

Part-II : Investigator Profile

(Please identify clearly changes, if any in Project personnel)

810 Principal Investigator

8101 Name : K. M. Abdulla Koya
 8102 Designation : Scientist (Selection Grade)
 8103 Division / Section : Crop Protection/ Entomology
 8104 Location : Indian Institute of Spices Research, Calicut
 8105 Institute Address : Indian Institute of Spices Research,
 Marikunnu (P. O.) Calicut-673 012, Kerala.

811 Co-Investigator

8111 Name : S. Devasahayam
 8112 Designation : Principal Scientist
 8113 Division / Section : Crop Protection/ Entomology
 8114 Location : Indian Institute of Spices Research, Calicut

8115 Institute Address : Indian Institute of Spices Research,
Marikunnu (P. O.) Calicut-673 012, Kerala.

812 Co-Investigator

8121 Name : M. Anandaraj
8122 Designation : Principal Scientist
8123 Division / Section : Crop Production/ Plant Pathology
8124 Location : Indian Institute of Spices Research, Calicut
8125 Institute Address : Indian Institute of Spices Research,
Marikunnu (P. O.) Calicut-673 012, Kerala.

Part-III: Technical Details

820 Introduction and objectives

8201 Project objectives

The project was proposed as there reports from farmers especially from Wyanad and Kodagu Districts in Kerala and Karnataka, respectively, regarding widespread infestation by mealybugs on black pepper roots. Since the problem was serious and infestation by mealybugs damaged the vine affecting the yield, the Research Council held during 1998 suggested to formulate a project to study all aspects of the problem and to evolve control measures against the pest. It was felt essential to conduct surveys to find out the areas where the pest infestation was more and also the extent and nature of damage caused by the pest. Moreover, the interaction of mealybug with the fungus *Phytophthora capsici* causing foot rot disease of black pepper was thought to be important. Finally evolving control measures against the pest was necessary to save the vines. The project was hence proposed incorporating all these aspects.

8202 Background information and importance of the project:

Planococcus sp. has been reported to infest shoots and other aerial parts of black pepper vines in Malaysia and Indonesia (Devasahayam 2000). No reports are available regarding infestation of this species on roots of black pepper vines. *Planococcus citri* has been reported to attack many economically important crops in the world including grapes, coffee and citrus. The pest infestation is generally seen on aerial parts such as flower buds, tender stems, young fruits etc; however, on coffee, *P. citri* also infests roots resulting in wilting and mortality of young plants. Studies conducted by various workers on life cycle and biology of the pest on coffee have been reviewed by Pelley (1968). Various control schedules have been suggested against mealybugs in which biological control forms and important one.

No work has been done in India on *Planococcus* sp. infesting black pepper vines. The genus *Planococcus* comprises of many economically important species among which *P. citri* and *P. lilacinus* are polyphagous and have been recorded on horticultural crops such as pineapple, grape, sapota, guava, mango, cocoa and coffee. The morphology, nature of damage, life cycle and seasonal abundance of these two species have been studied by various workers on these crops and reviewed by Tandon (1993). However, little information is available on *Planococcus* sp. that infests subterranean parts of various crops. In coffee, *P. citri* has also been reported to infest the basal region of the stem and roots. Severely infested plants wilt and young plants succumb to the pest attack. Various aspects of bioecology of *P. citri* infesting coffee have been studied and reviewed by Reddy and Naidu (1999).

821 Project technical profile

8211 Technical programme

(Indicate briefly plan of procedure, techniques, instruments and special materials, organisms, special environments etc.)

- a) Survey for incidence of mealybugs.
- b) Nature of damage caused by mealybugs.
- c) Life history of mealybugs.
- d) Standardization of techniques for mass culturing mealybugs.
- e) Management of mealybugs.

8212 Total man months involvement of component project workers

- | | |
|---------------|------|
| a) Scientific | : 40 |
| b) Technical | : 15 |
| c) Supporting | : 15 |

822 Final report on the Project

Detailed report containing all relevant data with a summary of results (not exceeding 2-5 pages)

- a) Distribution

Surveys conducted in Wyanad District during 1998 revealed that 20%-80% of the vines were infested by mealybug *Planococcus* sp. during monsoon period. The incidence was found to be 4.4%-17.8% during summer months. During 1999, the incidence varied from 6.7%-42.2% when the survey was carried out in nine locations. However, at two locations mealybugs were not noticed. Surveys conducted in Calicut District during 2000 showed that mealybug infestation was negligible in these areas except in a few gardens in Chakkittapara area. During 2001, surveys conducted in north eastern part of

Calicut district indicated that mealybug infestation could not be located in 12 gardens visited. Out of 39 gardens surveyed spread over 13 locations in Kodagu District of Karnataka, 3 gardens showed medium and 13 gardens mild infestation by *Planococcus* sp.

Table 1. Survey for incidence of root mealybug infesting black pepper

State	District	No. of locations surveyed	Percentage infestation (range)
Kerala	Wyanad	23	4.4-80.0
Kerala	Calicut	19	0.0-13.3
Karnataka	Madikeri	13	4.4-24.4

a) Nature of damage

Studies conducted on nature of damage caused by mealybugs indicated that they were present on main roots as well as on secondary and tertiary roots and were found to be present even up to a depth of 2 feet below the soil on the roots. Many of the vines having mealybugs infestation were also affected by *Phytophthora* foot rot disease and such vines exhibited yellowing, defoliation and wilting.

b) Life history

The morphometrics of adults and crawlers were determined. The total life span from crawler to adult ranged from 32-36 days. The total number of crawlers produced by a female ranged from 19-197.

c) Standardization of techniques for mass culturing

Seven host materials such as elephant foot yam, colacasia, coleus, potato, pumpkin and squash were most ideal for mass culturing.

d) Management of mealybugs

Preliminary field trails using neem products and organic compounds revealed that neem products did not have any impact on the mealybugs. However, chlorpyrifos at 0.1% was most effective when the root zone of black pepper vines were drenched with the insecticide solution. A field trail was conducted at Kalpeta using insecticides such as quinalphos, malathion, chlorpyrifos and prophenophos all at 0.075% concentrations singly and in combination with wetting agent for management of mealybugs. The insecticide application was carried out during May and August and observations on incidence of root mealybug were carried out 30 days after the final treatment (drenching with insecticides).

Combined analysis of data of two years showed that all the insecticides were effective in reducing the population of root mealybug when compared to control. However, wetting agent alone was found to be equal to untreated control. Among the various treatments, chlorpyriphos was the most effective and was on par with quinalphos and prophenophos.

Table. 2. Efficacy of insecticides against root mealybug

Treatment	Population/ 2.5 cm of root
Quinalphos 0.075%	0.5 de
Chlorpyriphos 0.075%	0.0 e
Prophenophos 0.075%	1.6 cd
Malathion 0.075%	2.2 c
Quinalphos 0.075% + Sandovit 0.1%	1.1 cde
Chlorpyriphos 0.075% + Sandovit 0.1%	0.0 e
Prophenophos 0.075% + Sandovit 0.1%	1.1 cde
Malathion 0.075% + Sandovit 0.1%	2.5 c
Sandovit 0.1%	7.7 b
Control	9.4 a

(DMRT test at $P < 0.05$)

8221 Achievements in terms of targets fixed for each activity

Sl. No.	Target	Achievement
1.	Survey for incidence of mealybugs	Surveys conducted in Wyanad District showed that mealybug population was less during summer. In Kodagu District of Karnataka, out of 39 gardens surveyed, 13 gardens showed mild level and 3 gardens medium level infestations.
2.	Nature of damage caused by mealybugs	Mealybugs were noticed on roots of black pepper vines upto a depth of 2 feet under the soil.
3.	Standardization of techniques for mass culturing mealybugs	Out of seven host materials tested, pumpkin and squash were found most ideal for culturing mealybugs.
4.	Management of mealybugs	Drenching the root zone of infested pepper vines with 0.075% chlorpyriphos was found to suppress the pest population.

8222 Questions answered

Question - What are the measures to be adopted for controlling mealybug infestation on the roots?

Answer - Drenching of affected vines with chlorpyrifos 0.075% is effective for the management of mealybugs on roots of black pepper.

8223 Process/Product/Technology/ developed

Management of mealybug infesting black pepper roots with chlorpyrifos 0.075%.

8224 Practical utility (not more than 150 words)

The technology developed for the management of mealybug infesting black pepper roots would help in preventing the mortality of affected black pepper vines and thus increase the productivity of the crop.

8225 Constraints, if any :

Nil

823 Publications and material development :

(One copy each to be supplied with this pro forma)

8231 Research papers

Nil

8232 Popular articles

18. Devasahayam, S. and Abdulla Koya, K. M. 1999. Mealybugs can kill- Beware. Spice vision 1: 7- 8

8233 Reports

IISR Annual Reports 1998-2003

8234 Seminars, conferences and workshops (relevant to the project) in which the scientists have participated (List abstracts forwarded):

- 1) ENTOMOCONGRESS 2000, 5-8 November 2000, Thiruvananthapuram.

Papers presented

- 1) Devasahayam S and Koya K. M. A. 2000. Evaluation of entomopathogenic fungi against root mealybug infesting black pepper. ENTOMOCONGRESS 2000, 5-8 November 2000, Thiruvananthapuram.

824 Infrastructural facilities developed

(Details of field, laboratory, note books and final material and their location)

Necessary facilities for mass culturing of mealybug for conducting basic studies were developed.

825 Comments / Suggestions of Project Leader regarding possible future line of work that may be taken up arising out of this Project.

During the course of the studies, a few fungal pathogens were noticed in the field and the impact of such pathogens on mealybugs are to be studied in detail.

**Part-IV : Project Expenditure
(Summary)
Year (1998-2003)**

830 Total Recurring Expenditure

8301 Salaries (Designation with pay scaly):

		<u>Estimated</u>	<u>Actual</u>
i) Scientific	:	Rs. 780000	Rs. 780000
ii) Technical	:	Rs. 111000	Rs. 111000
iii) Supporting	:	Rs. 107000	Rs. 107000
Sub-Total	:	<hr/> Rs. 998000	<hr/> Rs. 998000

8302 Consumables

i) Chemicals	:	Rs. 10000	Rs. 10000
ii) Glasswares	:	Rs. 10000	Rs. 10000
iii) Others	:	-	-
		<hr/>	<hr/>

Sub-Total	:	<u>Rs. 20000</u>	<u>Rs. 20000</u>
8303 Travel	:	Rs. 10000	Rs. 10000
8304 Miscellaneous (other costs)	:	Rs. 10000	Rs. 10000
8305 Sub-Total (Recurring)	:	<u>Rs. 1038000</u>	<u>Rs. 1038000</u>
831 Total Non-Recurring Expenditure (Equipments and works)		-	
Total (830 and 831)	:	<u>Rs. 1038000</u>	<u>Rs. 1038000</u>

Part-V: Declaration

This is to certify that the final report of the Project has been submitted in full consultation with the project workers as per the approved objectives and technical programme and the relevant records, note-books; materials are available for the same.

Signature of Project Investigator

Co-Investigators

Signature & comments of the Head
of the Division/Section

Signature & comments of the Director