

PROJECT COMPLETION SUMMARY SHEET

DATE Sheet completed: 15 March 2000

Project Title:	The chemical ecology and mating behaviour of the millet pests, <i>Coniesta ignefusalis</i> and <i>Heliocheilus albipunctella</i>	
DFID Project Reference No:	R6693	
Programme:	Crop Protection Programme	
Programme Manager (Institution):	Dr Simon Eden-Green (NRIL)	
Sub-Contractor (if relevant):	NRI, Central Avenue, Chatham Maritime, Kent. ME4 4UB	
Production System:	Semi-Arid	
Programme Purpose:	2	
Commodity Base:	Millet	
Beneficiaries:	Research institutes, small-holders	
Target Institutions:	ICRISAT, Sahelian Centre, Niger	
Geographic Focus:	Niger, West Africa	
	Planned	Actual
Start Date:	1 April 1996	1 April 1996
Finish Date:	31 March 2000	31 March 2000
Total Cost:	£198,671	

1. Project Purpose:

The Purpose of the project was to develop and promote improved methods for management of principal insect pests of cereal-based cropping systems in areas where they are a major constraint to production. The project contributed to this Purpose by investigating the chemical ecology of the two most important insect pests of millet in West Africa, the millet stem borer, *Coniesta ignefusalis*, and the millet head miner, *Heliocheilus albipunctella*, in order to determine the potential of pheromones and plant chemicals in management of these pests.

2. Outputs:

Outputs were as follows:

- A training course on use of pheromones was run for West African extension staff, and the handbook "The Use of Pheromone Traps for Monitoring Millet Stem Borer, *C. ignefusalis*" was completed and published.
- Staff at ICRISAT Sahelian Centre were trained to prepare pheromone lures. Pheromone of *C. ignefusalis* was synthesised and provided to ICRISAT for maintenance of a trap network in 11 countries of the West and Central Africa Millet Research Network.
- Methods for use of pheromones for control of *C. ignefusalis* by mating disruption were established during field trials in Niger.
- Methods were developed for breaking diapause and rearing *H. albipunctella* in the laboratory.
- Extensive field and laboratory studies on mating behaviour of *H. albipunctella* demonstrated conclusively this is rather unique in that female moths are attracted to the male moths, mainly by sound. There is no evidence for any chemical attraction, and, in particular, previous reports of production of diethyl malonate by the male moths could not be confirmed.
- During the course of field work in Niger, another species very similar to *H. albipunctella* was observed in millet fields. This was identified as *Masalia nubila*.
- Previous reports of involatile chemicals in millet heads stimulating oviposition by *H. albipunctella* could not be confirmed. A rôle for volatile chemicals was demonstrated and components of millet volatiles stimulating receptors on the antennae of the female moths were identified. The compositions of volatiles from three different varieties of millet were compared.
- ICRISAT developed a new technique for assessing the ability of millet to support development of larvae of *H. albipunctella*, and this was used to compare survival

on three different millet varieties. Oviposition preferences by *H. albipunctella* for these three varieties were also compared in the field, complementing the laboratory work.

- Surveys in five villages in western Niger showed that farmers carried out qualitative crop loss assessment and were fully aware of the link between yield loss and insect pest damage. Most farmers practice pest control measures. These were mostly traditional methods, but farmers were keen to learn of new approaches, particularly against *H. albipunctella*. Methods for assessing damage and yield loss due to *H. albipunctella* were established.

3. Contribution of Outputs to Project Goal:

The project has established technology for use of the synthetic pheromone for both monitoring and mating disruption of the millet stem borer, *C. ignefusalis*. Monitoring has been taken up by the WCAMRN and there are proposals to use mating disruption in a project funded by IFAD and managed by the ICRISAT collaborator, Dr Youm.

The project has elucidated the mating behaviour of *H. albipunctella* and established that there is probably no prospect for using manipulation of this in management of the pest. Significant progress has been made in investigating the mechanisms of resistance in millet to *H. albipunctella* in terms of host selection for oviposition and success of larval development in different varieties. This data is still being analysed and the results will contribute to improved management of this pest which is recognised by farmers in the Sahel as a major constraint on growing of millet in the Region.

4. Publications:

YOUM, O., TOURE, K., DARBOE, M., RATNADASS, A., MAHAMADOU, C.I., BALDE, M. and HALL, D.R. (1997) Monitoring pearl millet stem borer (*Coniesta ignefusalis* (Hampson)) populations using pheromone-baited traps. Part I: Results from Mali, Gambia, Niger and Senegal. *International Sorghum and Millets Newsletter*, No. 38, 134-136. (Peer reviewed paper)

DAKOUO, YOUM, O., GWADI, W.K., AJAYI, O., DIKE, M.C., YEHOUENOU, A. and TANZUBIL, P. (1997) Monitoring pearl millet stem borer (*Coniesta ignefusalis* (Hampson)) populations using pheromone-baited traps. Part II: Results from Benin, Burkina Faso, Ghana and Nigeria. *International Sorghum and Millets Newsletter*, No. 38, 137-138. (Peer reviewed paper)

YOUM, O., BEEVOR, P.S., MCVEIGH, L.J. and DIOP, A. (1997). Effect of trap height and spacing in relation to crop height on catches of the millet stem borer, *Coniesta ignefusalis* males. *Insect Science and its Application*, **17**:162-168. (Peer reviewed paper)

YOUM, O., BEEVOR, P.S., HALL, D.R. and MCVEIGH, L.J. (1997). The potential use of pheromones for the management of the millet stem borer, *Coniesta ignefusalis* (Hampson). *Insect Science and its Application*, **17**:169-173. (Peer reviewed paper)

YOUM, O., RUSSELL, D.A. and HALL, D.R. (1998) Use of Pheromone Traps for Monitoring Millet Stem Borer, *C. ignefusalis*. ICRISAT press. 20pp. English and French versions (book).

BEEVOR, P.S., YOUM, O., HALL, D.R. and CORK, A. (1999) Identification and field evaluation of components of the female sex pheromone of the millet stem borer, *Coniesta ignefusalis* (Hampson) (Lepidoptera: Pyralidae). *Journal of Chemical Ecology*, **25**: 2643-2664. (Peer reviewed paper)

5. Internal Reports:

Quarterly and Annual reports.

YOUM, O. and OWUSU, E. (1998) Farmers' perceptions of crop losses due to insect pests in pearl millet.

YOUM, O. and OWUSU, E. (1998) Assessment of yield loss due to the millet head miner *Heliocheilus albipunctella* (Lepidoptera: Noctuidae) using a damage rating scale and regression analysis.

OWUSU, E. and YOUM, O. (1998) Preliminary notes on millet head miner, *Heliocheilus albipunctella* (Lepidoptera: Noctuidae) host plant-female egg oviposition interactions

6. Other Dissemination of Results:

“Sound, scent and sex in the scourge of the Sahel”. Presentation to Royal Entomological Society, London, by Dr S Green, November 1998.

7. Follow-up indicated/planned:

Dr Youm (ICRISAT) is proposing to follow up work on mating disruption of *C. ignefusalis* as part of a project in Niger, Nigeria and Burkina Faso funded by IFAD.

The results on host finding and selection by *H. albipunctella* and the success of subsequent larval development should be followed up in collaboration with millet breeders at ICRISAT Sahelian Centre. This project has confirmed that *H. albipunctella* is generally regarded as the most damaging insect pest of millet in the Sahel, and development of resistant varieties now appears to be the most appropriate approach to management of this pest by smallholder farmers in the Region.

The identification of *M. nubila* on millet in Niger is a noteworthy finding. This species is easily confused with *H. albipunctella* so that its importance as a pest species may have been overlooked in the past, and its role should be further investigated.

8. Name and signature of author of this report:

Prof D R Hall