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A simple and low cost semiochemical based trapping method for the management of banana pseudostem weevil, *Odoiporus longicollis* Olivier (Coleoptera:Curculionidae)

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ABSTRACT

Aggregation pheromone of banana pseudostem weevil, Odoiporus longicollis in conjunction with host plant extract was used to develop an efficient trapping method to monitor and control the pest. In a field experiment, funnel traps baited with the lure of aggregation pheromone, 2-methyl-4-heptanol in combination with host plant extract attracted significantly more weevils than traps baited with either pheromone or host plant extract alone. Semiochemical based trapping in weevil management has potential either in mass trapping or as part of an integrated pest management (IPM) programme.

Keywords: *Odoiporus longicollis*, Semiochemical, 2-Methyl-4-heptanol, Funnel trap.

INTRODUCTION

The banana pseudostem weevil, *Odoiporus longicollis* Olivier (Coleoptera: Curculionidae) is an important pest which affect the growth of banana and plantain in South East Asia [1]. Adult females of *O. longicollis* lay eggs in the outermost leaf sheath of banana. Larvae hatched from the eggs bore into the living tissue, producing frass- filled tunnels that weaken the affected parts of the host plant and permit invasion of fungal and bacterial pathogens. Mature larvae pupate in cocoons made from plant fibres close to the exit holes. Now a day, this weevil poses a serious threat to the banana cultivation under garden land and highland of Tamil Nadu. A heavy loss of yield was reported due to this pest. Therefore, an effective management programme for this weevil is essentially required.

At present, banana pseudostem trapping is the only method available to monitor this pest. It was reported that male weevil produced a pheromone, 2-methyl-4-heptanol which attracted both male and female banana weevils [2]. It was reported that the female weevil also produced sex

pheromone [3]. However, the authors were unable to identify the components. According to Gunawardena and Dissanayake, 2-methyl-4-heptanol works only in the presence of food bait under field conditions using bucket traps [2]. The authors used a big food bait and, therefore, required a trap of large size. This was not affordable for marginal farmers. Due to this, the above method is not popular among the farming communities. The purpose of this study is to develop a simple and low cost indigenous semiochemical based trapping method to control *O. longicollis*.

MATERIALS AND METHODS

Traps

Plastic funnel traps were used in the field experiments to compare the potency of the pheromone, 2-methyl-4-heptanol in combination with host plant extract. Each trap (Fig. 1) consists of two white plastic funnels of the same size (12 cm dia x 8 cm stem length) kept close to each other with a gap of approximately 2 cm by a polypropylene twine. A 100 ml plastic screw capped container (a bottle with 7 cm base and 14 cm height) was used to hold soap solution up to a mark of approximately 3 cm from the bottom. A round hole of 2 cm was made on the screw cap of the container to enable it to insert the stem of one of the funnels. The plastic container with soap solution retained the trapped weevils. Each assembled trap was tied on a bamboo stick of about 30 cm. The stick was tied around the pseudostem with a height of 1 m from the ground. The funnel trap was hanged on the bamboo stick.

Chemicals

The pheromone, 2-methyl-4-heptanol was purchased from M/S. Chempure (P) Ltd, Mumbai. This compound was diluted with hexane (HPLC grade) solvent. The host plant extract (cultivar Nendran) was prepared from 100 g of banana pseudostem pieces in hexane by solvent extraction method. The supernatant was carefully removed to a flask and reduced to 10 µl/g equivalent using rotary evaporator. The pheromone and host plant extracts were filled in a 2 ml effendorf tube (lure) which was hanged halfway inside the funnel trap by a polypropylene twine. The release rate of pheromone and host plant extract was found to be 60 mg/day under laboratory conditions and lasted up to 21 days under field conditions.

Field experiments

All experiments were carried out at Maharajapuram village, Thirukkattupalli Taluk, Thanjavur district of Tamil Nadu from 15th January to 4th February 2010. The traps were placed in a shaded area of *Musa* plantation, arranged in a straight line perpendicular to the prevailing wind direction with alternation of the treatments under examination. They were placed approximately 10 m apart and checked at weekly intervals. The following treatments were employed and each replicated nine times in a randomized block design:

1. Pheromone (PH) + Host plant extract (HPE)
2. PH
3. HPE
4. Control (hexane)
5. Banana pseudostem trap (Control check)

Each trap was baited with one of the above treatments. Weevils in the traps were removed weekly and counted. Over all, 36 traps were used in the experiments.

Statistical analysis

The data on mean weekly catches were analysed using analysis of variance. One way ANOVA was performed for mean separation, where, significant (P <0.05) statistical differences were detected.

RESULTS AND DISCUSSION

The data obtained from the field experiments are presented in the Table 1. In the field experiments, traps baited with PH combined with HPE caught significantly (P<0.05; F = 6.010; d.f. = 8, 44; ANOVA; Table 1.) more weevils than traps baited with PH and HPE alone in the 1st week of the experiments. A mean capture of 3.222 weevils was recorded in the trap baited with PH + HPE. During the 2nd week of the experiments, weevil capture was reduced and the maximum mean capture was recorded in the trap baited with PH + HPE (P< 0.05; F = 8.918; d.f. = 8, 44; ANOVA). During the 3rd week of the experiments, there was no significant weevil capture in the traps baited with different semiochemicals. This indicated the reduction of the weevil population at the experimental site (P> 0.05); F = 1.571; d.f = 8, 44; ANOVA).

Aggregation pheromone of the Australian population of New Guinea sugarcane weevil, *Rhabdoscelus obscurus* (Boisduval) in conjunction with other semiochemicals was successfully used to develop an efficient trapping method for the weevil population in Guam [4]. Attraction of adult banana weevil, *Cosmopolites sordidus* to volatiles from banana pseudostem tissue and the synthetic pheromone Cosmolure+ was studied in the laboratory and in the field showed that the attraction was significant under laboratory conditions and the host plant attraction was not effective to deploy under field conditions [5]. The attractiveness of volatiles emitted by adult cottonwood leaf beetle, *Chrysomela scripta* feeding on the foliage in the field using modified boll weevil traps was tested [6]. Mass trapping of *Cosmopolites sordidus* using a pheromone-baited pitfall trap and *Metamasius hemipterus* using a pheromone-sugarcane-baited open gallon trap was conducted in commercial plantain and banana [7]. A lethal pitfall trap using semiochemical-mediated attraction of *Metamasius hemipterus sericeus* was developed [8]. Application of bark beetle semiochemicals was successfully developed for quarantine of bark beetles in China [9]. Hence, massive trapping of banana speudostem weevil may be a viable method for control.

Table 1. Mean weevil catch per trap per week

	Week		
	I	II	III
2-Methyl-4-heptanol + Host plant extract	3.222[a]	1.889[a]	0.667
2-Methyl-4-heptanol	1.000[bc]	0.788[b]	0.375
Host plant extract	1.667[b]	0.500[b]	0.250
Control (no lure)	0.220[c]	0.111[b]	0.000
Banana pseudostem trap	0.444[c]	0.222[b]	0.222
CD (0.05)	1.426	0.684	0.438
SEd	0.700	0.336	0.215
Level of significance	**	**	NS

** Highly significant
NS = Non Significant
a = best, b = better, bc = fair and c = poor

In this study, we tested the behavioural activity of the *O. longicollis* pheromone mixed with the odour of its host plants and developed a simple and affordable field trap system to control banana pseudostem weevil.

CONCLUSION

This investigation indicates the potential of using lures containing the PH in combination with HPE. Though, the solvent extract of host plant enhances the attraction of the PH, identification of the active ingredient could be of great use. Since our trap design is simple and cost effective which may be used by small farmers for monitoring the pest.

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