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Efficiency of pheromones and trap types in the capture of the banana weevil *cosmopolites sordidus* germar in Uganda

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Abstract

Pheromone traps (Pitfall-cosmolure+, Pitfall-RMD-1, Gallon-Cosmolure+ and Gallon-RMD-1) were evaluated for efficiency in trapping banana weevils *Cosmopolites sordidus* Germar under field conditions in Uganda. They were compared with conventional pseudostem traps, adoption of, which has been slow. The Pitfall-cosmolure+ traps caught 18 times the number of weevils as compared to the pseudostem traps that caught a mean of 1.3 weevils per trap per day. The weevil catches of the other three-pheromone traps were significantly lower than the pitfall-cosmolure+ trap catches and significantly higher than the pseudostem trap catches but similar among themselves. Both male and female weevils were equally attracted. The traps attracted weevils mainly from a radius of 10 metres. Pheromone trapping appears to have a great potential for integration in other management practices of the banana weevil in Uganda.

Key Words: Banana weevils, Combination lure, Cosmolure, Cosmopolites sordidus, Pheromone

Introduction

The banana weevil *Cosmopolites sordidus* Germar is one of the major constraints to banana production especially in small scale farming systems (Bujulu *et al.*, 1983; Sikora *et al.*, 1989; Stover & Simmonds, 1987). Weevil control, when applied, relies on the application of costly agrochemicals that are beyond the reach of resource poor farmers. Resistance towards these chemicals has recently developed in some countries (Bujulu *et al.*, 1983; Collins *et al.*, 1991). Cultural control practices that are again of limited application include crop sanitation and trapping. Integrated pest management approach (IPM) appears to be a plausible method being developed for the control of this pest. Weevil trapping using banana pseudostem traps is the commonly advocated for component of the IPM options (Gold, 1998). This method however, has not been easily adopted in Uganda due to its being labour intensive. An easy to use, effective and sustainable technology, involving use of pheromone traps, has been identified as a plausible alternative (Alpizar and Fallas, 1997). It could be used in combination with other control measures, especially those based on cultural practice, as an IPM option.

The pheromone trapping system has been reported to be a safe, long lasting, effective and reasonably priced component of pest management (Alpizar and Fallas, 1997). The trapping system has been reported to reduce damage and increase yields in banana and plantains (Alpizar and Fallas, 1997). Pheromone lures (Cosmolure+) increased the attractiveness of stem traps by 5-10 times in Cosat Rica. Cosmolure baited buried pitfall traps containing 3% laundry detergent in water were however 2.5 times more effective than cosmolure baited stem traps. The capture rate of the trap was reported increased by 20% when cosmolure baited plastic gallons with a ramp were used as compared to baited pitfall traps (Alpizar and Fallas, 1997).

This paper gives preliminary results of a study conducted at Kawanda Agricultural Research Institute (KARI), Uganda to validate the efficiency of the technology under Uganda conditions.

Materials and Methods

Site

The study was conducted on-station in a 4 year old banana plantation of about 1 hectare, planted with the cultivar Mbwazirume (AAA-EA). The field was previously used for a black sigatoka experiment and consisted of 36 plots with 25 mats in each plot.

Types of traps

Two pitfall traps and two gallon traps were one each treated with a cosmolure and a combination lure (RMD-1) pheromone placed in the banana field as baits for the banana weevil. The conventional pseudostem traps were included as a check. Traps were checked every day for a month and the number of weevils caught in each trap recorded. Pseudostem traps were renewed every 3 days. Weevils caught in pheromone traps were sexed to determine sex ratios of weevils attracted to pheromone traps. Trap designs and types were as follows:

i) Pitfall **traps + Cosmolure+ or RMD-1**: Pitfalls were prepared by cutting open 10 litre buckets at a height of 15-cm (Fig. 1a). A pheromone lure was hung from the roof of the bucket cover using a nylon string. A laundry detergent was added in the traps to reduce surface tension and therefore prohibit the weevils from climbing out.

Fig. 1(a)

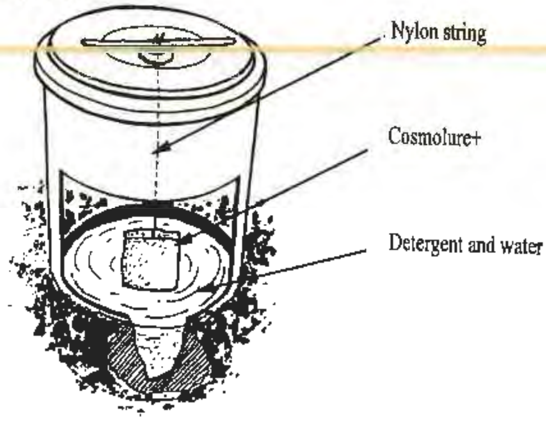
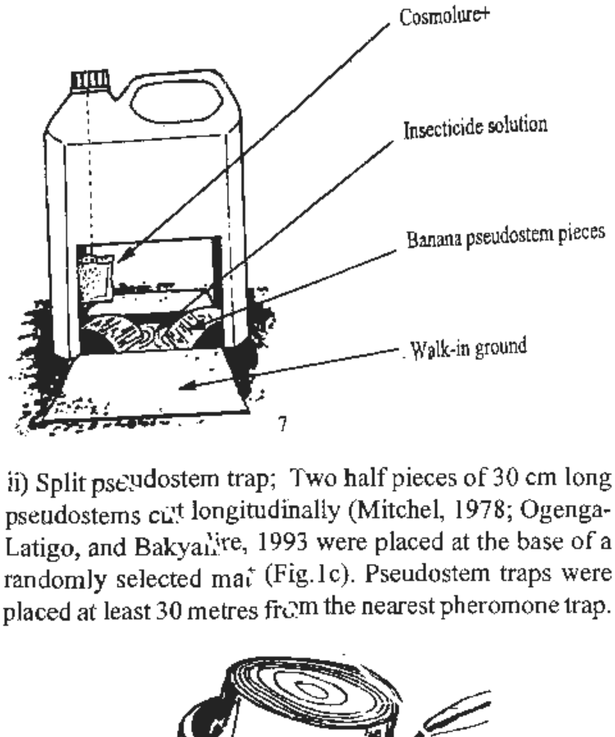


Fig. 2 (b)

ii) Gallon traps with a ramp+ cosmolure or RMD-1: Gallon traps were made out of a 5 litre Jerrycan (Fig. 1b). A Window was cut in each side of the jerrycan and the flap folded down to make a walk-in ramp. Traps were placed in the soil to make ramps touch on the ground. Either a cosmolure or RMD-1 pheromone was hung from the cup of the jerrycan using a nylon string. Pseudostem pieces (5-10 cm long) soaked in a solution of Furadan (10g Furadan to 1 litre of water) were placed at the bottom of the gallon to kill weevils whenever attracted into the trap.



ii) Split pseudostem trap; Two half pieces of 30 cm long pseudostems cut longitudinally (Mitchel, 1978; Ogenga-Latigo, and Bakyalire, 1993 were placed at the base of a randomly selected mat (Fig.1c). Pseudostem traps were placed at least 30 metres from the nearest pheromone trap.

Determination of distance of attraction of weevils by pheromone traps

Weevils were marked according to sex and distance of release by scratching on elytra using a dissecting blade. Weevils were released at 5, 10, 20, 30, 40, 50 and 60 metres from the pitfall-cosmolure trap. The marked weevils were recaptured and recorded every day for four weeks.

Results and Discussions

The pitfall-cosmolure traps caught 18 times the number of weevils as compared to the pseudostem traps (control), which caught a mean number of 1.3 weevils per trap per day (Fig. 2). The weevil catches of the other three pheromone traps were significantly lower than the pitfall-cosmolure trap catches and significantly higher than the pseudostem trap catches but similar among themselves.

According to results, pitfall-cosmolure traps to have the greatest potential in enhancing weevil trapping in Uganda conditions compared to all other pheromone traps under study. In addition to its high weevil-capturing rate, the trap is less costly to use, as one needs only to add a laundry detergent. In contrast, the gallon with a ramp trap needs addition of banana pseudostem pieces treated with an insecticide, which are costly and may cause harm to the farmer. The weevil catches of Gallon traps baited with cosmolure are not in agreement with what was reported in Costa Rica condition (Alpizar & Fallas, 1997). According to the work conducted in Costa Rica, Gallon baited traps are expected to capture 20% more than pitfall traps baited with Cosmolure. It was not clear why the gallon-cosmolure trap efficiency was low in Ugandan conditions.

The percentage of female and male weevils attracted by both pheromone traps and pseudostem traps were not significantly ($P<0.05$) different (Table 1). Pheromone traps equally attracted both female and male weevils ($p<0.05$).

The pheromone-baited traps (Pitfall-cosmolure trap) attracted weevils mainly from a radius of 10 metres with pheromone action decreasing greatly after 20 metres (Fig.3). Few weevils from the distance of 60 metres from the traps were recaptured in pheromone traps in a period of four weeks. The data here suggests that 20 metres would be the optimum distance of separation between pheromone traps in case of mass trapping, which confirms observations from Costa Rica (Oeschlager, Pers. comm.) This would require at least 25 pheromone traps per hectare without changing trap locations in the field. The trap density of 25 per hectare (non-movable) might be more effective as compared to use of 4 traps per hectare with traps moved 20 metres along the 60 meter axis every month to cover the entire infested field (Alpizar and Fallas, 1997). The trap density of 4 per hectare was reported to reduce weevil populations significantly within six months. The rate of reduction of weevil population using 25 traps per hectare compared to 4 traps per hectare needs to be determined in Ugandan conditions.

In general, pheromone trapping appears to be a potential method for integration in other management practices of the banana weevil in Uganda. The traps have a simple design and may easily be produced by the farmers themselves. In addition, these traps require little maintenance and can be used in remote locations where frequent visits are impractical. The presented results are however preliminary more time is need[illegible] confirm the feasibility of the pheromone trap [illegible] on farmer's fields.

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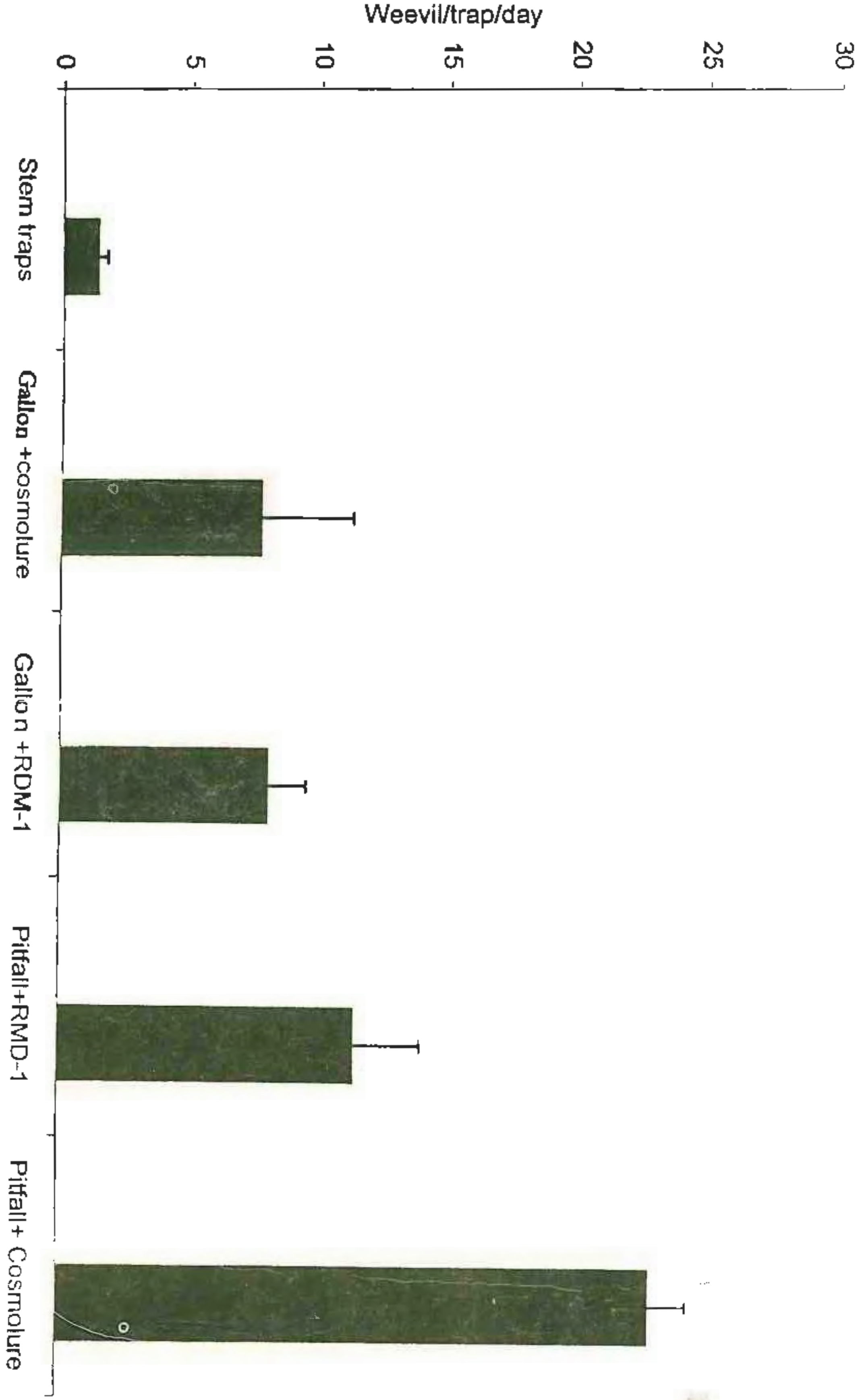

Fig. 2: Mean weevil catches in different types of traps

Table 1: Sex ratios of weevils caught by pheromone traps

Trap Type	Number of weevils (n)	% weevils trapped		
		Males	Females	p-value
Pitfall + Cosmolure	274	50.9	49.1	0.838ns
Gallon + Cosmolure	104	51.8	48.2	0.964ns
Pitfall + RMD-1	169	54.7	45.3	0.312ns
Gallon + RMD-1	127	45.4	54.6	0.433ns

ns= not significant at p=0.05

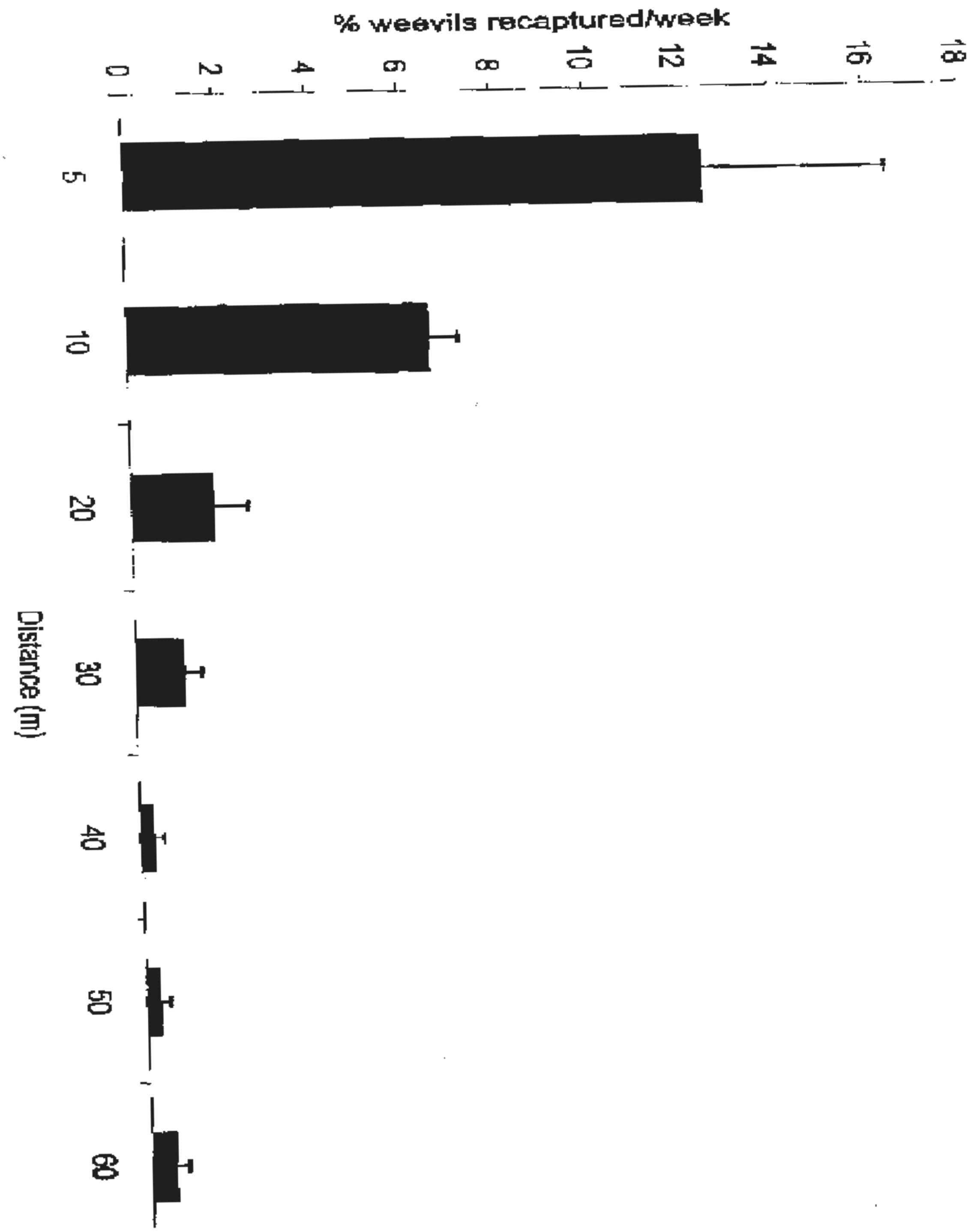

Fig.3: Mean percentage of weevils recaptured per week by pheromone traps

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