A Suggestion to Use Dogs for Detecting Red Palm Weevil (*Rhynchophorus ferrugineus*) Infestation in Date Palms in Israel

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The date palm, *Phoenix dactylifera* L., is the most important fruit crop in the Middle East, where it has been cultivated since ancient times. Since the mid 1980s the red palm weevil (RPW), *Rhynchophorus ferrugineus* (Olivier) (Col., Curculionidae), has caused serious damage to date palms in the Gulf region (1). It was recorded for the first time in the United Arab Emirates in 1986; then was found in Saudi Arabia in 1987 and in the Islamic Republic of Iran in 1992 (9). It crossed the Red Sea into North Africa and was recorded in Egypt in 1993 (5) and in the Palestinian Authority, Jordan and Israel in 1999 (7). The weevil is widely distributed in Southern Asia and Melanesia, where it feeds on a broad range of palms including coconut, sago, date, and oil palms (11).

Eggs of the RPW are laid in the trunk of the palms and the larval stages feed on the soft plant tissue within the trunk of palms, which leads to the formation of tunnels inside the palm. Under heavy attack the tree is weakened and dies. In infested plantations, yields have been estimated to drop from 10 tons to only 0.7 ton per ha (6). Because of the concealed nature of the grubs, early detection by pest management specialists is difficult and often the pest is detected only after most damage has already been inflicted. This is because the openings of the tunnels are concealed under the trunk fibers, beneath the bases of the leaflets or hidden between the tree trunk and the offshoots. In this respect pheromone traps may serve as a general warning device indicating the presence of the pest in the area (10). However, the actual detection of such trees at their early stage of infection still remains a problem. Early detection of infected trees would allow their rescue by various treatments – trunk injection with insecticides or soil applications (1). Late detection of infected trees results in heavy damage that cannot be cured, and such trees have to be destroyed.

Due to the importance of this pest to all date palm growers in the region, the Peres Center for Peace, Israel, and Novartis Agro AG, Switzerland, initiated an Israeli-Arab cooperative project. This project aims at developing an Integrated Pest Management (IPM) program for the control of RPW. Within the framework of this project, first records of the pest's appearance in Israel, Jordan, and the Palestinian Authority were obtained and its occurrence was confirmed (7). This early detection enabled the authorities to undertake suitable monitoring and control measures at an early stage of infestation and to prevent further buildup of the pest population.

Following the detection and the immediate control operations, efforts were aimed at developing better and more effective methods for early detection of infested trees. Preliminary results regarding the possibility of using dogs for detecting date palms infected with the RPW are presented in this study.

Allen *et al.* (2) refer to the possibility of chemical detection of insects as follows: "Plant feeding by insects produces unique signatures of chemical compounds that often are exploited by natural enemies (8,12), and these chemical signatures could be used to locate infested plants in the field. There even are published claims by some crop consultants that they can smell mite infestations themselves (4). Because the existence of plant–insect chemical signatures is well established, it seemed reasonable that dogs could be taught to recognize them. In fact, there is at least one study that demonstrates this, in which German shepherds were trained to find gypsy moth, *Lymantria dispar* (L.), egg masses and pheromone-marked items (13).* Dogs are being used now by USDA–

[1]Received Dec. 12, 1999; received in final form Feb. 13, 2000; http://www.phytoparasitica.org posting March 8, 2000.

*Dogs can be used to detect screwworm fly infestations (14).

APHIS to find foreign plant materials in the luggage of international travelers and currently are used in over 20 international airports (3,15). Canines have such a keen olfactory sense that they can detect a buried land mine 50 cm underground in a swath 2–3 m wide (Mine detection dogs – http//www.humanitydog.se/minedog.htm).

In spite of the olfactory ability of dogs, an enormous amount of research is being done on the development of 'electronic noses', which will be used, perhaps, in the future. Currently, however, dogs are still the most capable methods of detecting explosives. It appears that chemical detection of insects looks promising, whether with dogs or other bio- or electronic technology."

Two dogs (Golden Retriever) were trained in the Afikim kennels to detect the smell of the ooze that is exuded from RPW-infested trees. This ooze (the brownish-yellow smelly secretion from an infested tree) was collected from infested trees and stored in a refrigerator. Small quantities of it (~0.5 g) were packed within small, ball-shaped (2 cm diam), plastic netting (50 mesh). The small quantity of ooze used as bait was to ensure that dogs would respond to infected trees even at the initial stage of infestation. The procedure for training the dogs was as follows: (*a*) The dog is allowed to play with the net balls containing the ooze. (*b*) Soon after the dog starts to enjoy the game and to bring back the net balls, the trainer begins to hide the bags and let the dog find them. Every time the dog finds a hidden ball he is rewarded with food. (*c*) The balls are hidden inside date palm trees and the dogs are sent to find them. Every time they find one, they sit down near the tree waiting to get their reward. The training procedure is based on a conditional chain process comprised of game, ball, tree, the word 'search', and rewarding the dogs. Training lasts for 30–45 days (1 h/day).

A few tests for determining the searching ability of the dogs were carried out during July–October 1999. The dogs were released in date palm plantations where 'oozing balls' had been hidden within a few trees (ten trees in each test). In all cases (four tests) the dogs found the hidden baits very quickly, with 100% success in finding them. In October–December the dogs were sent out to search in a plantation where high RPW captures were recorded previously. The dogs found infected trees that had not been detected previously.

The dogs' persistence, working ability and capacity to locate infested trees should be tested further. To the best of our knowledge, this is the first report that dogs are an effective tool for detecting infestations of RPW in date palms. The possibility of using dogs for early detection of RPW infestations might contribute to better management of RPW in date palm plantations.

ACKNOWLEDGMENTS

It is a pleasure to thank all those who supported the operation of this project, particularly Prof. S. Pohoryles, Director of The Andreas Agricultural Development Trust; Mr. A. Loehken, from Novartis Agro AG, Switzerland; Mrs. Keren Meron, from the Peres Center for Peace; Mr. B. Glasner and Mr. U. Landau, from the Israeli Date Growers Organization; and Mr. S. Biton, from the Israel Ministry of Agriculture.

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