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Efficiency assessment of an Attract and Kill technology to contribute to the control of RPW in applied field conditions

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Abstract

Mass trapping and limited duration or specifically targeted insecticides treatments constitute two of the main components of an integrated and participative strategy conceived to obtain quickly the sustained decrease of the RPW population.

The attract and kill (A&K) technology (of the lure and kill type in this paper) combines two aspects of these two components: semiochimical attraction, not to a trap, but to small sites on the trees where the pest is killed by a contact insecticide. The great advantages of such technology are that the attraction is specific of the pest, the insecticide is not spread in the environment and its effectiveness lasts longer than usual insecticidal treatment.

For RPW control in date palm plantations, this technology is not used till now and the number of scientific papers published on that issue is very reduced. However, the first results suggested that this technique could be interesting in completing the components of the IPM strategy to control RPW.

Our experimentation consisted to assess the efficiency of the A&K treatment by comparing the captures in conventional traps, 4 weeks before the application of the treatment and 4 weeks after its application. The treatment was applied on the trunk of all the palms of a 4 ha date palms plantation. The traps at the density of 1 trap/ha were placed in the centre of the plantation.

The result shows a spectacular and brutal decrease in the captures in the traps after the treatment. However, the reduction of RPW population after the A&K treatment application has probably be biased by a natural RPW flights decrease due to a brutal increase in temperature from the 5th week. A similar decrease was observed in a close and similar date palm plantation of 4 ha where 4 traps (1 trap/ha) were placed also in the centre of the plantation. However, the decrease of RPW captures in the

treated plot is more than twice as high as the nearby plantation.

This result suggests a possible efficiency of the A&K treatment to reduce significantly the RPW population. Anyway, this experiment should be repeated in conditions to avoid the risk of temperature bias by assessing the performance of A&K when the RPW flying population increases or is stable.

1. Introduction

Mass trapping and limited duration or specifically targeted insecticides treatments constitute two of the main components of an integrated and participative strategy conceived to obtain quickly the sustained decrease of the RPW population (1).

The attract and kill (A&K) technology (of the lure and kill type in this paper) combines two aspects of these two components: semiochimical attraction, not to a trap, but to small sites on the trees where the pest is killed by a contact insecticide. The great advantages of such technology are that the attraction is specific of the pest, the insecticide is not spread in the environment and its effectiveness lasts longer than usual insecticidal treatment.

For RPW control in date palm plantations, this technology is not used till now and the number of scientific papers published on that issue is minimal (2, 3).

The first paper was published in 2011 (1). It showed that a paste formulation containing 15% ferrugineol (pheromone attractant) and 5% of cypermethrin insecticide (killing by contact the attracted RPW) placed at the bottom of 100 buckets distributed in 0.4 ha date palm plantation attracted and killed a number of RPW similar to the number of RPW captured in the equivalence of one "conventional" trapping system per ha. No statistically significant difference was observed between the captures with the "conventional" trapping system and in the buckets containing the A&K paste.

However, this result suggests that this technique, with the treatment applied on the date palm trunk itself, could be interesting in completing the components of the IPM strategy to control RPW. For example, when only the density of one "conventional" trapping system per ha is adopted, this component requires weekly servicing when the A&K would require only one intervention to apply the product whose effect lasts at least three months, according to the authors of this paper.

Some other papers presented results on the same issue, but material, method and statistical analysis were absent.

On a very similar subject (same Rhynchophorus species) but in coconut plantation, very promising results were obtained (4). They also present the interest to correspond to how this treatment is conceived to be applied in actual field conditions: the product was not placed in bucket but on the palm trunk. The experimental design compared RPW captures before and after the treatment in traps placed closed to the plantation where the palms were treated. The difference between the captures before and after the treatment was statistically significant and, probably, with a very high effect size.

However, during the three weeks preceding the treatment, the evolution of the captures in the traps followed a considerable decrease. This evolution reveals a possible experimental bias due to a natural reduction of RPW population, resulting for example from an important increase of temperatures.

Our experiment aimed to realize a similar experiment in date palm plantations.

2. Materials and methods

The experiment was realized in an area of the oasis of Bahariya during 8 weeks from May 6 to July 6, 2023. Most of the palms of the selected plot were infested at the top of the trunk. The plot was of 4 ha, containing between 150 to 200 date palms per ha. One "conventional" trapping system was placed in the middle of each ha of plantation.

The trapping system was of the "conventional" type. The traps were weekly serviced (dry dates substitution, water replacement) and monitored (number of captured males and females RPW).

The A&K treatment was applied on all the palms once, just after the 4th week of traps monitoring. The treatment consisted of depositing on the palms trunk at around 2 m height, in two opposite places, 6 g/palm of a paste Smart ferrolure® of Chemtica, containing ferrugineol (15%) as attractant and cypermethrin (5%) as insecticide to kill the RPW by contact.

The objective of the experimental design was to compare the capture per trap and week before and after treatment.

To dispose of an indication of the RPW captures evolution in the area during the 8 weeks of the experiment, we added to the experimental design a "control" plot close to the plot where the A&K treatment was applied.

This plot was also of 4 ha, and 4 "conventional" traps were placed in the centre of each ha. These traps were controlled and serviced weekly as the traps of the treatment plot.

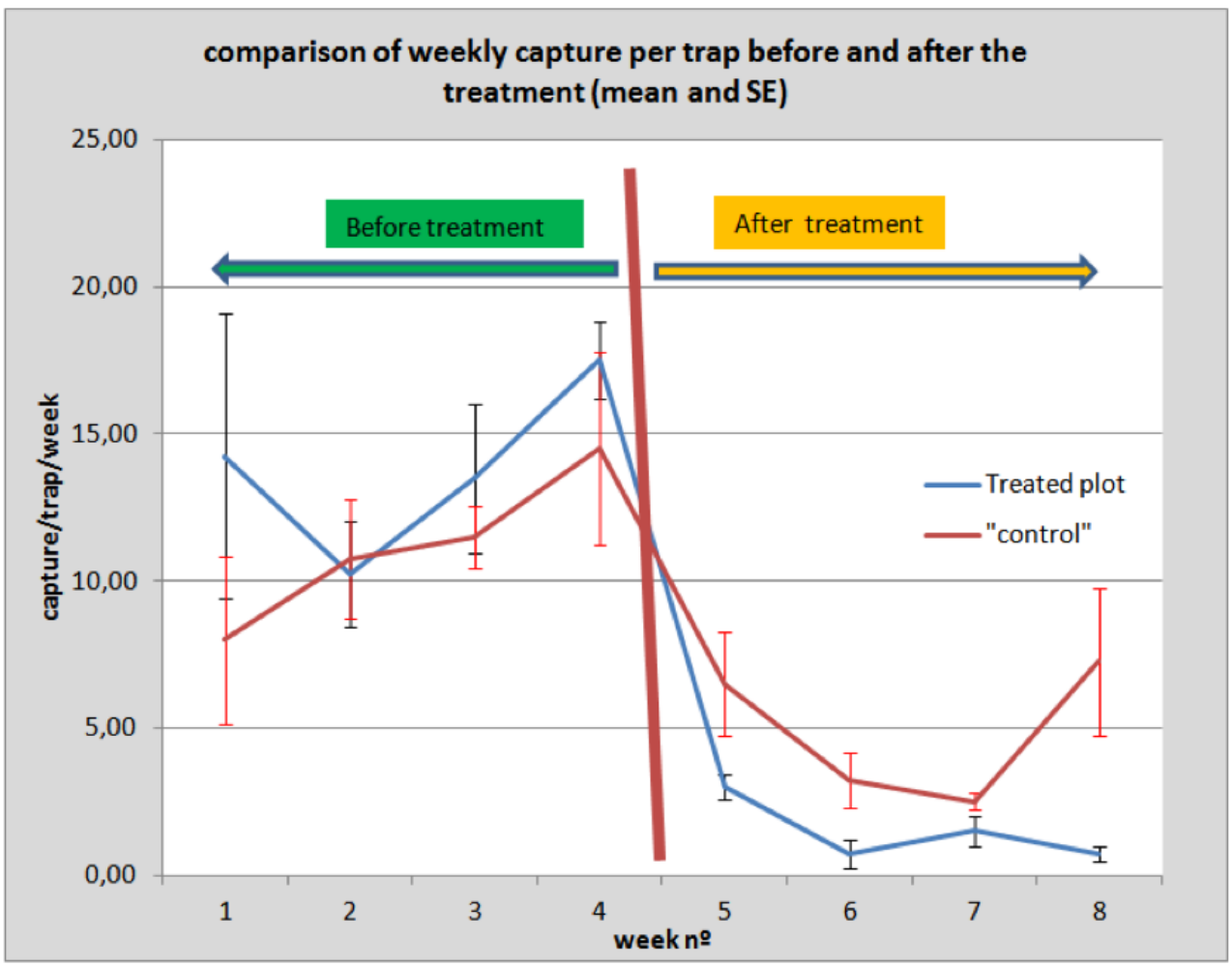

Figure 1. Comparison of weekly captures before and after the A&K treatment

3 Results and discussion

The analysis of the results consisted in comparing the number of weevils captured per week and per trap before and after the treatment. The result shows (Figure 1) a significant (Wilcoxon paired sample test), spectacular and brutal decrease in the captures in the traps after the treatment.

However, the reduction of RPW population after the A&K treatment application was probably influenced by a natural RPW flights decrease due to a brutal increase in temperature from the 5th week. This increase was perfectly perceptible in the field. In addition, the evolution of the captures in the "control" plot (red line of the figure n°1) was very similar to the one of the treated plot.

The similarity between the two evolutions reveals the probable existence of an experimental bias. Nevertheless, the captures in the treated plot were more than twice higher than in the "control" plot, which suggests a potential efficiency of the treatment.

4. Conclusions

The results of this experimentation suggest a possible efficiency of the A&K treatment to reduce rapidly and significantly the RPW population. This experiment should be repeated in conditions to avoid the risk of temperature bias by assessing the performance of A&K when the RPW flying population increases or is stable.

In addition, the experiment should be prolonged until the treatment loses its efficiency, according to the application season, to establish the calendar of treatment application rhythm. This treatment could constitute an exciting and low-cost complement to the IPM strategy.

5. References

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