A COMPARISON OF SEVERAL TRAPS AND ATTRACTANTS AS A FIRST APPROACH TO THE USE OF MASS TRAPPING AGAINST THE OLIVE FRUIT FLY (DIPTERA, TEPHRITIDAE) IN THE VALENCIAN COMMUNITY.

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Abstract: The Valencian Community (on the eastern coast of Spain) is the fourth Spanish region in olive production (for oil and olives). One of the main problems for this crop is the olive fruit fly, *Bactrocera oleae* (Gmelin) and this pest has traditionally been combated in the region by the use of chemicals. Nowadays, it is been studied the technical and economical feasibility in using some ecological methods against the pest. One of these methods could be the mass trapping, so some trials have been started to know its effectiveness, its cost and its effect on natural enemies in order to select the best one.

Keywords: Olive fruit fly, traps and attractants, mass trapping.

Introduction

The Valencian Community is the 5th Spanish region in olive production, with a total of 110,331 olive tons, both for table olives and oil (MARM, 2009). *Bactrocera oleae* (Rossi) is one of the most serious pests of olives worldwide (Daane & Johnson 2010). It is an insect that affects the olives for direct consumption and production of oil (increase of acidity). The control of this pest in the Valencian Community, as in the rest of Spain, had traditionally relied on the use of chemicals. Recently, the development of mass trapping for the control of *B. oleae*, a widely known system that is commonly being used against other tephritid pests, may allow progress in controlling this insect, but the viability of the different attractants and traps (and their combinations) for practical use in the control of the pest must be analyzed (Ros *et al.* 2008 & 2009).

In this work, we present a trial conducted in olive groves in the province of Valencia, to compare attractiveness and effectiveness of several attractant+trap combinations which had yet been studied in other olive Spanish regions.

Material and methods

The trial was carried out in two olive plots located in Enguera (Valencia, Spain), an inner town about 70 km away from the Mediterranean coast and with a large expanse of olive groves, primarily for oil production. A different olive variety was in each plot: Arbequina and Villalonga.

Five traps (glass MacPahil, Tephritrap, ecological Tephritrap, Easy trap and Olipe) and three attractants (Nulure+Borax, Tephri Lure and Ammonium Phosphate) were selected to be tested in a total of 15 combinations (trap+attractant) to determine the best option between all combinations to be used in the mass traping of the pest (Fig. 1). These combinations had yet been studied in previous experiments in other Spanish regions (Ros *et al.* 2005, 2008, 2009).

The trial was carried out in 2008. It started on 4th June (with the setting of the traps in the two plots) and finished on 31st December (with the last collection of catches and removing the traps).

Traps were placed on trees in both plots and every two trees, over an area of about 2.300 m^2 in each plot. They were moved between trees throughout the experiment so that all trap+attractant combinations were in all positions in each plot. Traps were moved, attractants were renewed and insects inside traps removed and counted every two weeks.

The presence at the traps of non-target insects, such as other flies, wasps and natural enemies, especially lacewings was also checked.

Figure 1. The five traps used in this trial: (above, left to right) McPhail, Tephri and ecological Tephri; (below, left to right) Easy and Olipe.

An ANOVA was performed to analyze fly catches in relation to traps, attractants and fly sex (due to the importance in catching females) using InfoStat version 2009 (Di Rienzo *et al.* 2009) and so compare all traps with each attractant and *vice versa*, and also verify the best combination in catching flies (LSD test with Bonferroni correction for an overall significance level of 5%).

Results and discussion

The ANOVA on fly catches data show statistical differences between traps and attractants and also an interaction between these two factors (Table 1). No differences in catches with regard to sex, nor interaction between this factor and the other two, were detected. So, in general, all combinations capture males and females alike.

Table 1. ANOVA of three factors (trap, attractant and sex) on fly catches data.

Source of varation	Arbequina	Villalonga
Trap	<.0001	<.0001
Attractant	<.0001	<.0001
Trap*Attractant	**<.0001**	**0.0003**
Sex	0.9030	0.2238
Trap*Sex	0.6704	0.4245
Attractant*Sex	0.9807	0.1319

In figure 2 cumulated fly catches throughout the trial in the two plots, Villalonga and Arbequina, are shown. Data were similar in the two plots, so in the two olive varieties. Tephrilure and Nulure seem to be good attractants while Phosphate Ammonium is clearly the worst of the three. As for the traps, Tephri and ecological Tephri are the traps in catching more flies with all the attractants.

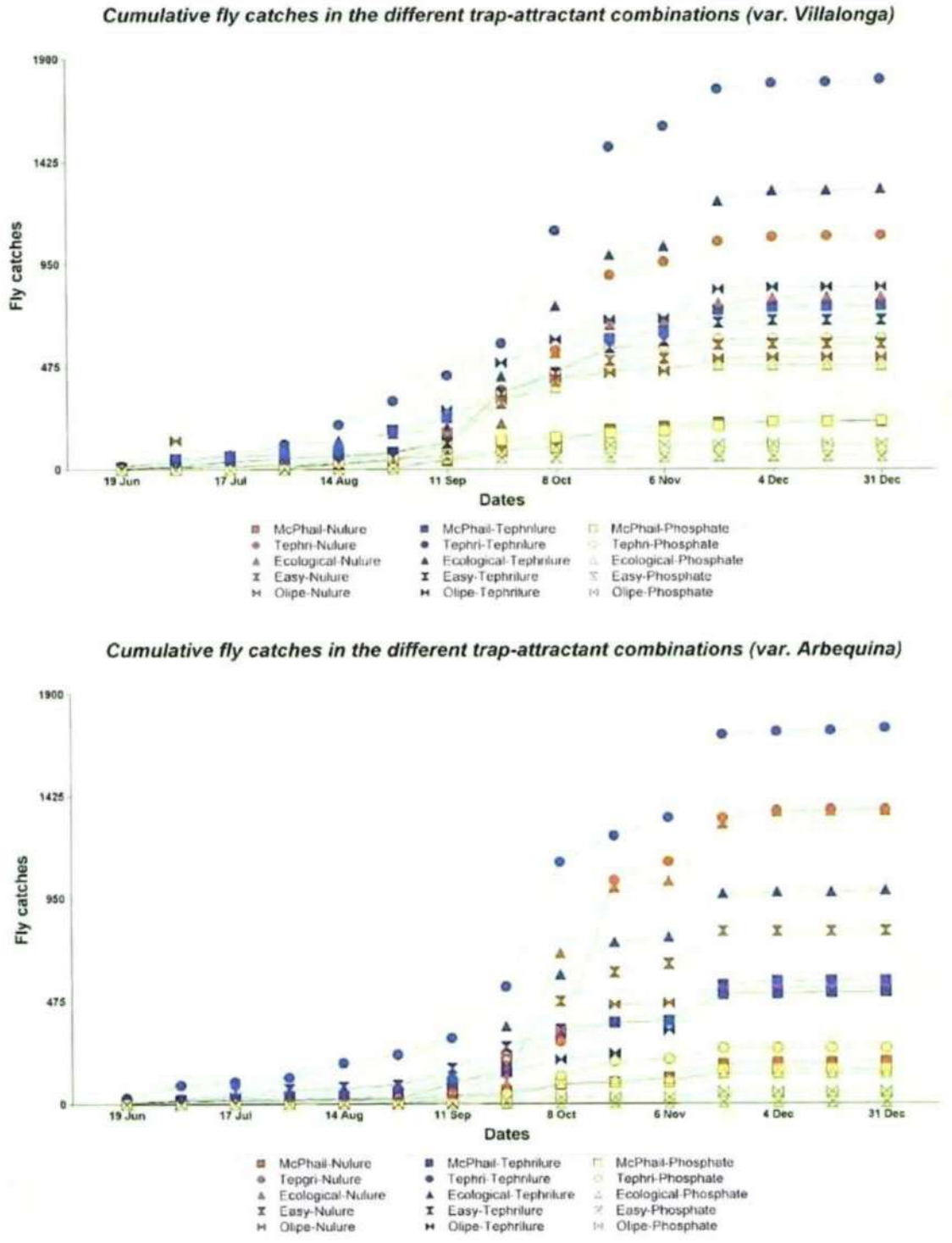

Figure 2. Cumulative catches in the different trap+attractant combinations troughout the trial in Villalonga (upper graph) and Arbequina (lower graph) plots, respectively.

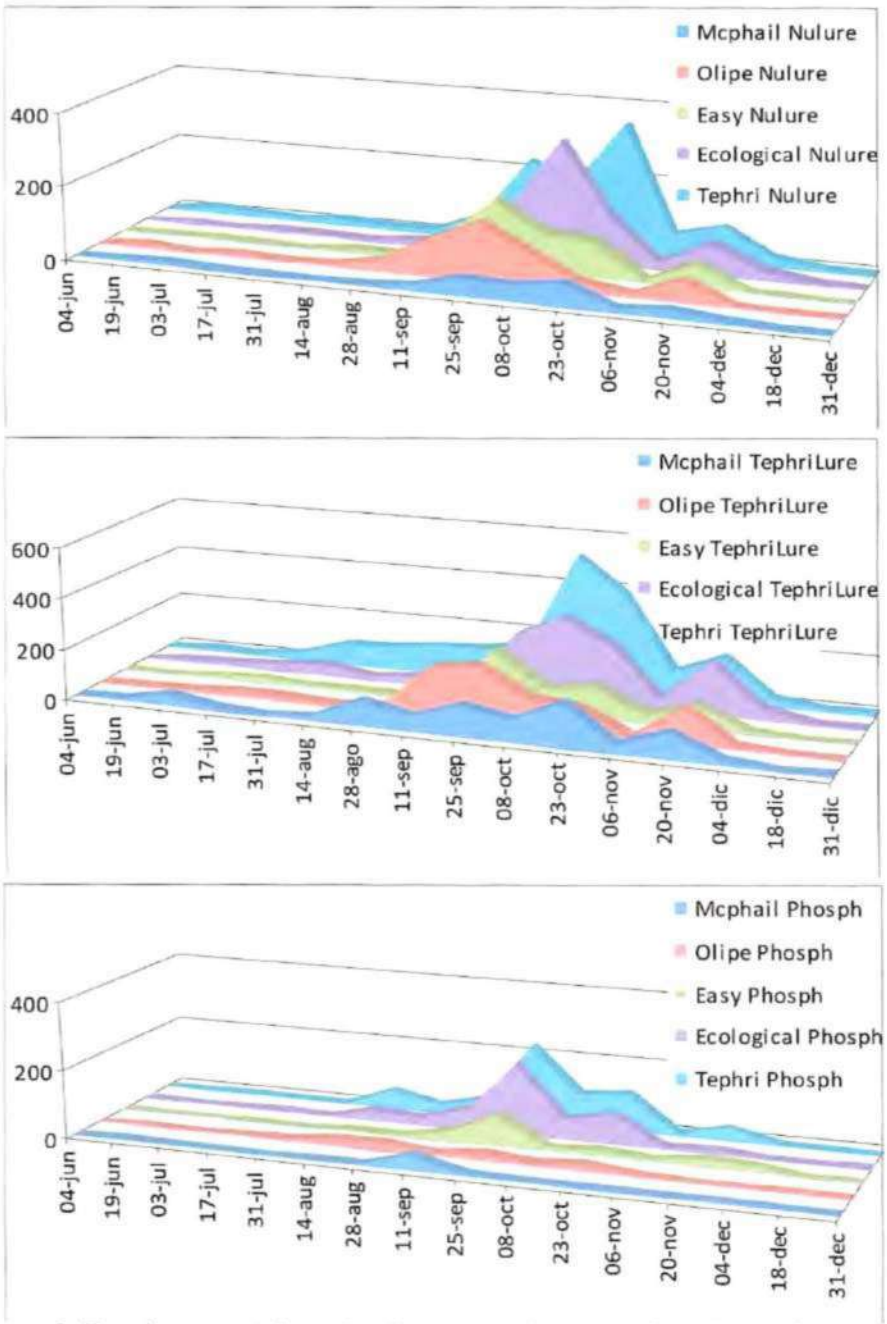

Figure 3. Sum of *B. oleae* catches in the two plots as function of trap type (by color indicated in the legends) and separated by attractant (upper graph, Nulure; middle, Tephrilure, and lower graph, ammonium phosphate) throughout the trial.

According to the LSD test, the best trap and the best attractant in capturing olive flies were Tephritrap and Tephri Lure respectively. In addition, the best combination was Tephritrap + Tephri Lure. Ammonium Phosphate shows the worst result in capturing flies, and this compound with Easy and Olipe traps were the worst combinations. Our results are different to those found by Ros *et al.* (2008, 2009), where the best trap was Easy, much better than the two Tephri options, although they are similar with regard to the attractant effectiveness. That difference could be attributed to various causes, such as

the different distribution of traps in plots in the experiments or also, as say Daane & Johnson (2010), because "the use of baits varies by region"

All combinations in both plots show two periods of high fly captures: from mid September to mid October and on mid November, as can be seen in Fig. 3. In this sense, our results can not be compared with others (Ros *et al.* 2008, 2009) for the different duration of trials: until end December in ours and mid November in others.

On the other hand, captures of other non-target insects on traps were very common. A high number of several fly species were caught in all traps. Some wasps were especially catched at the end of the experiment, and the most significant was the capture of numerous adults of lacewings between August and September, wich is a very important natural enemy of several olive pests. So the incide of traps in lacewing catches must be considered when choosing the best trap for mass trapping against the olive fruit fly. Results show that the best trap in catching flies, Tephritrap, was also one that had the lowest ratio *lacewing / flies* (0'07 in both plots) and these data must be considered to determine the real effectiveness of the traps.

Mass trapping could be an interesting method to be applied against the olive fruit fly in the Valencian Community but it must be analyzed not only the effectiveness of the trap+attractant combinations but also its economic cost and its impact on natural enemies to select the best one to be included in the integrated management of the pest. In that way, our best attractant, Tephri Lure, could be not an interesting compound to be used in mass trapping of the olive fruit fly in the Valencian Community due to its high economic cost.

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