



# Monitoring the effect of Oxalic Acid against tick population and non target arthropods in a Meso-mediterranean environment.



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## INTRODUCTION

*Hyalomma lusitanicum*, is the most abundant exophilic tick in Meso-mediterranean environments of Central Spain (Cota, 2009). Environmental friendly tick control measures are difficult to apply, especially for eurixene ticks such as, *H. lusitanicum*.

In a previous study the Oxalic Acid (OA), a bio-pesticide used in bee colonies for *Varroa destructor* control, demonstrated its efficacy against *H. lusitanicum* adults in lab conditions (Olmeda et al. J. Med,Entomol, 2008).

The purpose of the present study was to evaluate the ixodicidal activity of different water dilutions of OA in natural field conditions.

Four different water dilution of Oxalic Acid (OA) (0.5, 1, 3 and 6%) were tested for ixodicidal activity. A 0.15% water solution of a commercial acaricide product containing Fenitrotrion 25% and Cipermetrine 2.5% (FC), and a control just with water, were used to compare results. 400 l of each product was irrigated in 5 plots of 50 x 30 m (1500m<sup>2</sup>) in Latin Squares, with 10 m of passage non treated between them. Immediately after irrigation pitfall traps were placed in each plot and 24 hours later tick abundance record (30 min/square) and soil samples for Berlesse technique were taken in each plot..

	Evergreen oaks						Olive trees						Eucalyptus						
	OA 6%	OA3%	OA1%	OA0.5%	water	F+C	OA 6%	OA3%	OA1%	OA0.5%	water	F+C	OA 6%	OA3%	OA1%	OA0.5%	water	F+C	
17/06/2008	3					3							3						3
18/06/2008																			
08/07/2008	4	4				4													3
09/07/2008	3					3													
30/07/2008							5	5	5	5	5	5							
01/05/2009		5	5	5	5	5													
20/05/2009							5	5	5	5	5	5							
15/07/2009		5	5	5	5	5													
TREAT. SQU.	10	14	10	10	20	20	10	10	10	10	10	10	3					3	3

Table 1. Plots (1500m<sup>2</sup>) treated

## MATERIAL AND METHODS

The study was carried out in a private property located in Ciudad Real, Central Spain (37°24'78"N; 42°59'101"E; HT669m).

The place of study covers an area of 13.000 Ha of Meso-mediterranean bioclimatic environment. Vegetation is mainly composed by cereals, *Olea europea*, *Paeonia broteroi*, *Pinus pinaster*, *Quercus ilex*, *Quercus faginea*, *Quercus pyrenaica*, *Quercus rotundifolia*, *Ulmus minor*. No domestic animals inhabit the property while wild fauna is abundant: *Cervus elaphus*, *Capreolus capreolus*, *Oryctolagus cuniculus*, *sus scrofa*, *Lepus europaeus* and *Alectoris rufa*.

In order to establish the moment of maximum activity of host seeking ticks, its dynamic was previously studied for three years (2007-09).

Three representative areas of the Meso-mediterranean environment were selected (plantation of Olive trees, Evergreen oak forest and a plantation of Eucalyptus trees) and 8 trials were performed between June 2008 and June 2009 (Table 1). Previously to the treatments, environmental conditions and tick abundance record was determined (Table 2).

No differences between plots were observed in relation with the arthropods fauna by Berlesse. The mean of arthropods trapped by Pitfall in Fenitrotrion and Cipermetrine treated plots was lower than control and OA treated plots. (Table 4).

	Environmental conditions						
	OA 6%	OA3%	OA1%	OA0.5%	water	F+C	
N <sup>er</sup> of plots	13	24	20	20	33	33	
treated area (m <sup>2</sup> )	19500	36000	30000	30000	49500	49500	
Vegetation > 35 cm (%)	85,71	73,68	66,67	66,67	72,73	72,73	
< 25 cm (%)	14,29	26,32	33,33	33,33	27,27	27,27	
Wind low (%)	46,15	78,95	100,00	100,00	75,00	75,00	
moderate (%)	53,85	21,05	0,00	0,00	25,00	25,00	
Temperature Environment (°C)	29,41	25,91	25,31	25,38	26,97	26,97	
Soil (°C)	27,16	26,98	26,40	26,52	27,75	27,75	
Relative Humidity Environment (%)	26,38	33,00	34,65	34,40	31,24	31,24	
Soil (%)	28,15	32,17	33,65	33,65	31,30	31,30	

Table 2. Environmental conditions of treatments

	Berlesse (Mean/plot)							Pitfall (Mean/plot)						
	OA 6%	OA3%	OA1%	OA0.5%	water	F+C		OA 6%	OA3%	OA1%	OA0.5%	water	F+C	
n <sup>er</sup> sampled plots	4	19	15	15	19	18		0	5	5	5	5	5	5
Insect	1	3,11	2,2	4	2	2,2		159,4	62,2	31,8	52	12,8	0,4	
Arachnida	0	0	0	0	0	0		2	1,8	1	2	0,4		
Nematodes	0	1	1,07	0,93	0,8	0,5								
gr. Soil	n.d.	7	3	0	7	3								

Table 4. Mean of non target arthropods after treatm.

These preliminary data suggest Oxalic Acid could be useful in host seeking tick control.

## RESULTS

As a first step to determine the effect of Oxalic Acid in field conditions, global data are presented without any other consideration but the dilution of the product.

As expected, *Hyalomma lusitanicum* was the most abundant host seeking tick during the study period (94% of collected ticks). The present results are referred to this species.

Although conventional treatment was the most effective, Oxalic Acid dilutions seemed to produce a significant tick reduction 24 hours after treatment (Table 3, Graf 1). OA3% seemed to be the most effective, even more than OA6%. The effectiveness of OA1% and OA0.5% was similar, with a reduction of 49%. Other variables of different trials should be studied in order to establish the influence in the effectiveness of treatment of some conditions, such as temperature or humidity.

Oxalic Acid dilutions	% reduction OA dilutions	% reduction Fenitrotrion+Cipermetrine dilution
6%	58	75
3%	73	82
1%	49	82
0,5%	49	82

Table 3. Percent. of tick reduction after treatments

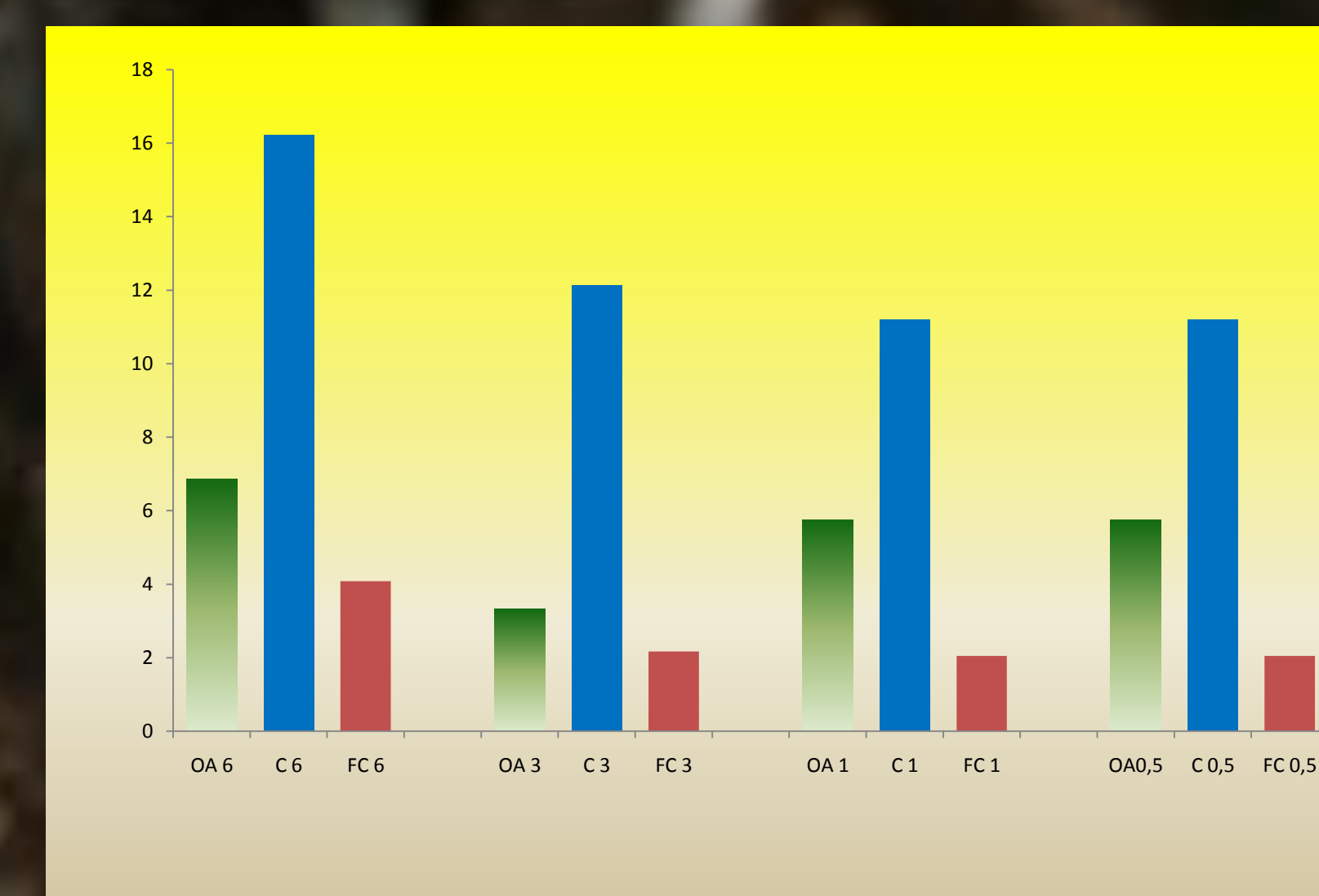


Fig 1. Mean of ticks/plot/treatment.

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