24th Conference

ESOVE 26

From ecology to outbreaks: Integrating knowledge for effective vector management in Europe

Larvicidal efficacy and lasting activity of a silicon based granular formulation on *Aedes albopictus* and *Culex pipiens* in urban setting

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Introduction

In the Italian urban environment, stagnant water in road drains is the main breeding site for mosquito species such as *Culex pipiens* and *Aedes albopictus*. To rationalize economic resources, municipalities need larvicide products capable of guaranteeing control for at least 3–4 weeks after application, allowing the planning of 5–6 seasonal intervention cycles. This field study evaluated the efficacy and persistence of action of a **novel granular silicone formulation AQUATAIN GR** compared to the reference liquid product AQUATAIN AMF, **under real conditions** during the summer of 2025.

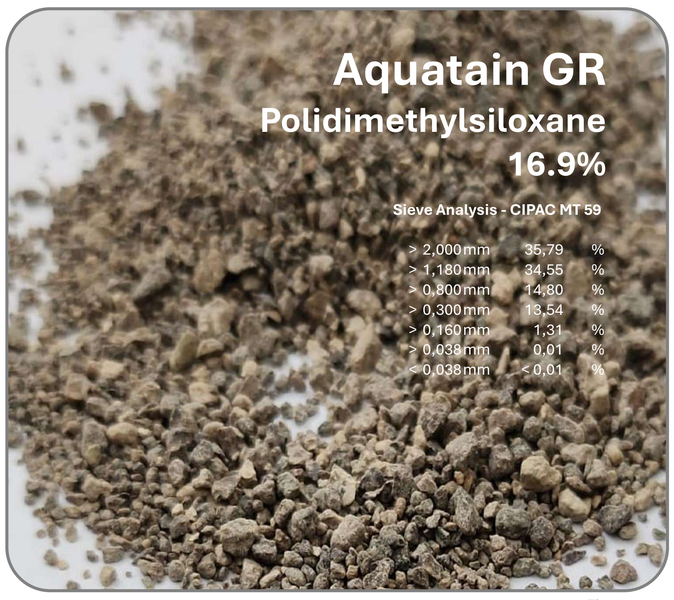


Fig. 1

Objectives

- ✓ **Efficacy and persistence evaluation**: to evaluate the **larvicidal efficacy** and **lasting activity** against aquatic mosquito stages in road drains under real field conditions
- ✓ **Comparative assessment:** to compare the performance with the widely used benchmark (AQUATAIN AMF)
- ✓ **Operational suitability**: to check the compatibility between the granular formulation and commercial distribution equipment in routine operations



Fig. 2

Methodology

The field trial included **two consecutive tests** conducted in the municipality of Modena (Italy) on a sample of 50 road drains (40 x 40 cm, capacity up to 40 l):
- 20 treated with AQUATAIN GR (24 g/drain)
- 20 with AQUATAIN AMF (5 ml/drain)
- 10 used as an untreated control.

The first test took place from June 4 to July 8 (**34 days**), while the second from July 16 to August 29 (**44 days**). Sampling was carried out weekly using a fine mesh net. To accurately assess population dynamics, the analyses focused on **mature larvae** (L3–L4) and **pupae**. Efficacy was expressed as a percentage reduction in the treated drains compared to the control, corrected with Abbott's formula, and statistically analyzed (ANOVA, Tukey's test, $p < 0.05$). **Local precipitation data were integrated to assess the impact of rainfall events.**

Product	Dose	Treated road drains (n.)	Control road drains (n.)
1st trial: 04/06/25 - 08/07/25 (34 days)			
AQUATAIN GR	24 g/drain	20	10
AQUATAIN AMF	5 ml/drain	20	
2nd trial: 16/07/25 - 29/08/25 (44 days)			
AQUATAIN GR	24 g/drain	20	10
AQUATAIN AMF	5 ml/drain	20	

Results

1st trial (June –July)

	Products	N.	Mean	Median	SD*	Tukey Test (1)	% reduction compared to the control (2)
Day 0	AQUATAIN AMF	20	37.50	31.00	20.97	a	
	AQUATAIN GR	20	53.70	43.50	27.50	ab	
	CONTROL	10	66.70	59.50	43.73	b	
Day 6	AQUATAIN AMF	20	0.00	0.00	0.00	a	100.00%
	AQUATAIN GR	20	0.40	0.00	1.57	a	**98.91**
	CONTROL	10	45.50	43.00	25.11	b	
Day 13	AQUATAIN AMF	20	2.20	0.50	3.68		81.97%
	AQUATAIN GR	20	11.45	5.00	23.91	NS	**34.46%**
	CONTROL	10	21.70	9.00	34.51		
Day 20	AQUATAIN AMF	20	13.25	15.5	10.80	a	71.12%
	AQUATAIN GR	20	7.55	5.00	7.09	a	**88.51%**
	CONTROL	10	81.60	76.00	49.25	b	
Day 27	AQUATAIN AMF	20	12.60	3.00	18.24	a	50.31%
	AQUATAIN GR	20	6.20	2.00	9.37	a	**82.92%**
	CONTROL	10	45.10	25.5	37.33	b	
Day 34	AQUATAIN AMF	20	30.55	21.00	30.76	ab	-7.18%
	AQUATAIN GR	20	13.30	8.00	16.88	a	**67.42%**
	CONTROL	10	50.70	33.00	51.94	b	

(1) Identical letters indicate no statistically significant difference.
(2) Corrected with Abbott's formula.

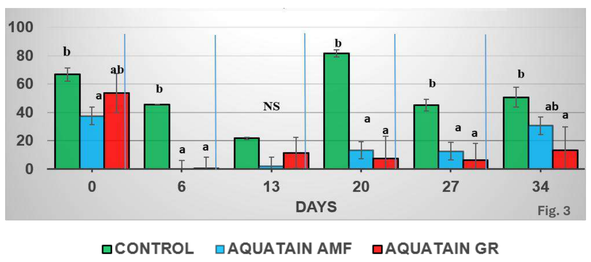
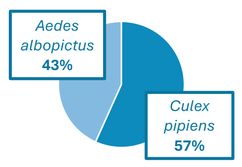


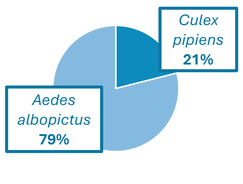
Fig. 3



Initial knockdown (Day 6): 97–100% larval reduction for both formulations across both trials.

1st trial (June –July)

Rainfall impact (Day 13): Heavy wash-off event; temporary drop for AQUATAIN GR (34.5%) *vs* AQUATAIN AMF (82.0%).
Recovery & persistence (Days 20–27): AQUATAIN GR showed strong recovery (88.5 - 82.9%), whereas AQUATAIN AMF declined (71.1 - 50.3%).
Day 34: AQUATAIN GR maintained 67.4% control; AQUATAIN AMF efficacy dropped to 0%.



2nd trial (July–August)

Day 14: rain-induced loss of efficacy for both products (46.5% AQUATAIN GR vs 60.2% AQUATAIN AMF).
Days 21–28: rebound of efficacy and sustained 4-weeks control (83.7% AQUATAIN GR vs 79.8% AQUATAIN AMF).
Day 35+: efficacy diminish for both formulations.

2nd trial (July–August)

	Products	N.	Mean	Median	SD*	Tukey Test (1)	% reduction compared to the control (2)
Day 0	AQUATAIN AMF	19	68.58	60.00	41.80		
	AQUATAIN GR	17	45.00	45.00	19.15	NS	
	CONTROL	9	76.67	55.00	38.08		
Day 6	AQUATAIN AMF	19	0.16	0.00	0.69	a	99.63%
	AQUATAIN GR	17	0.59	0.00	1.06	a	**97.88%**
	CONTROL	9	47.33	25.00	68.77	b	
Day 14	AQUATAIN AMF	19	19.42	10.00	25.17	a	60.20%
	AQUATAIN GR	17	17.12	8.00	16.32	a	**46.54%**
	CONTROL	9	54.56	31.00	59.46	b	
Day 21	AQUATAIN AMF	19	3.79	0.00	6.36	a	87.12%
	AQUATAIN GR	17	2.41	0.00	3.74	a	**87.51%**
	CONTROL	9	32.89	20.00	40.09	b	
Day 28	AQUATAIN AMF	19	3.11	0.00	7.46	a	79.84%
	AQUATAIN GR	17	1.65	0.00	3.22	a	**83.71%**
	CONTROL	9	17.22	14.00	10.44	b	
Day 35	AQUATAIN AMF	19	48.11	40.00	46.17		16.55%
	AQUATAIN GR	17	32.41	25.00	25,66	NS	14.31%
	CONTROL	9	64.44	44.00	54,65		
Day 44	AQUATAIN AMF	19	1.400	10.00	14.11		42.97%
	AQUATAIN GR	17	10.76	3.00	20.88	NS	33.17%
	CONTROL	9	27.44	18.00	24.90		

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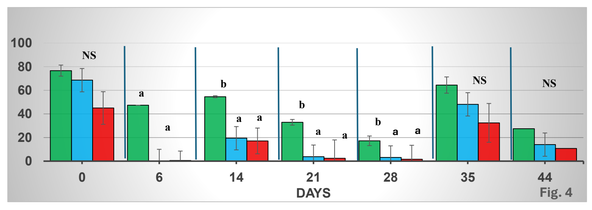


Fig. 4

Fig. 3 and Fig. 4 - Overall mean density of L3-L4 and pupae (n/net) of *Cx. pipiens* and *Ae. albopictus* distinguished by products and by sampling day. The bar is the standard error.

Discussion and conclusion

In field conditions and in the presence of a **regime of intense rainfall**, both silicone-based formulations showed equivalent and **prolonged larvicide action** for up to four weeks. The temporary decrease in efficacy followed by the subsequent recovery observed for AQUATAIN GR **highlights a dynamic of gradual release of silicone** oil by the granular support, capable of mitigating the effects of washout caused by rainfall. In addition, the operational tests confirmed the **full compatibility between AQUATAIN GR and the equipment currently in use for the distribution of granular formulations**. The tested granular formulation may represent an innovative and practical solution for the optimization of urban vector control, showing significant resilience to weather events: although subject to a temporary drop in efficacy immediately after intense rainfall, its gradual release dynamic allows for a rapid recovery of the larvicidal activity, ensuring an overall residual protection for up to four weeks.

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