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**Introduction**

There is an organic apiary in Apiculture Division in Puławy, Poland. According to the Regulation 834/2007 and Polish legislation we are not allowed to use chemical preparations against Varroa there. Only organic preparations are acceptable. That is why in years 2007 - 2011 we tested few organic anti-Varroa agents: oxalic acid, formic acid and Api Life Var (based on thymol and essential oils). Every preparation was used after honey harvest, from August to November. The efficacy of those substances was compared. After using every preparation *Varroa destructor* fallen on the bottom board was counted once a week. After that the control substance was applied and we could ascertain the efficiency of the anti-varroa means used.



Organic apiary

**Methods**

The research was done in the organic apiary of Apiculture Division localized in Poleski National Park in years 2007-2011. In 2007, in the organic apiary only oxalic acid was used. The concentration of solution was 5.2 %. In November, when external temperature was about 10°C acid was put (5ml) into every seam in the hive. The fallen of Varroa was counted on the 7<sup>th</sup> and 14<sup>th</sup> day after the acid was used. In 2008 experiment was done using Api Life Var. In the first period (29<sup>th</sup> of July 2008) two plates were put into hives for a period of 14 days and next (12<sup>th</sup> of August 2008) in every colony one plate, divided into two parts was employed. Thus, three plates per colony were used. The fallen of Varroa was counted on the 14<sup>th</sup> and 21<sup>st</sup> day post using the plates. After that, the efficiency of Api Life Var was verified using oxalic acid (3.2%) on the 29<sup>th</sup> of October 2008. It was calculated for two and three plates. In 2009 in one part of the apiary Api Life Var was used, and formic acid (60%) in the second one. Api Life Var was put into hives on the 2<sup>nd</sup> and 11<sup>th</sup> of September – only two plates per colony this year. Formic acid was applied in a special container from Nassenheider, located on the top of frames. Dose of the acid per colony was 120 ml. The fallen of Varroa was counted three times (11<sup>th</sup> of September as well as 1<sup>st</sup> and 27<sup>th</sup> of October.) In the end of October, to control efficacy of these two preparations, 3.2 % oxalic acid was used and on the 10<sup>th</sup> of November the fallen of Varroa was counted again. In 2010 (27<sup>th</sup> of August and 10<sup>th</sup> of September) and in 2011 (4<sup>th</sup> and 19<sup>th</sup> of September) Api Life Var was used in the apiary and oxalic acid was used each year in November as well, as a control agent. After using the acid the fallen of Varroa was counted. The efficiency was defined independently for two and three plates of Api Life Var.



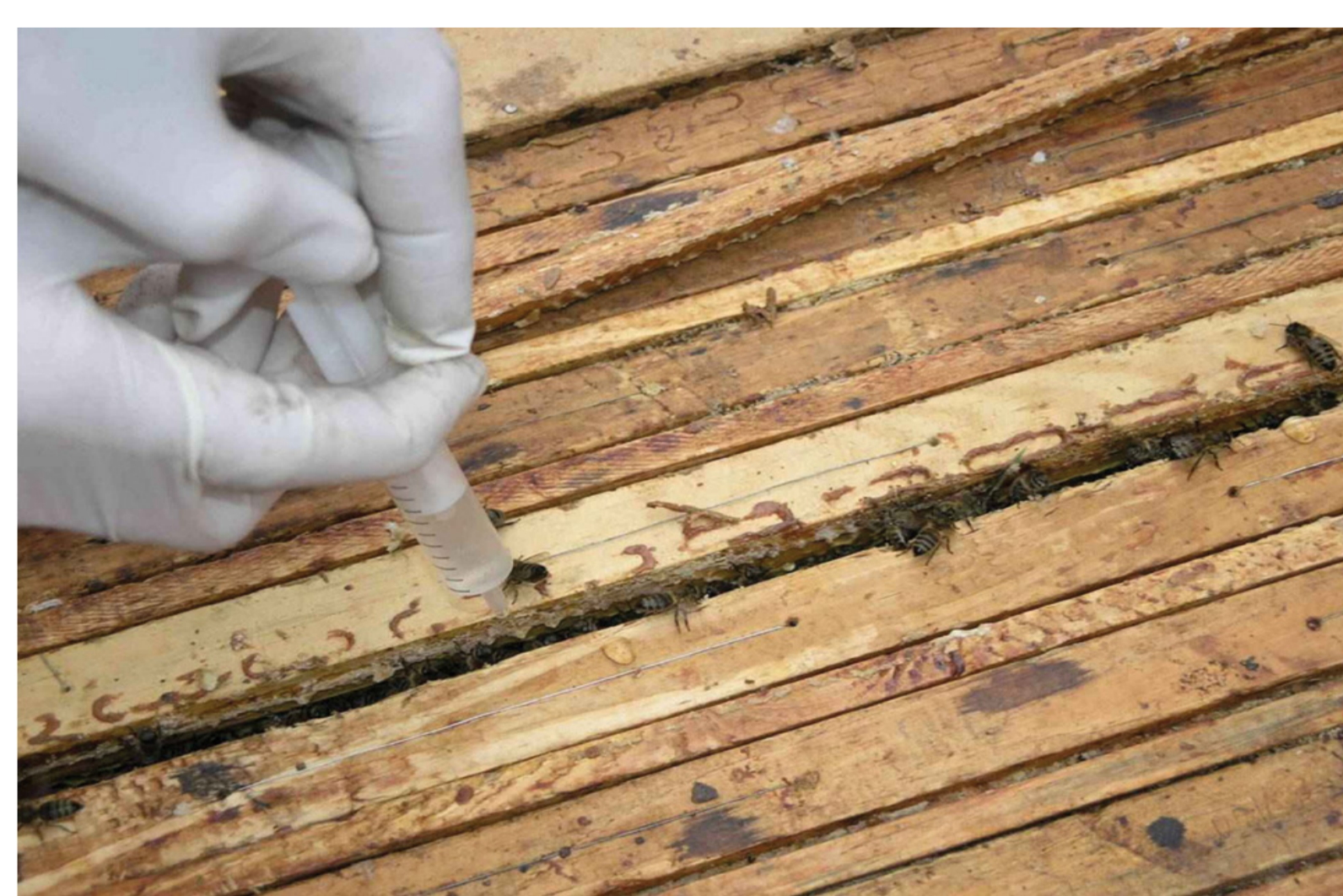
Our beekeepers



Use of Api Life Var



Formic acid in container from Nassenheider



Dosage of oxalic acid



Fallen of Varroa

**Results**

Efficiency of anti-Varroa preparations in the organic apiary in 2007-2011 (%)

Year	Preparation	The average efficiency (%)
2007	Oxalic acid	99.7
2008	Api Life Var 2 plates	85.5
	Api Life Var 3 plates	90.8
	Oxalic acid	97.2
2009	Api Life Var 2 plates	87.4
	Formic acid 60%	73.7
	Oxalic acid	97.8
2010	Api Life Var 2 plates	11.2
	Oxalic acid	95.8
2011	Api Life Var 3 plates	21.8
	Oxalic acid	96.2

**Conclusions**

The level of efficacy of oxalic acid was more than 95% and its application is simple. However, applying it in October-November (when there is no brood in colonies) is pointless as usually by that time a lot (or all) of bees are already killed by Varroa. The best concentration of solution is 3.5% under Polish climate conditions. 5.2% concentration used in 2007 had to be too high because in autumn colonies started to weaken and their strength after wintering was lower than usually.

The highest anti-Varroa efficiency was observed when Api Life Var was used in August (twice – for the first time 2 plates per colony for two weeks and then 1 plate for the next week) and oxalic acid (3.5%) in November, when there was no brood in colonies. When the area of brood in autumn is big, the efficiency of Api Life Var is very low (only about 21%). It is important that the colonies would be fed in 70% of its winter demand before using Api Life Var because its intense aroma initiates robberies in the apiary.

The results of the one-time use of 60% formic acid in the brood period were unsatisfactory (efficacy on the level of 74% only).