



Véto-pharma

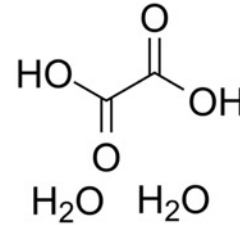
Committed to apiculture

Oxalic acid in summer: Comparison of three registered products in Spain - 2021



Oxalic acid dihydrate in beekeeping

- **Organic acid.**
- Occurs naturally in several **plant families.**
(Oxalidaceae = Wood sorrel, Rheum = Rhubarb)
- Investigated and used as a treatment against *Varroa destructor* **since the 1980s in Asia and Eastern Europe.**¹
- **Official authorization** as varroa treatment in Western/Central Europe later.
(Germany: 2006, France: 2015, Spain: 2007)



1 - Nanetti, Antonio & Ralph, Büchler & Charrière, Jean-Daniel & Friesd, Ingemar & Helland, Stine & Imdorf, Anton & Korpela, Seppo & Kristiansen, Preben. (2003). Oxalic acid treatments for varroa control (review). Apiacta. 38.

Oxalic acid dihydrate in beekeeping

- Mode of action of oxalic acid **not fully understood**; suspected mode of action: **acidity (acidic burn)**.¹ Oxalic acid is a contact miticide.
- To be used in **brood-free colonies** (or nearly brood-free) to maximize efficacy.²
- Targets **phoretic mites** on the bees, not those in the capped brood.²
- **Classified as varroa treatment eligible for organic beekeeping by EU regulations** (EU Council Regulation, No. 1804/1999).³
- **Highly efficient, organic treatment** with very **low chances of resistance** development in varroa mites.⁴



¹Nanetti, Antonio. "Oxalic acid for mite control—results and review." FAIR CT97-3686 (1999): 9.

²Rademacher, Eva, and Marika Harz. "Oxalic acid for the control of varroosis in honey bee colonies—a review." Apidologie 37.1 (2006): 98-120.

³Maggi et al. (2017). The susceptibility of Varroa destructor against oxalic acid: a study case. *Bulletin of Insectology*. **70 (1)**: 39-44.

⁴Rosenkranz, Peter, Pia Aumeier, and Bettina Ziegelmann. "Biology and control of Varroa destructor." Journal of invertebrate pathology 103 (2010): S96-S119.

Oxalic acid treatments in Mediterranean Climates



Photos: Miguel Ángel Rodríguez

MEDITERRANEAN CLIMATES

Often no natural brood stop

- ▶ Artificial brood break such as complete brood removal or queen caging necessary before application.
- ▶ Queens caged for 25 days to obtain brood-free colonies.
- ▶ Widely used technique in Italy where much of the research on this subject has been conducted.

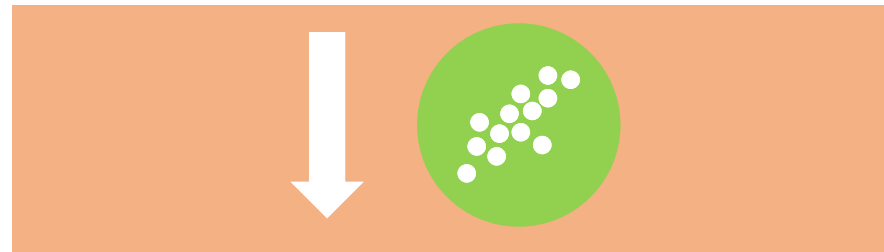
Practical advantages of Oxalic Acid as a Varroa Treatment ^(1/3)

Flexible Temperature Range



- ▶ Only organic active whose efficacy is **independent of temperature**.¹
- ▶ Formic acid and thymol: smaller temperature range because evaporation depends on temperature.
- ▶ **OA is a contact miticide** (no evaporation).

Low Residue Levels



- ▶ Hydrophilic – **no accumulation in wax**.²
- ▶ **Natural component of honey**, occurs in wide range (3.3–761.4 mg/kg) in different honeys.³
- ▶ All 3 application methods (trickling, sublimation, spraying) result in very minimal and short-lived OA increase in honey.²

1 - Rosenkranz, Peter, Pia Aumeier, and Bettina Ziegelmann. "Biology and control of Varroa destructor." *Journal of invertebrate pathology* 103 (2010): S96-S119.

2 - Rademacher, Eva, and Marika Harz. "Oxalic acid for the control of varroosis in honey bee colonies—a review." *Apidologie* 37.1 (2006): 98-120.

3 - Nanetti A., Ghini S., Gattavecchia E., Bartolomei P., Marcazzan G.L., Massi S. (2003) Pharmacodynamics of oxalic acid and treatment residues in honey, European Group for Integrated Varroa Control, Rauschholzhausen, [online] [http:// www.apis.admin.ch/host/varroa/rausch.htm](http://www.apis.admin.ch/host/varroa/rausch.htm) (accessed on 27 July 2005).

Practical advantages of Oxalic Acid as a Varroa Treatment (2/3)

Low Risk of Resistance Development



- ▶ Low chances of resistance developing, since **low residues and rapid degradation** in the hive.¹
- ▶ Maggi et al. (2016) showed that even a mite population that has been exposed to OA treatments 64 times in 8 years was still completely susceptible to OA.¹
- ▶ Damaging effects of the acidic burn of OA on mites may make resistance difficult.¹

Highly Efficient



- ▶ **High field efficacy** of OA treatments can be achieved with all 3 application types.²
- ▶ The most relevant factor for treatment outcome (efficacy) is the **amount of brood** in the colonies at application.²
- ▶ Beekeepers can treat in naturally brood-free hives or perform a brood intervention.

1 - MAGGI M., TOURN E., NEGRI P., SZAWARSKI N., MARCONI A., GALLEZ L., MEDICI S., RUFFINENGO S., BRASESCO C., DE FEUDIS L., QUINTANA S., SAMMATARO D., EGUARAS M., 2016.- A new formulation of oxalic acid for Varroa destructor control applied in Apis mellifera colonies in the presence of brood.- *Apidologie*, 47 (4): 596-605.

2 - Rademacher, Eva, and Marika Harz. "Oxalic acid for the control of varroosis in honey bee colonies—a review." *Apidologie* 37.1 (2006): 98-120.

Practical advantages of Oxalic Acid as a Varroa Treatment (3/3)

Safety for Bees



- ▶ **Single applications (trickling)**
 - ▶ well tolerated at OA concentrations $< 4.6\%$.¹
- ▶ **Multiple summer or autumn treatments (trickling or spraying)** ▶ poorly tolerated¹
- ▶ Some studies suggest better tolerability of repeated treatments in Southern climates¹



1 - Rademacher, Eva, and Marika Harz. "Oxalic acid for the control of varroosis in honey bee colonies—a review." *Apidologie* 37.1 (2006): 98-120.

COAG Andalucía and Véto-pharma: OA Field Study

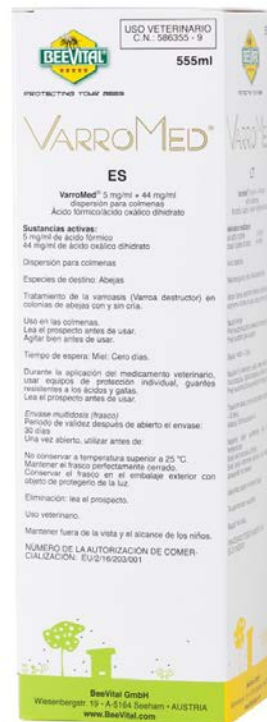
COMPARATIVE FIELD TEST:

Efficacy, Toxicity, Colony Strength

► **Objective:** Test and compare field efficacy of 3 registered OA applications in Spain

► Summer treatment by trickling.

► In compliance with the product labels



Materials and Methods I

APIARY:

- ▶ Location: Montroi (Valencia)
- ▶ Bees: *Apis mellifera iberiensis*
- ▶ # Colonies: 21 (7 per treatment group)
- ▶ Hive type: Langstroth
- ▶ Trial start: July 2021



Experimental colonies with basket traps to collect dead honey bees.

Photo: Enrique Simó

Materials and Methods II



3 applications

No queen caging

Applications on Day-12, Day-6, Day0

Control: Apivar (42 days)

Control application: Day14



1 application

Queen caging (25 days)

Application on Day0

Control: Apivar (42 days)

Control application: Day14



1 application

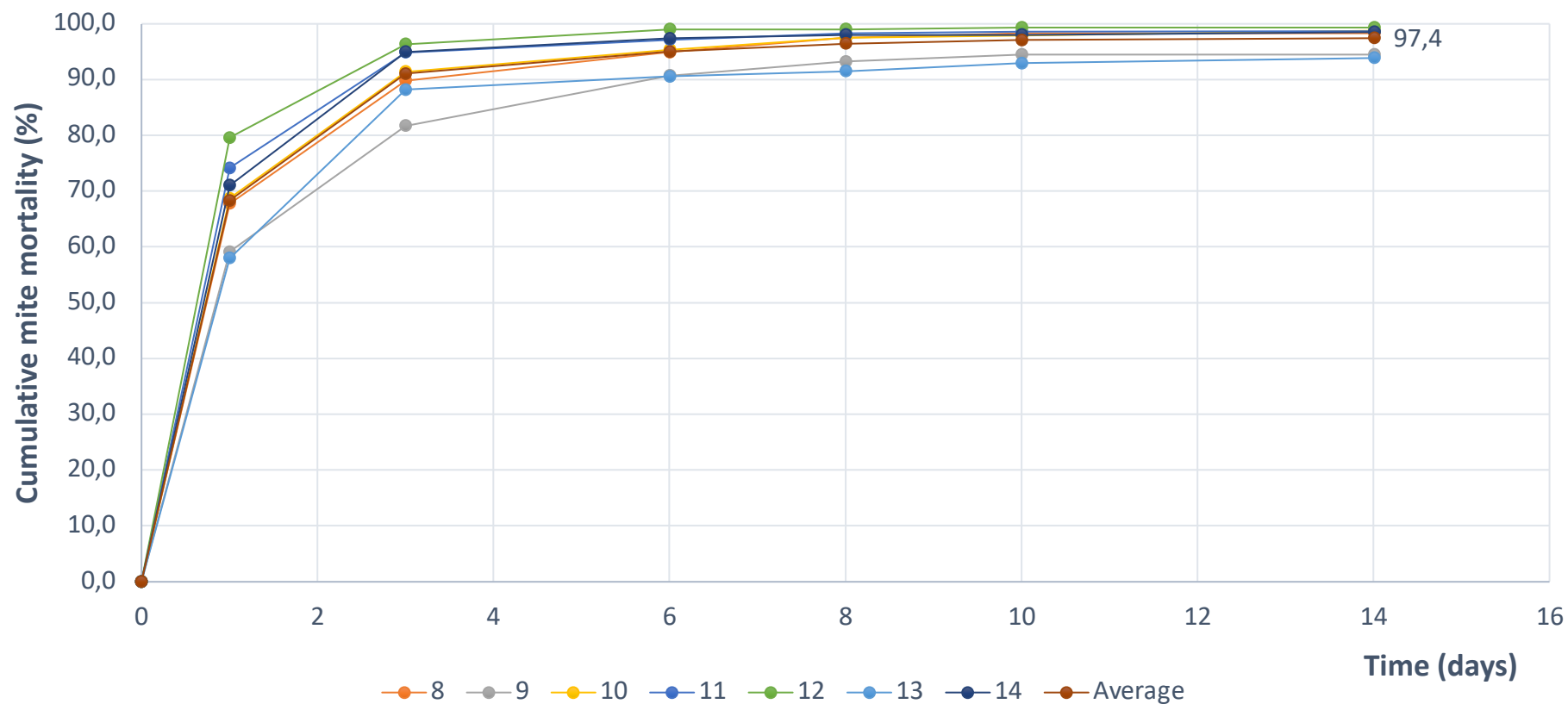
Queen caging (25 days)

Application on Day 0

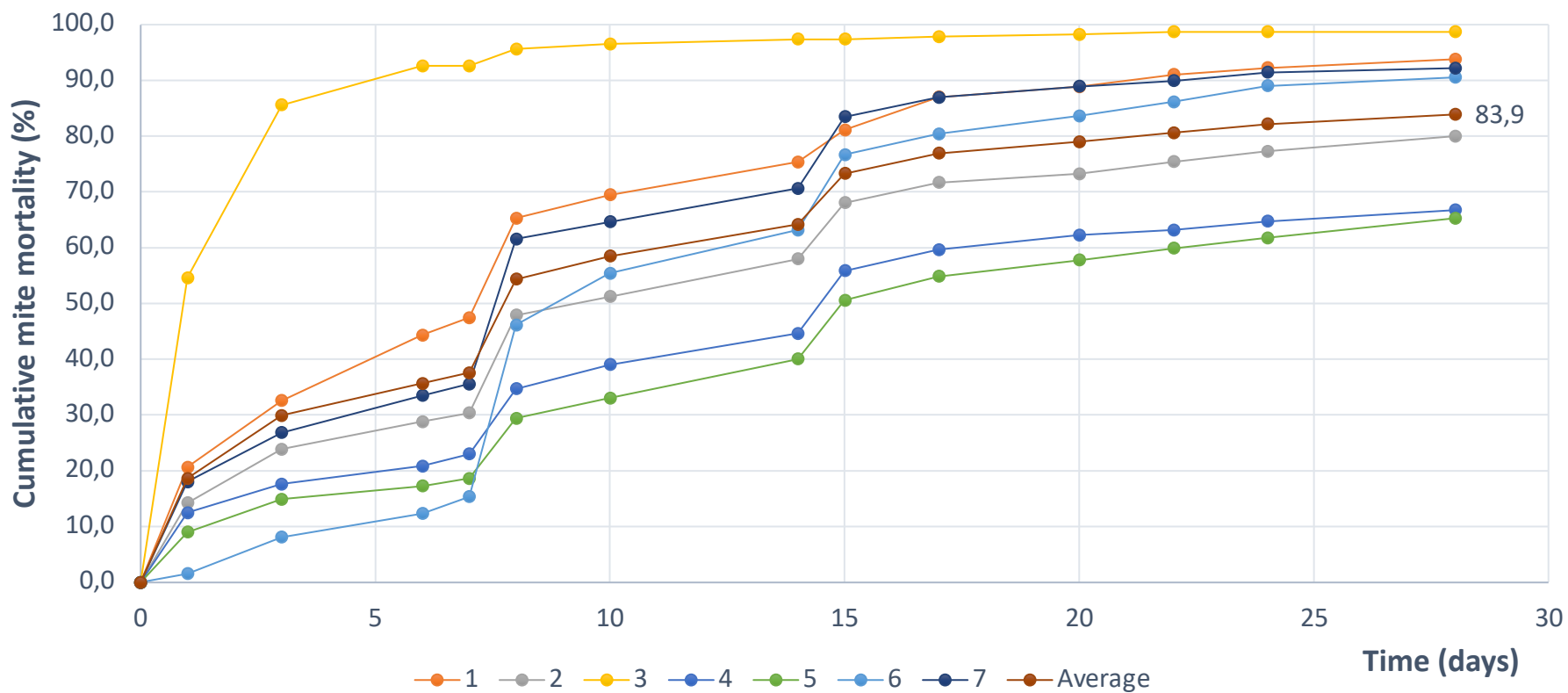
Control: Apivar (42 days)

Control application: Day14

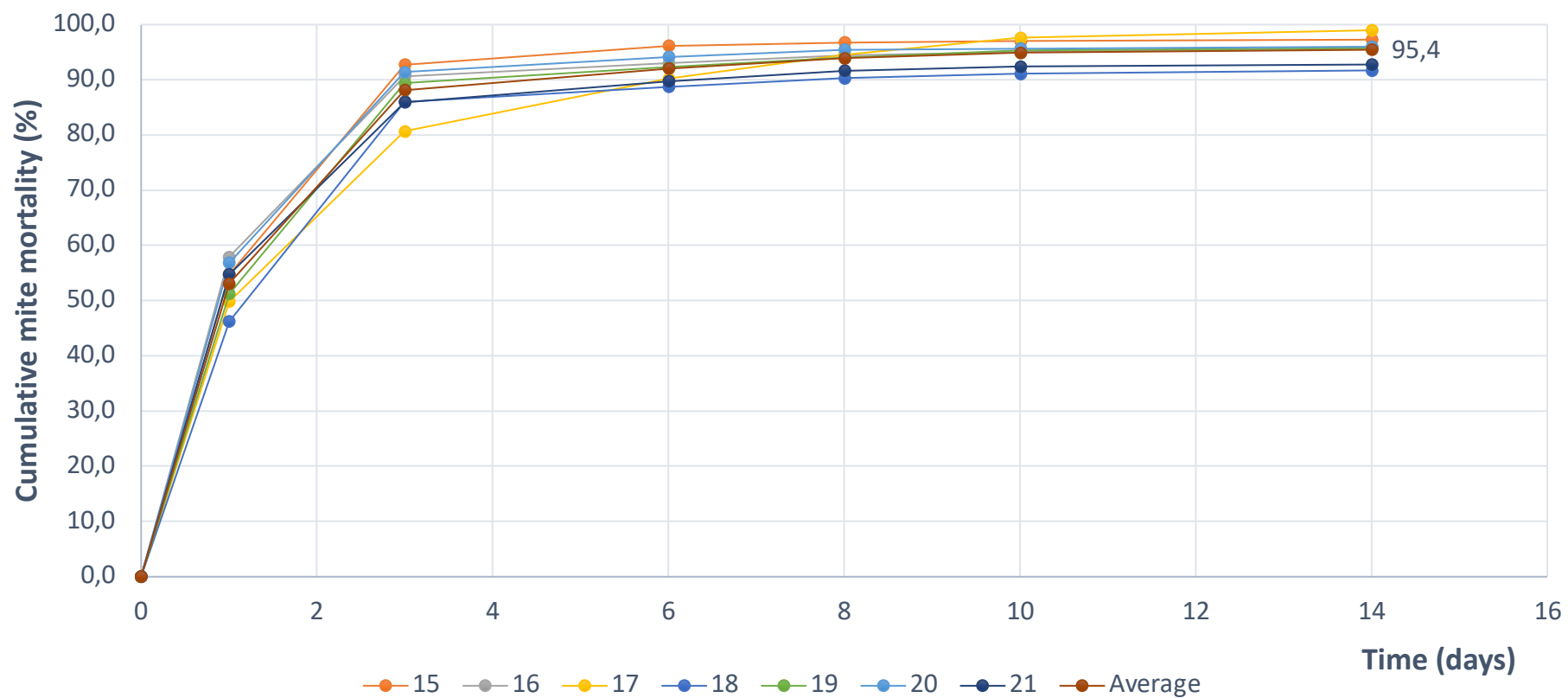
Results – Efficacy: Api-bioxal



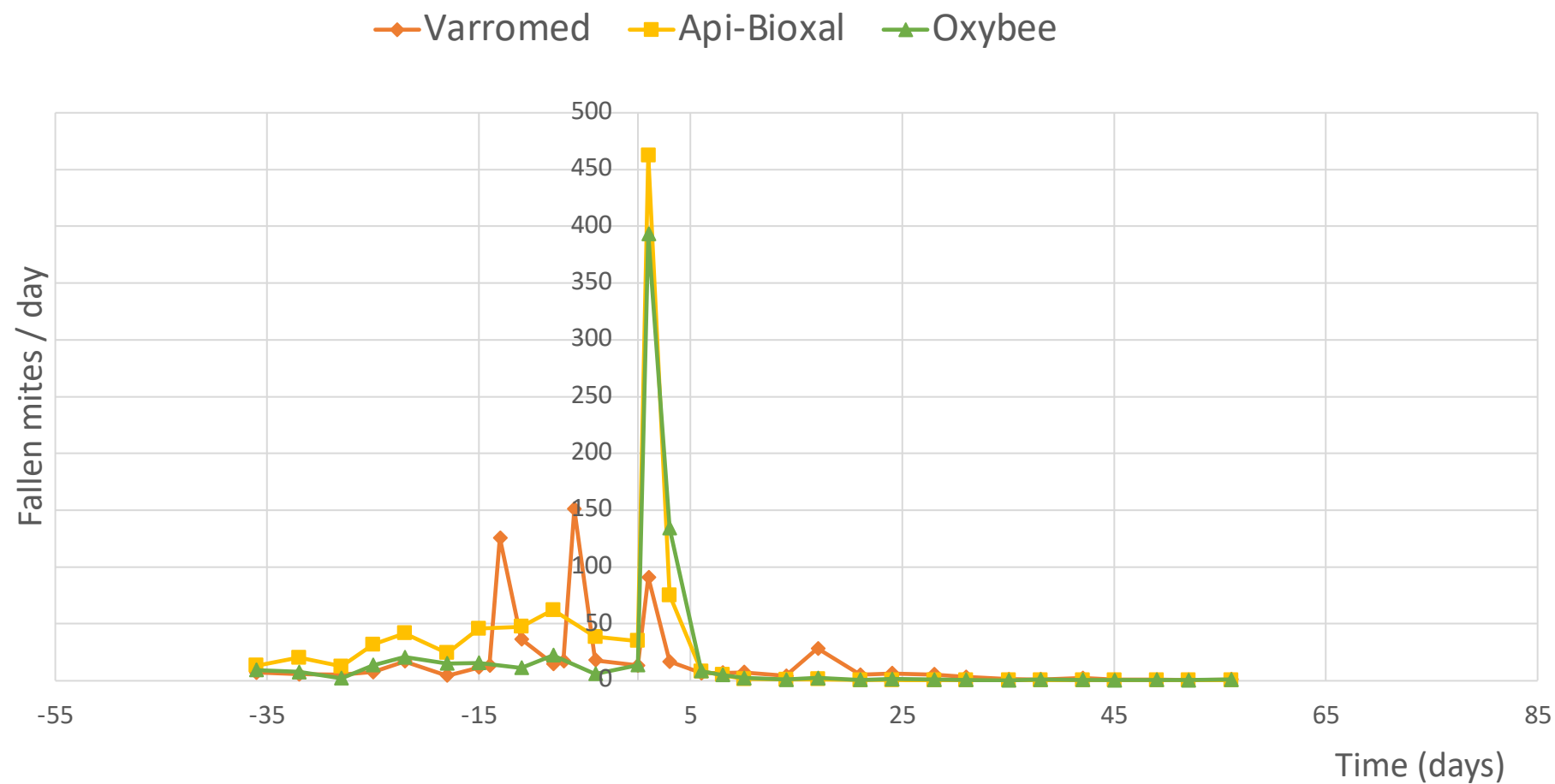
Results – Efficacy: Varromed



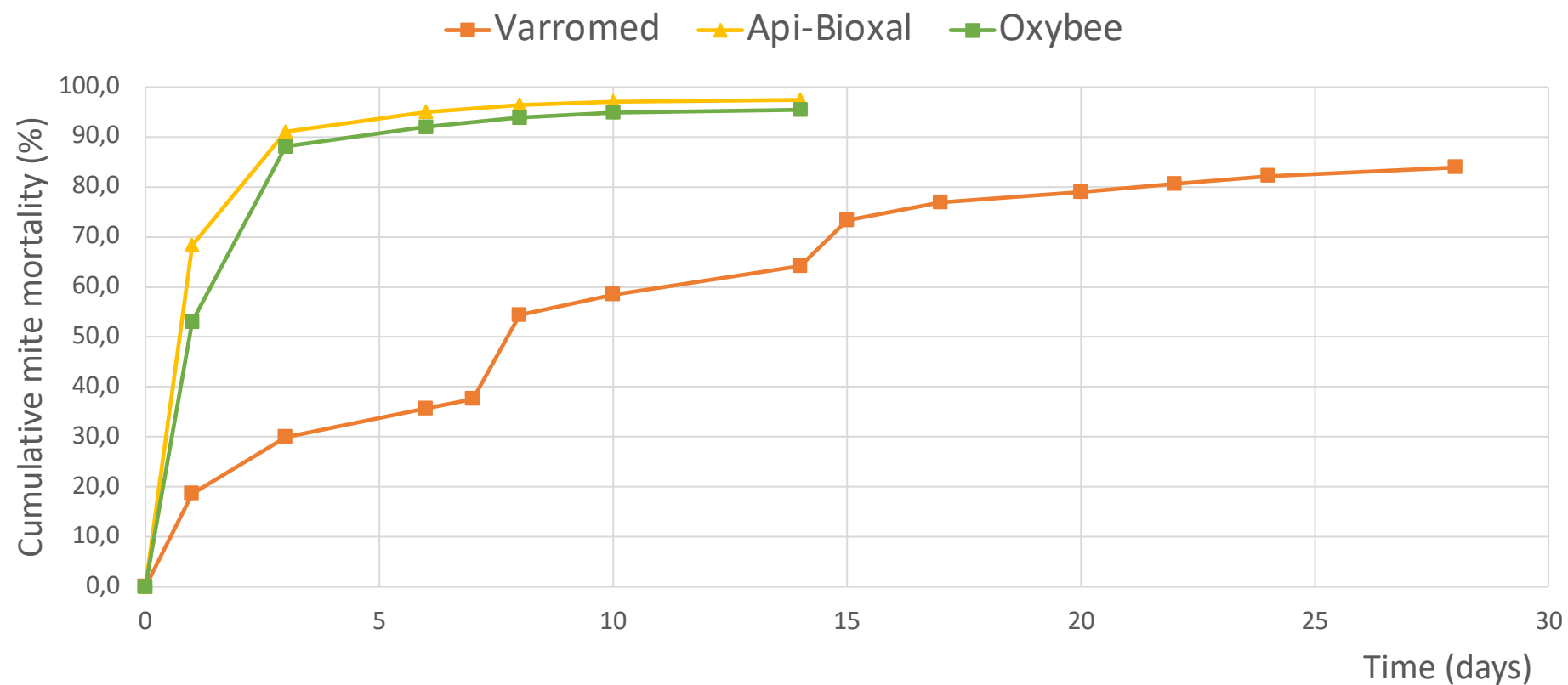
Results – Efficacy: Oxybee



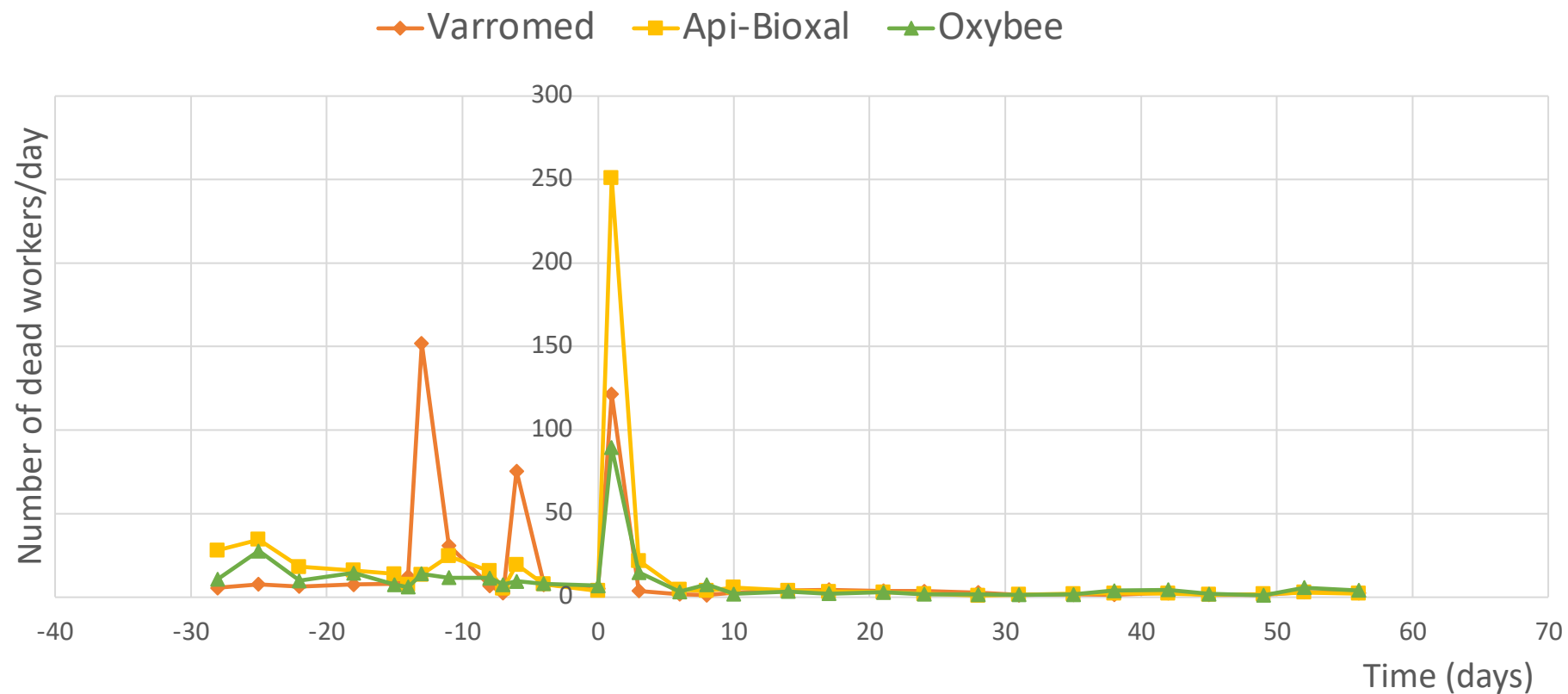
Results – Efficacy: Daily Mite Fall



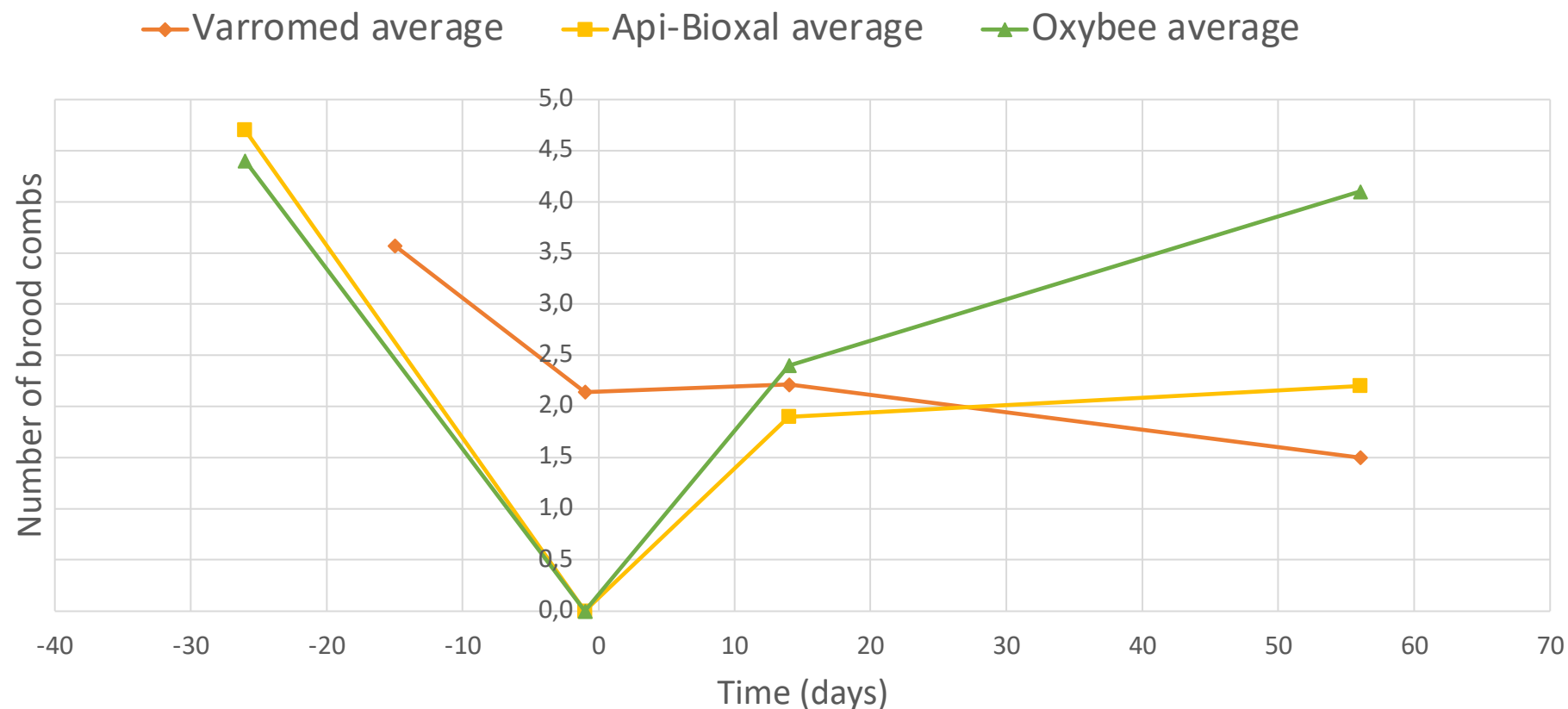
Results – Efficacy: Cumulative



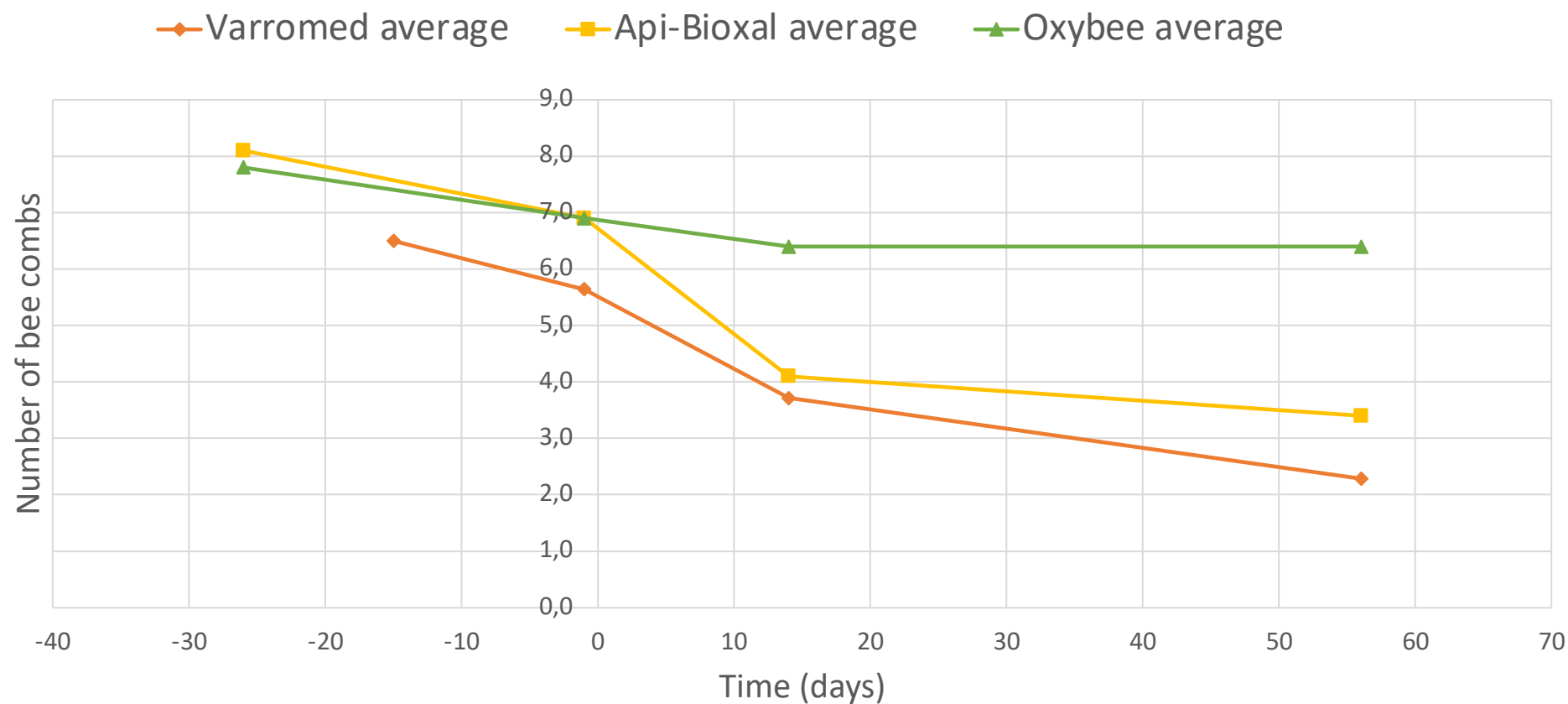
Results – Toxicity: Daily Worker Bee Mortality



Results – Evolution of Brood Frames



Results – Evolution of Frames covered with Bees



Conclusion

- ▶ Oxybee was very efficient in brood-free honeybee colonies without a significant negative impact on colonies
- ▶ Api-Bioxal and Varromed applications caused a detrimental effect on experimental colonies, with high losses of bees and brood
- ▶ Three applications of Varromed in the presence of capped brood is clearly insufficient to control varroa mite infestation efficiently



Photo: Enrique Simó



Photo: Enrique Simó



Merci !
Thank you!
Danke!
¡Gracias!

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Legal notices

OXYBEE powder and solution for 39,4 mg/ml bee-hive dispersion for honey bees. Composition: 1 ml of mixed bee-hive dispersion contains 39,4 mg of oxalic acid dehydrate. **Indication(s) for use :** For the treatment of varroosis (*Varroa destructor*) of honey bees (*Apis mellifera*) in brood free colonies. **Withdrawal period(s) : Honey:** zero days. Do not use during honey flow. **Special precautions :** This veterinary medicinal product is highly acidic and could have irritating and corrosive effects on the skin, eyes and mucous membranes. Personal protective equipment consisting of protective clothing, acid-proof gloves and safety glasses should be worn. **Marketing authorisation holder:** Dany Bienenwohl GmbH, Geyerspergerstr. 27, 80689 Munich, Germany. **Distributed by:** Vétô-pharma, 12-14 avenue de la Croix Martre 91120 Palaiseau, France. **V0119**

Oxybee is a veterinary medicine. Please ask advice to your veterinarian, pharmacist or sanitary organization. In case of persistence of clinical signs, consult with your veterinarian. Read carefully the instructions on the product label before use.