

Three Decades of Living with Varroa in Iran

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Introduction

Varroa destructor is an external parasite found throughout most of the world that attacks all life cycle stages of a broad range of honeybees. *Varroa destructor* sucks the blood from both the adults and the developing brood, weakening and shortening the life span of bees upon which they feed. Until recently, *Varroa destructor* was thought to be a closely related mite species called *Varroa jacobsoni*. Both species mite the Asian honey bee, *Apis cerana*.

However, the species originally described as *Varroa jacobsoni* by Oudemans in 1904 is not the same species that also attacks *Apis mellifera*. The first report to *Apis mellifera* probably took place in the Philippines in the early 1960s, where imported *Apis mellifera* came into close contact with infected *Apis cerana*. In 2000, Anderson and Trueman had not identified varroa destructor as a separate species. This late identification corrected some previous confusion and mislabelling in the scientific literature Varroa destructor distributed on most continents in less than four decades.

At the present time only Australia is considered free of *Varroa destructor*.

Adult female mites are reddish-brown in colour, have eight legs and a flattened oval shape. Denmark et al. (2000) reports that the females measure 1.00 -1.77mm long and 1.50-1.99mm wide. Their curved bodies fit into abdominal folds of the adult bee and are held there by the shape and arrangement of ventral setae (the stiff hairs on the abdomen). This protects them from the bee's normal cleaning habits. Adult males only occur in sealed brood and are yellowish with lightly tanned legs, a spherical body shape, and measure 0.75-0.91mm long and 0.71-0.88.

Scientific classification

Kingdom: Animalia
Phylum : Arthropoda
Class :Arachnida
Subclass :Acari
Order :Parasitiformes
Suborder:Mesostigmata
Family :Varroidae
Genus :Varroa
Species :Varroa destructor



Varroa destructor females

Varroa was first found in Iran in the 1980s and for three decades Iranian beekeepers have had to deal with this mite. Various treatments were evaluated and Apistan® became the most popular. However, in 1996 their problem worsened when Apistan®-resistance population of varroa emerged. The parasite mite *V.destructor* is well known to beekeepers because in many countries it is the most common cause of death of *Apis mellifera* colonies. It was first found in Iran in the 1980, and we have been faced with this problem for three decades. Methods of controlling the varroa mite have been investigated and several products are now approved for use. Since 1996 to up today difficulty in Iran as well as in other countries has been the development of resistance in varroa to pyrethroids. This has led to high mortality of colonies worldwide, and we have therefore investigated various new control products on sale.



Treatment by Bayvarol® strips

The Ministry of Jihad-e-Agriculture in Iran purchased treatments for *V. destructor* infestation from different firms (Ciba Geigy, Bayer healthcare AG, Sandoz, Farmak-achim, Alvetra, Vita Europe, Elanco. Veto-Pharma, Chemicals Laif S,r,i), in order to test their action on the parasites and effectiveness of different types of treatment : by inhalation (fumigation), absorption (systemic action) and contact (slow release) evaporation. Varroa infestation in Iran is serious, and table 1 lists the results of the treatments since 1983 to 2012.

Table 1. Results of different treatment on bee colonies infested with *Varroa destructor*. A; number of treatment at weekly intervals, B; efficacy, 1985 and 1998 . C; resistance. D; bee mortality. E; efficacy 1998 and 2012.

commercial name	Active ingredient	A	B	C	D	E	Action
Folbex®VA	Bromopropylate	6-8	90-95%	Yes	No		Fumigation
Varroazin®	Phenotiazin	3-4	90-95%	Yes	No		Fumigation
Varrostan®		2	85-90%		Yes		Fumigation
Tactic®	Amitraz	2	85-90%		Yes		Systemic
Apitol®	Cymiazole	2	95%		Yes		Systemic
Perizin®	Coumaphos	2	98%	No	No		Systemic
Apistan® strips	Fluvalinate	1	99%	Yes	No	0-30%	Contact
Bayvarol® strips	Flumethrin	1	99%	Yes	No	30-99%	Contact
Apivar® strips	Amitraz	1		No	No	98%	Contact
ApiLifevar®	Thymol Camphor Menthol	3-4		No	Yes	60-92.12%	Evaporation
Apiguard®	Thymol	2x double doses		No	Yes	60-81,12%	Evaporation
Formic acid plates	Formic acid	2-3		No	Yes	60-70%	Evaporation



Treatment by Perizin®



V. destructor and *Tropilaelaps mercedesae*

Since 2000, use has been made of Thymol, which is the active component of Apiguard®, ApiLifeVar® and Thymovar® as well as all products base in Thymol. In 2000 and 2011, I tested in Iran and Afghanistan, and also studied many publications from around the world. Thymol has the advantage of being a natural substance, and one with a low toxicity to humans also *V. destructor* has not been reported as being resistant to it.

However, the use of Thymol, has the following disadvantages :

- Colonies must be given two to three times treatments with Thymol, and the treatment repeated in the autumn. Mites that survive the first treatment reproduce during the bees' active season. So it's necessary to use another acaricide in the autumn (according to J.P. Faucon and R. Shahrouzi 2003)
- A strong odour is apparent during the three days following treatment, which disturbs the colony and stimulates the bees to clean their hive
- For two or three applications the treatment takes 3-16 weeks, which is inconvenient for the beekeeper.
- It is necessary to provide a space between the top of the frames in a hive and the hive roof, for instance by inserting an empty super ; this reduces the temperature of the bees and increases their honey consumption.
- Temperature variations during the treatment are important . If the temperature is above 35°C , the treatment is more effective (< 70%) but causes a higher larval mortality. If the temperature is less 12°C the treatment is less effective (>60%) and leads to a higher mortality of adult bees.
- When colonies infested with Varroa destructor were treated only with Apiguard® or ApiLifevar®, Thymovar® they showed abnormally high winter losses , with clear evidence of mites (J.P. Faucon and Reza. Shahrouzi 2003).
- All products base in Thymol are ineffective against *Acarapis woodi*; both Menthol and Formic acid were found to be effective.



Treatment by Apistan® strips



Treatment by Apivar® strips

Mite Resistance

Varroa mites resistance to pesticides is a well known phenomena. The first cases of resistance to organophosphates were reported in 1947 (According Delome and Dacol 1989). Varroa mite may develop resistance to chemicals used in control strategies. This is especially true for mites which, in general, have short life cycles and particularly for *V. destructor* which may have twelve generations per year. There is an increased probability of varroa mite developing resistance as a result of prolonged contact with an acaricide. This is one of the reasons that manufactures or products for controlling varroa, advise users to limit the frequency and period of application. Despite precautionary measures, it is now evident that acaricides such as fluvalinate (Lodesani et al.,1992) accumulate in the wax creating conditions for prolonged contact with varroa, especially inside brood cells where they reproduce. The likelihood of varroa developing resistance was particularly high, as many other mesostigmatid mites had already been reported to be resistant to synthetic pyrethroids, including fluvalinate. The ineffectiveness of fluvalinate has been reported in Italy and in France and in Iran (Milani 1995, Faucon, 1994, R.Shahrouzi 1998).The use of this chemical for varroa control has become widespread over the last few years because it is easy to apply and relatively cheap. Nevertheless, the use of Apistan® and Apivar® has often been replaced by wooden strips impregnated with the same active ingredient, made by the beekeepers themselves using Klartan and Mavrik also Taktic.two products contain fluvalinate, the third product contain amitraz but are not authorized for use in beekeeping and difficulties in controlling the dose have led to problems of effectiveness.

Resistance to other acaricides, belonging to different groups of chemicals, has also been reported. Resistance to bromopropylate and chlordimeform was shown to be favoured by under dosing and this has been verified in laboratory tests (Ritter and Roth 1988). The presence in different countries, of *Varroa destructor* populations simultaneously resistant to different

pyrethroids, highlights the risk of basing control strategies purely on chemical treatment, particularly when the substances used belong to the same chemical family.

Conclusion

After over three decades my experiences in France and Iran, also Afghanistan and Iraq...etc. in the use of different types of treatments: by inhalation (fumigation), absorption (systemic action) and contact (slow release), evaporation against of *V.destructor* agree that the efficacy depends on the local conditions and that some care is needed. In the Middle East Asia region, the optimal conditions are a high and stable external temperature and the absence of worker brood. The main precautions consist of avoiding reinfestation and robbing, in treating outside periods of nectar flow or queen rearing and in verifying the efficacy of the treatment. The alternative to chemical control is thus more than the simple use of a vegetable or animal extract in place of synthetic acaricide. It requires an additional effort from the beekeeper to manage the bee colonies, which is more time consuming.

Although we are in the 21st century, *Varroa destructor* will undoubtedly remain for several years one of the principal agents of the weakening of apiarian livestock. *V. destructor* is a serious disease. It is necessary to learn how to live with it. This can be done:

- By preserving only strong colonies in the apiaries.
- By systematically changing the queens every two years, by developing queens selected for resistance to the diseases.
- The first treatment must be carried out in late September or early October in Iran and Afghanistan by chemical acaricide. To give over wintering bees the optimum potential for survival, it must be sufficiently effective to ensure that at the end of the treatment there will be fewer than 50 parasites within treated hives.
- If colonies were treated only with Apiguard and ApiLifevar and Thymovar and Formic-acid, they showed abnormally high winter losses, with clear evidence of mites. So it is necessary to use another acaricide chemical (Bayvarol®, CheckMite+®, Apivar®, Oxalic acid.....etc).
- If an apiary's colonies are located in an area conducive to the rearing of brood (potential source of development for the parasite), the second treatment must be carried out in early spring.

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