

The Varroa Mite Today

Puget Sound Beekeeper's Association

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Short Story / Review

What is it?

An exotic parasitic mite.

What Does it do?

It infests honey bee colonies, feeding on brood and adults.

It can wipe out a large proportion of the hive population and cause the colony to die out.

What can be done about it?

Monitor and Control to keep populations down.

Use resistant bee stock.

Get used to living with it (think *management*).

Taxonomy

2 species

Varroa jacobsoni

Description adult reddish brown, oval disc

Range Indo-Malayan island region

Natural Host *Apis cerana*

Varroa destructor

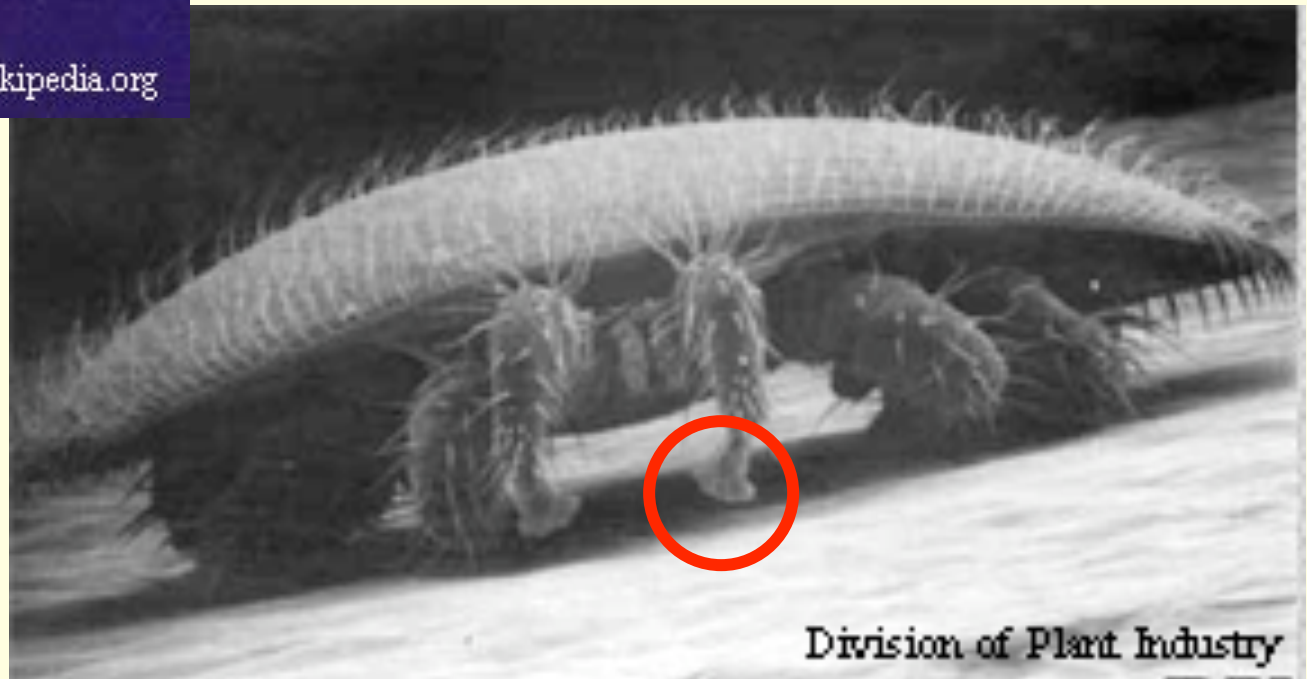
Description very similar to *V. jacobsoni* except at molecular level. Mistakenly known as *V. jacobsoni* until 2000

Range East Asian mainland

Natural Host *Apis cerana*, transferred to *Apis mellifera* with advent of *A. mellifera* beekeeping in Asia



en.wikipedia.org



Division of Plant Industry

Life History

In hive

- Reproduces on late instar larvae
- Prefers drone brood (longer development time)
but will also use worker brood
- Enters brood cell just prior to capping
- Rapid reproduction

Cycle:


Original female fertile lays up to 4 eggs

sequentially in capped cell

Eggs hatch, males + females

Siblings mate

Mated females emerge to repeat

Development of the bee brood		Day		Development of the varroa mite	
Queen lays egg	Egg phase	1			
		2			
		3			
	Larva phase	4			
		5			
		6			
(uncapped brood)		7			Mite lays 4 eggs in the brood cell:
		8			1st egg 2.5 days after entering cell
		9			2nd egg 1.25 days later
Pupa phase		10			3rd egg 1.25 days later
		11			4th egg 1.25 days later
		12			Development to sexually mature mites:
		13			Female—7 to 8 days
		14			Male—6 to 7 days
		15			
(capped brood)		16			
		17			Damage to the brood
		18			
Emergence of worker bees		19			
		20			
		21			Mites emerge with bees or die



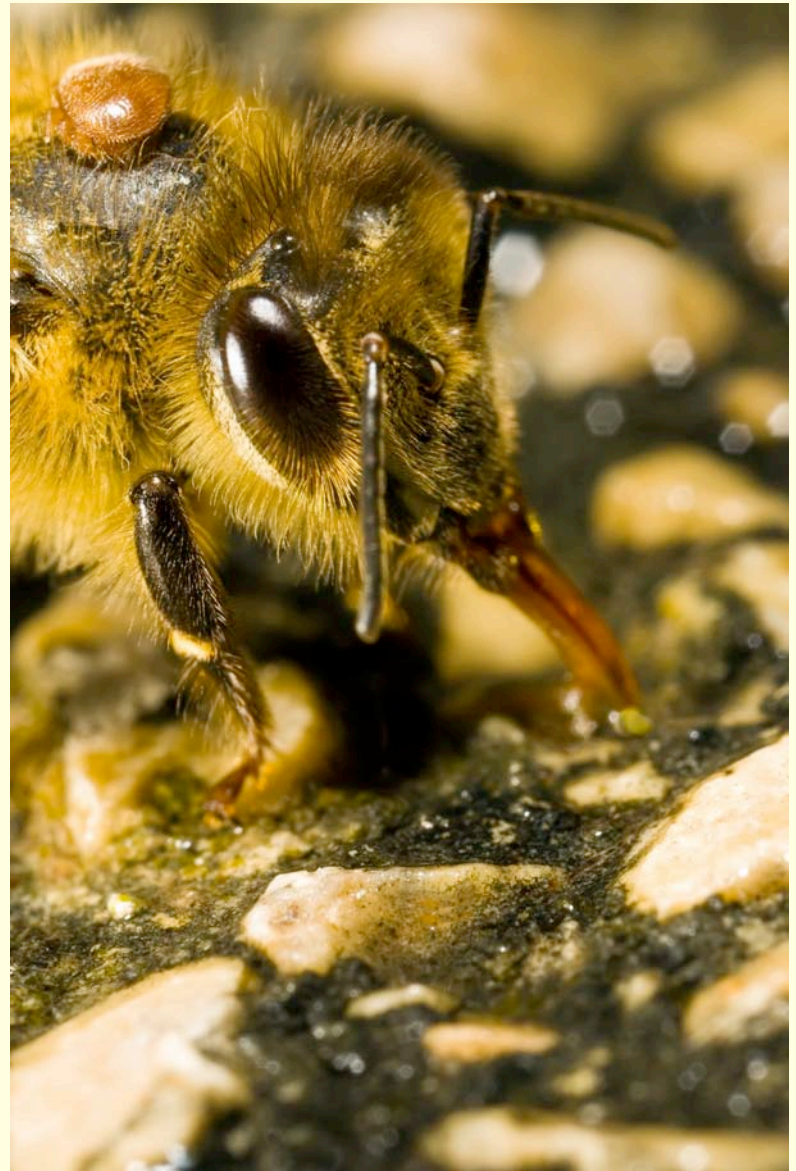
Scott Bauer, USDA

Dispersal

- On honey bees
- In transported hives
- In swarms
- On other insects



Stephen Ausmus, USDA





upload.wikimedia.org/wikipedia/commons

Effects on honey bees

- **No. 1** known biotic **threat** to beekeeping in N. Am.
- Haemolymph feeding: **puncture wounds**
- Weakens larva & introduces **viruses**
- May be part of complex of factors causing **CCD**

Associated pathologic bee viruses:

Deformed wing virus

Acute bee paralysis virus

Slow paralysis virus

(all RNA viruses that replicate upon injection in bee haemolymph)

Phenology/Seasonality of infestation

- **May take 1-2 years** to build up to lethal levels
- Population spikes with **drone** production
(Spring)
- Typically causes **mid-Summer crash**



www.issg.org

Monitoring

!!!Essential!!!

Ether Roll

Technique: spray jar of bees with automotive starter fluid, roll jar, count mites on glass

Alcohol Wash & Filter

Technique: pour alcohol in jar of bees, shake for 15 minutes, filter through screen

Problems (Both Roll & Wash):

Requires opening hive (disruptive)

Large destructive bee sample (bad for small colonies)

Assumes even sampling from all frames (difficult)

Roll & Wash Mite Population Size Determination

Low Brood: Multiply count by **100**

High Brood: Multiply count by **600**.

Sticky card (dual function monitor/control)

Technique: sticky card on bottom board catches mite fall

Advantages: may also function to **control** mites, unobtrusive, inexpensive, results vary

Problems: requires screened bottom board; messy; requires careful observation (debris may hide mites)



Drone pull

Technique: Remove drone pupae (use capping scratcher), count mites

Advantages: Direct count, easy, can be combined with drone removal

Problems: Requires many drones (seasonal);



Sugar shake

Technique: dust entire colony with powdered sugar, causes Varroa mites to fall off adult bees

Advantages: may also function to **control** mites, easy, inexpensive

Problems: moderately disruptive to colony? (effects unknown)

Sugar Shake (& Drone Pull?)

Mite Treatment Threshold: **5** mites per single count

Control

!!!Essential!!!

(someday may be obviated by resistant bees but not yet)

3 Basic Categories:

- Chemical
- Cultural
- Genetic

Chemical

Synthetic Pesticides Registered in U.S.A. for use in bee hives

Apistan pesticide-impregnated *strips*

“Fluvalinate”, pyrethroid

Toxicity: bees low; mammals, low

CheckMite+ pesticide-impregnated *strips*

“Coumaphos”, organophosphate, nerve poison

Toxicity: bees, low to moderate; mammals, moderate to high

Both:

Application: hang strips in supers,
treat before honey flow

Problems:

Residues: in honey, wax

Misuse: re-using strips &/or inadequate
treatment period or temperature

Resistance in mites: now widespread

Queen effects?

Fluvalinate & Coumaphos were pre-existing pesticides adapted in the 1980's for use in hives. Initial recommendations were to treat at very low thresholds or preventatively.

Formic Acid, liquid => vapor
also **MiteAwayII** (commercial gel packs),
concentrated version of naturally-occurring
compound (defensive secretion of ants);
Toxicity: strong acid, burns skin, eyes, mucous
membranes.

Application: reduce concentration to 60%, apply to porous
blocks or sponges; also pre-made gel packs, put on top bars
of brood boxes, active form is vapor

Problems:

Toxicity, requires beekeeper protection, gloves, goggles

Provisional Registration

Misuse: inadequate treatment period or temperature

Apistan, Coumaphos, & Formic Acid

mite population size determination when used for monitoring:

mites on sticky board X 6 (assumes no resistance)

Hivastan, Fenproximate, contact miticide, electron transport inhibitor, ***New Product***

Toxicity: bees, low; mammalian, low; aquatic life, high.

Application: patty

Problems:

Toxicity to nontarget organisms

Sec. 18 (provisional) Registration

Other?

Mitacur (hive formulation; also **Taktic**, other uses), Amitraz, amidine, nerve poison

Originally developed as a dual-use pesticide (tracheal & Varroa mites); Toxicity: bees, moderate; mammalian, low

No Longer Registered, i.e. illegal to use on hives

Oxalic Acid, spray or vapor

Essential oils

Apilife Var (European, 74% thymol, 16% eucalyptol, and 3.7% each of menthol and camphor)

Application: vermiculite wafers, vapor

Apiguard

Application: 25% thymol gel

Other essential oils

Types: Thymol, etc.

Problems: temperature dependent, frequent application

“Sucroside”, sugar esters

Application: spray

“Grease”

Food supplement patties

Other applications

Cardboard monitoring strips

Cultural

Drone removal

Application: Remove infested drone brood, freeze
(replace dead brood in comb for removal by bees)

Advantages: Massive mite depopulation

Problems:

drains hive resources

may require special drone comb

requires stringent removal cycle (or it will backfire)

requires freezer

cumbersome

Sugar shake

works but see Monitoring

Sticky card

works but see Monitoring

Genetic

Approach for bee breeders

- Import new strains
- Breed for “resistance” + local adaptations
 - Hygienic behavior, bees detect & remove mites as natural in *A. cerana*
 - Accelerated development?
 - Small cells?

Known sources of resistance:

Apis cerana (not feasible to introduce)

African honey bees (*A. mellifera scutellata*;
not generally useable)

“Russian” bees (hybrids available in U.S.A.)

Monitoring-based Treatment Thresholds

# Mites/Col.	Recommendation
less than 100	<ul style="list-style-type: none">● not an immediate problem● treat in September and October, after honey removal● continue to monitor bimonthly
100 - 999	<ul style="list-style-type: none">● mite infestation will have an economic impact● treat as soon as possible after removing honey; start in August, even if some crop potential is lost (winter bee population must be protected)● continue to monitor bimonthly
1000 mites +	<ul style="list-style-type: none">● colony collapse imminent● remove supers and treat immediately● treat again in October

Some Useful Varroa Resources

Note: the situation is changing rapidly. Books & articles are fast becoming obsolete. The internet may be the best resource but search carefully for best information.

Randy Oliver's "Scientific Beekeeping"

<http://www.scientificbeekeeping.com/>

University of Florida, General

http://creatures.ifas.ufl.edu/misc/bees/varroa_mite.htm

Wikipedia, General

http://en.wikipedia.org/wiki/Varroa_destructor

Government of Canada (Control Summary)

http://www.agf.gov.bc.ca/apiculture/factsheets/222_vardetect.htm

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