

# Spread of *Varroa* in Yucatan, Mexico

*Luis Medina Medina*  
Department of Apiculture  
Faculty of Veterinary Medicine  
University Autonomous of Yucatan

*Varroa* mite has negative impact on beekeeping.

- ✓ Reduction of honey production.
- ✓ Mortality of honey bee colonies.

## The continuous use of miticides in beekeeping:

- ✓ Increase the costs of honey production.
- ✓ Reduce the quality of honey.
- ✓ Parasites develop resistance to chemicals.

Dispersal of AHB's in the Americas due to their high tendency to swarm, migrate and abscond could contribute to introduction and dissemination of Varroa.

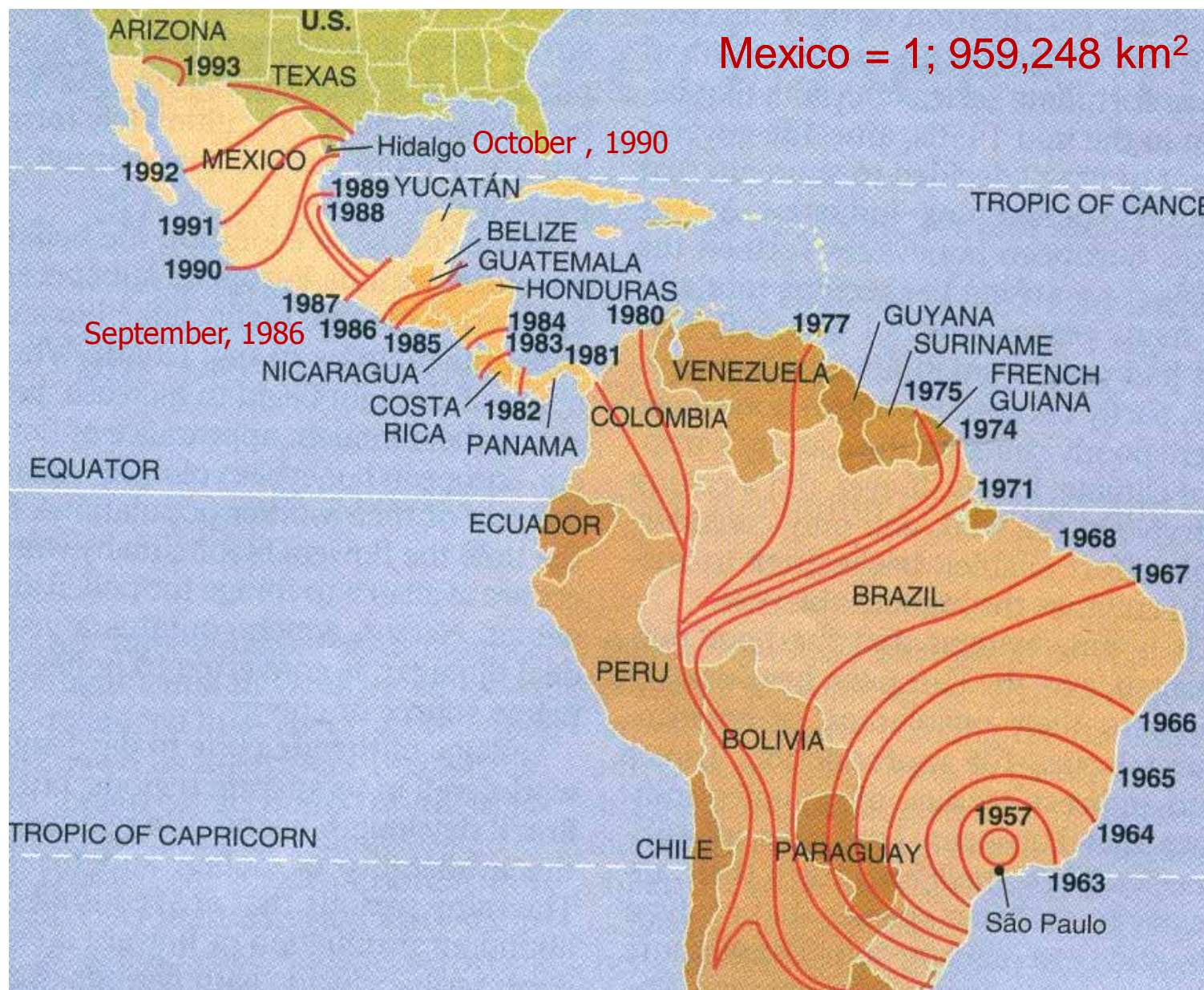
But....



AHB's have been suggested to be more resistant or tolerant to *Varroa* and other bee diseases favoring the displacement of EHB's and explains why AHB's have become established in many areas despite continuous presence of diseases and parasites.



## Spread of AHB's in Mexico



## Spread of AHB's in Mexico

### Beekeeping regions in Mexico

No. of beekeepers = 41,000

No. of HB colonies = 1.8 millions

Honey production =  $\pm$  57,000 tons / year



SAGARPA, 2010



## Spread of *Varroa* in Mexico since its introduction in 1992.





## Spread of *Varroa* in Mexico



Medina, 1998

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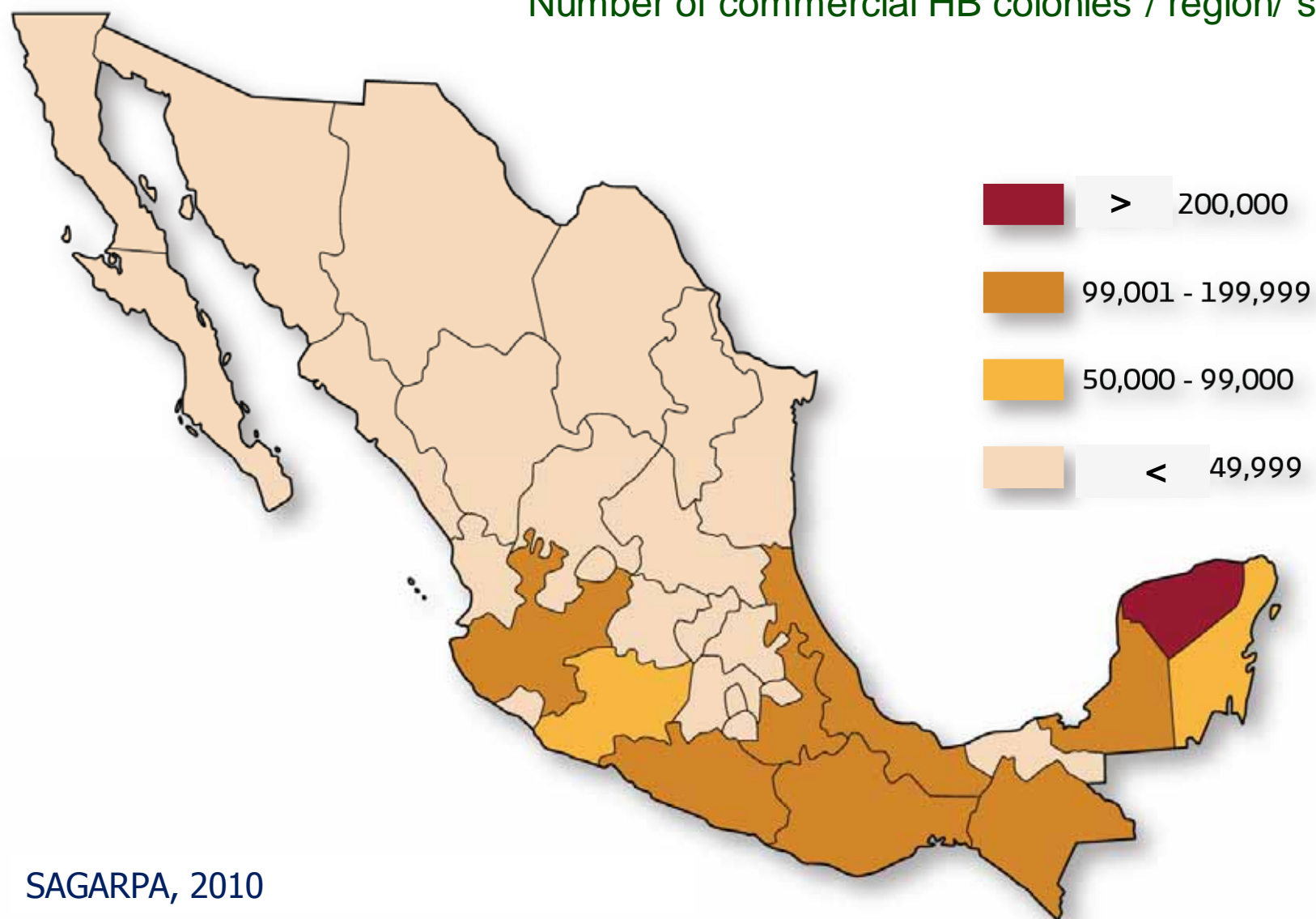
Medina, 1998





## Spread of *Varroa* in Mexico

Number of commercial HB colonies / region/ state



SAGARPA, 2010

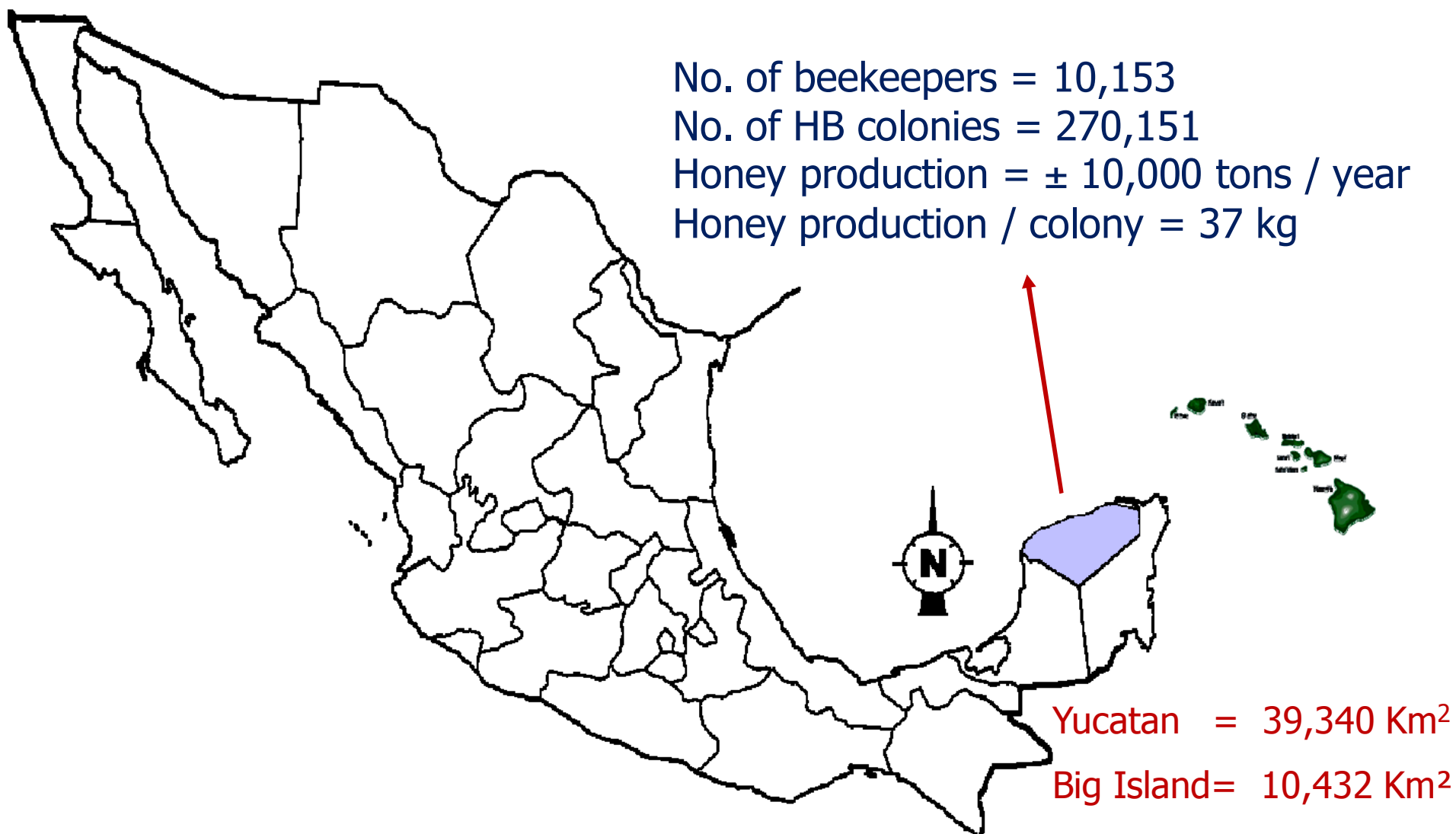
## Importance of beekeeping in Yucatan, Mexico

No. of beekeepers = 10,153

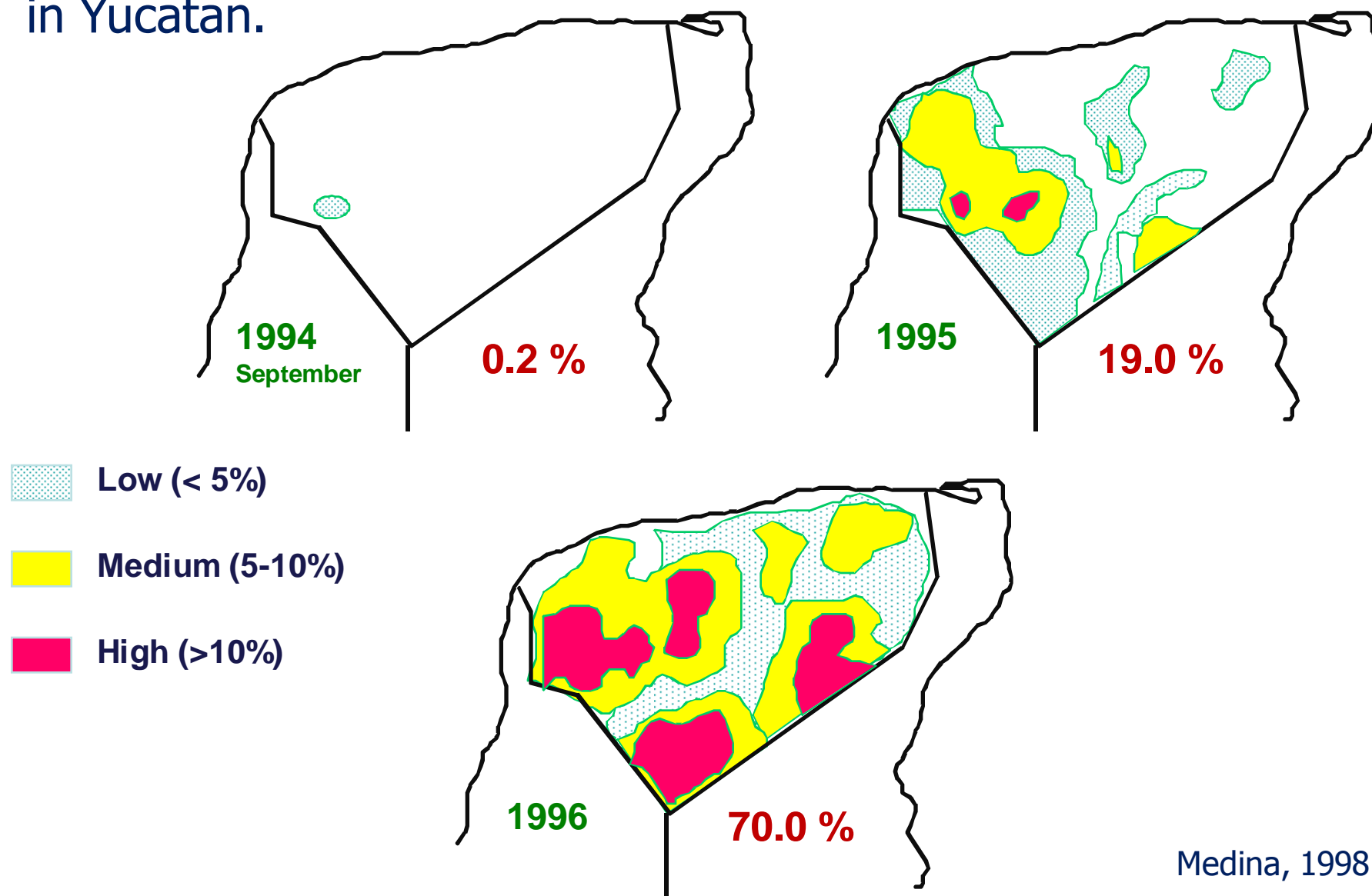
No. of HB colonies = 270,151

Honey production =  $\pm 10,000$  tons / year

Honey production / colony = 37 kg



## Spread of *Varroa destructor* in managed honey bee colonies in Yucatan.





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Medina, 1998

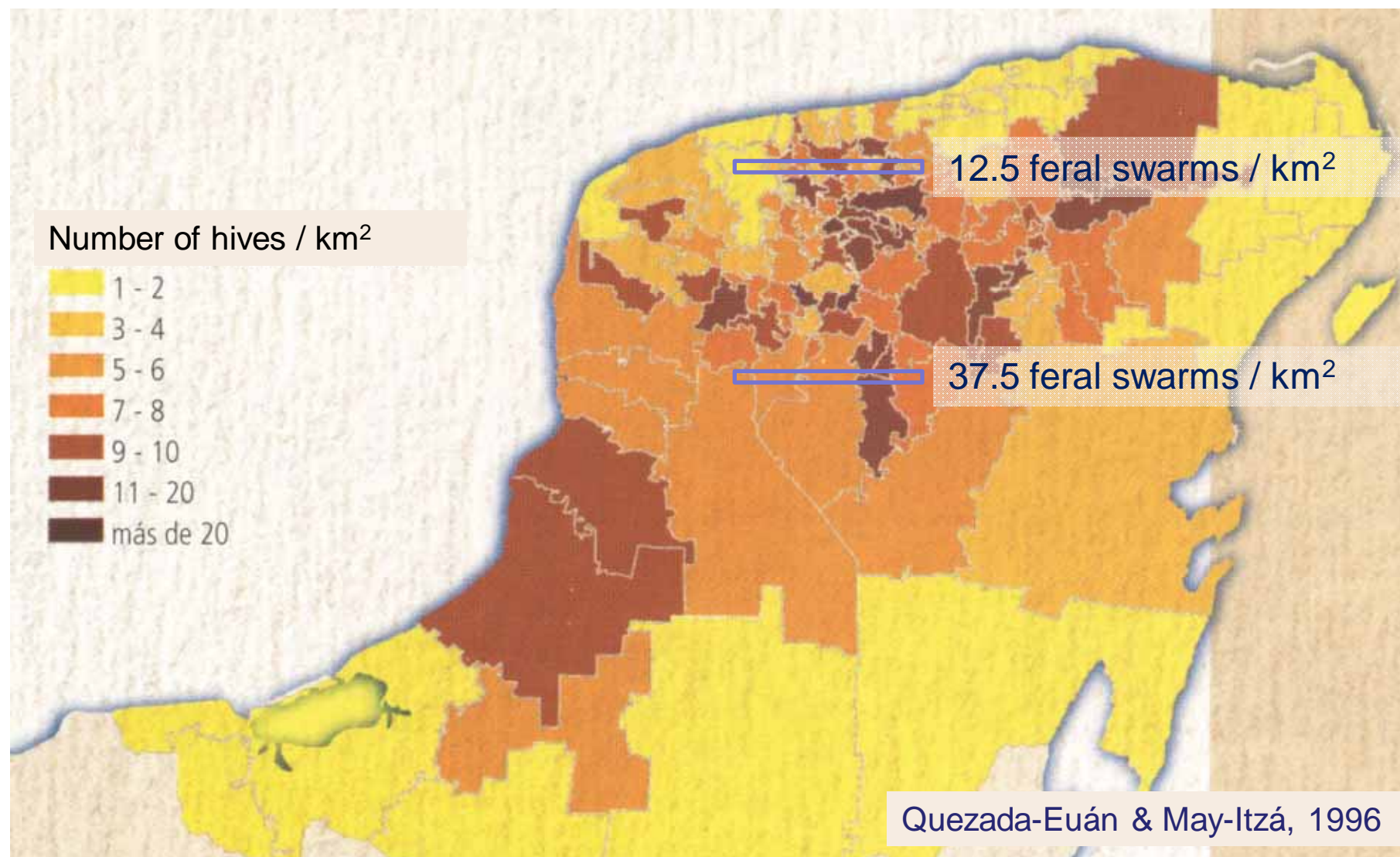


## Spread of *Varroa destructor* in managed honey bee colonies in Yucatan.

### Socio-economics characteristic of beekeeping in Yucatan (1998 – 2003)

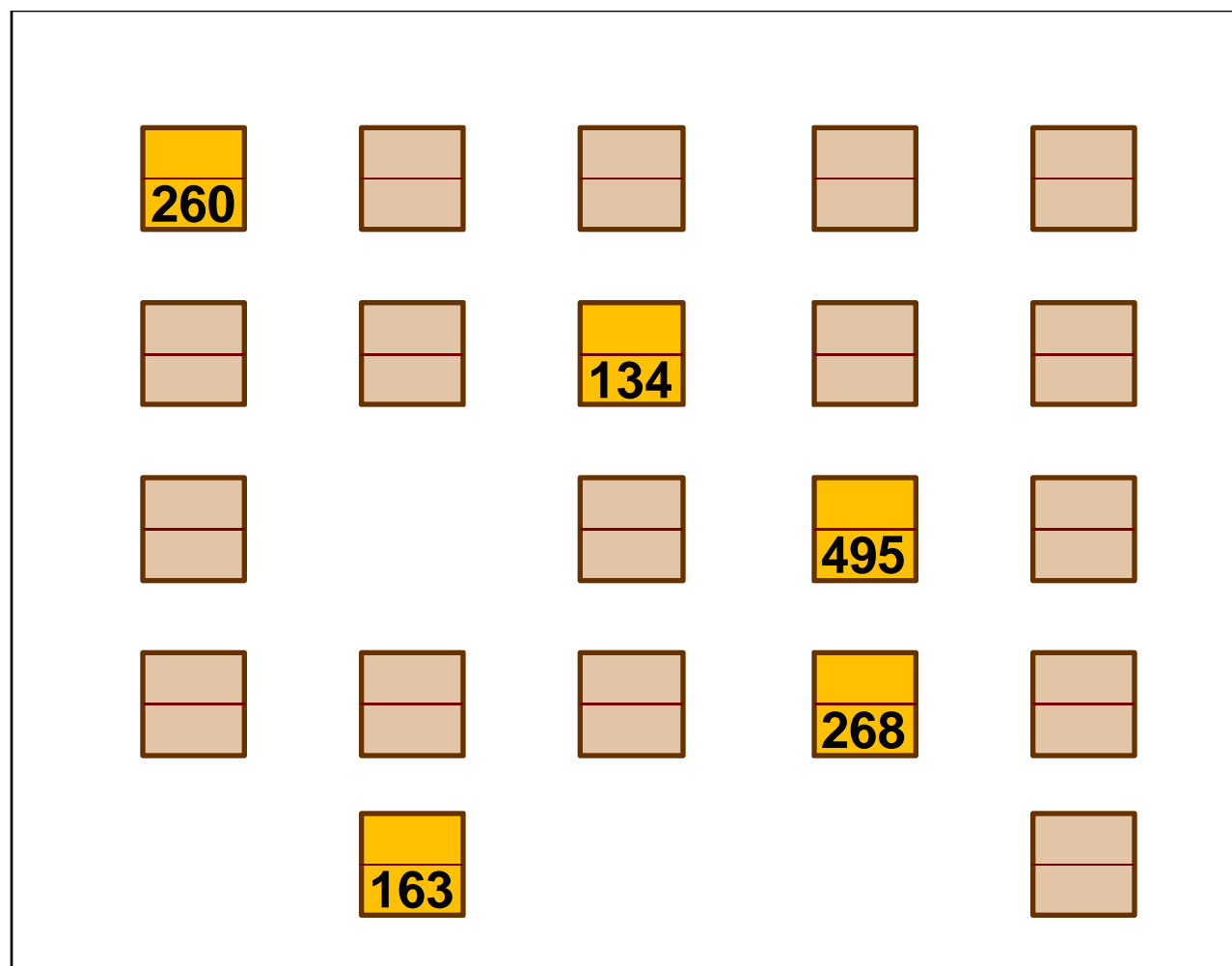
Beekeeper's age (years)	48
Academic degree	5 <sup>th</sup>
Experience with bees (years)	≥ 16
No. of apiaries / beekeeper	1.6
No. of hives / beekeeper	28
<b>No migratory beekeeping</b>	<b>≥ 96 %</b>
Presence of <i>Varroa</i>	90 %
Catch swarms	46 %

## Spread of *Varroa destructor* in commercial honey bee colonies in Yucatan.



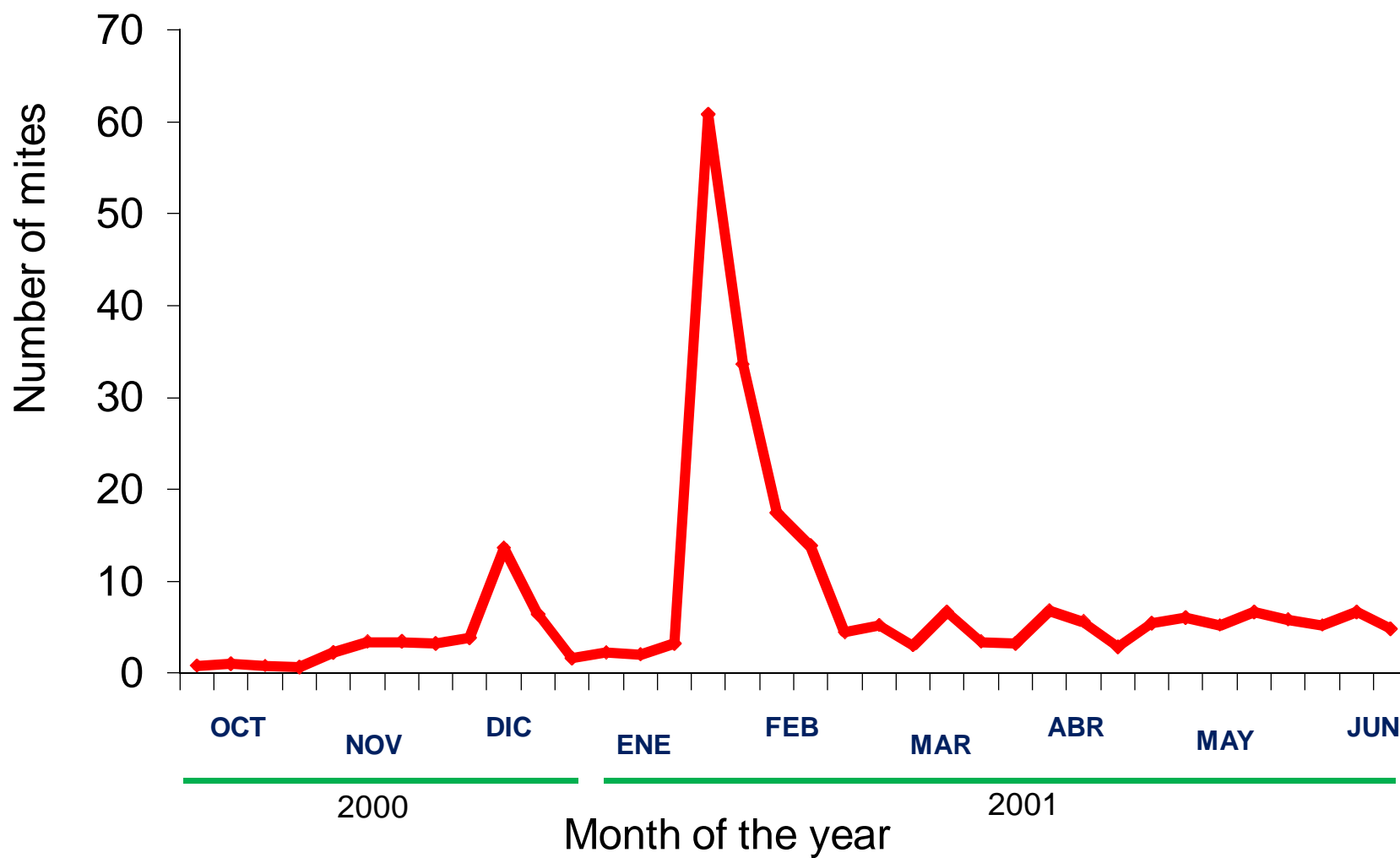
## Natural re-infestation of *Varroa* in commercial HB colonies

21 HB colonies were treated with a commercial miticide (Bayvarol®)



5 HB colonies were permanent treated with a double doses of a commercial miticide (Bayvarol®); October 2000 to June 2001.

## Varroa mite's re-infestation



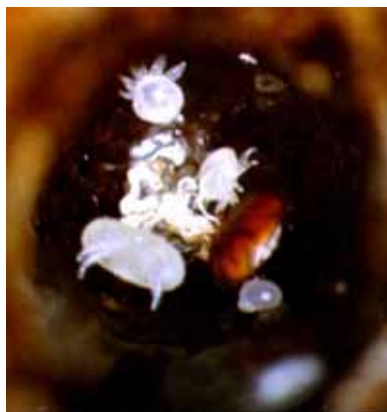
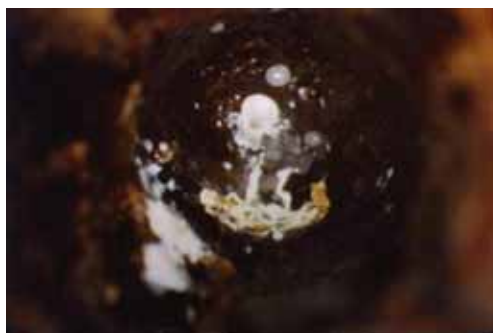
Secondary diseases affect collapse of AHB colonies infested with Varroa.

	Normal	Collapse
No. mites	1,812 $\pm$ 511 (598 - 5,766)	3,173 $\pm$ 1,528 <sup>NS</sup> (1,528 - 7,616)
No. CB Mummies	67.5 $\pm$ 13.0 <sup>a</sup> (20 - 175)	253.9 $\pm$ 86.5 <sup>b</sup> (17 - 1,067)

**CB** = Chalkbrood disease



## Reproduction of Varroa females in AHB brood affect mite population development in Yucatan?



Reproduction of *Varroa destructor* females in AHB and EHB worker brood.

	Similar	
	AHB	EHB
<b>Fertility</b>	88 %	91 %
<b>Fecundity</b>	4.86	4.93
<b>Mortality (mothers)</b>	2.0 %	1.8 %
<b>1<sup>er</sup> egg</b>	58 hdoc	60 hdoc
<b>5<sup>to</sup> egg</b>	174 hdoc	172 hdoc
<b>Development</b> (female)	141 h	134 h
<b>No. Adults daughters</b>	3	3

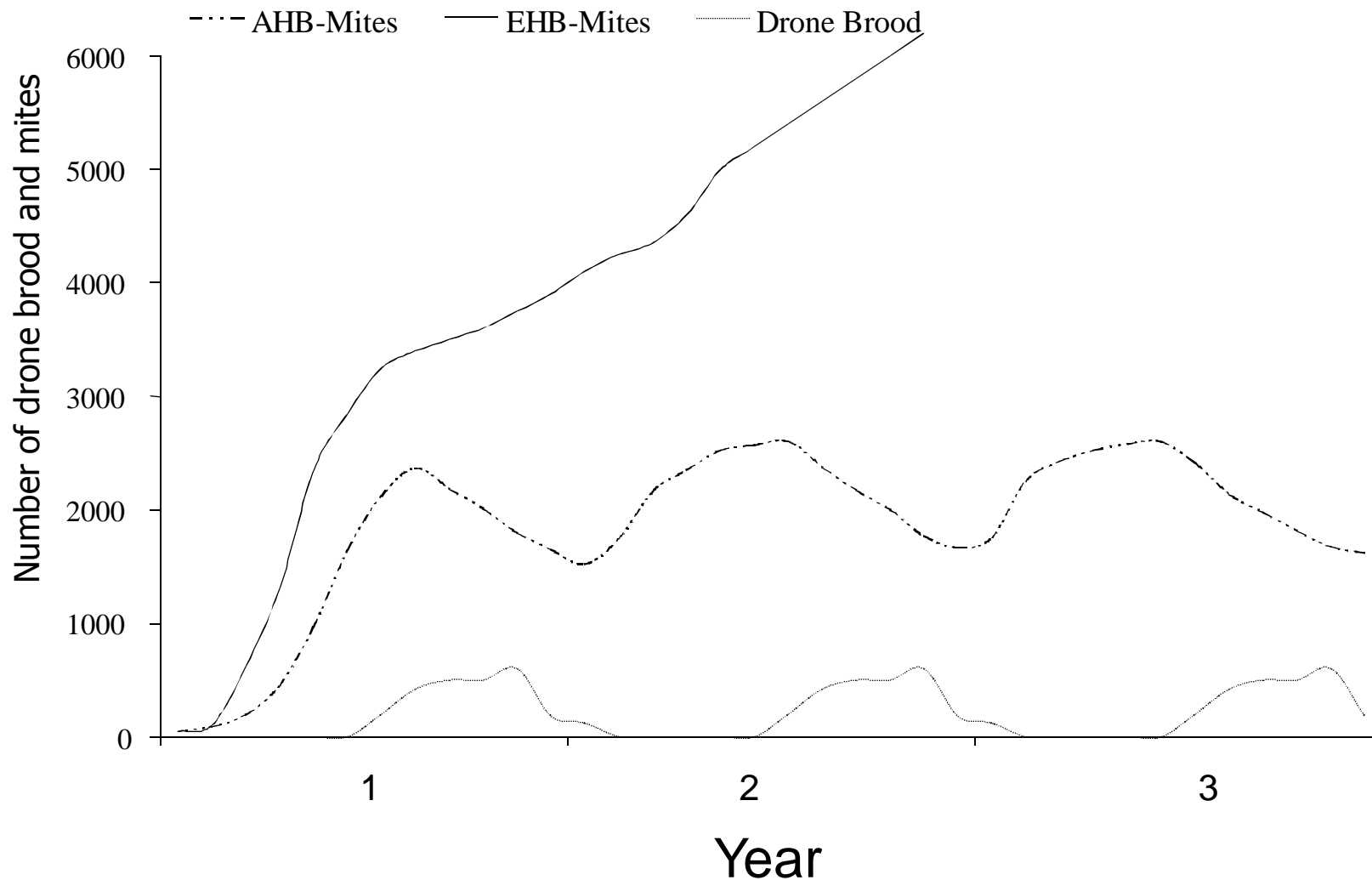
Medina & Martin, 1999

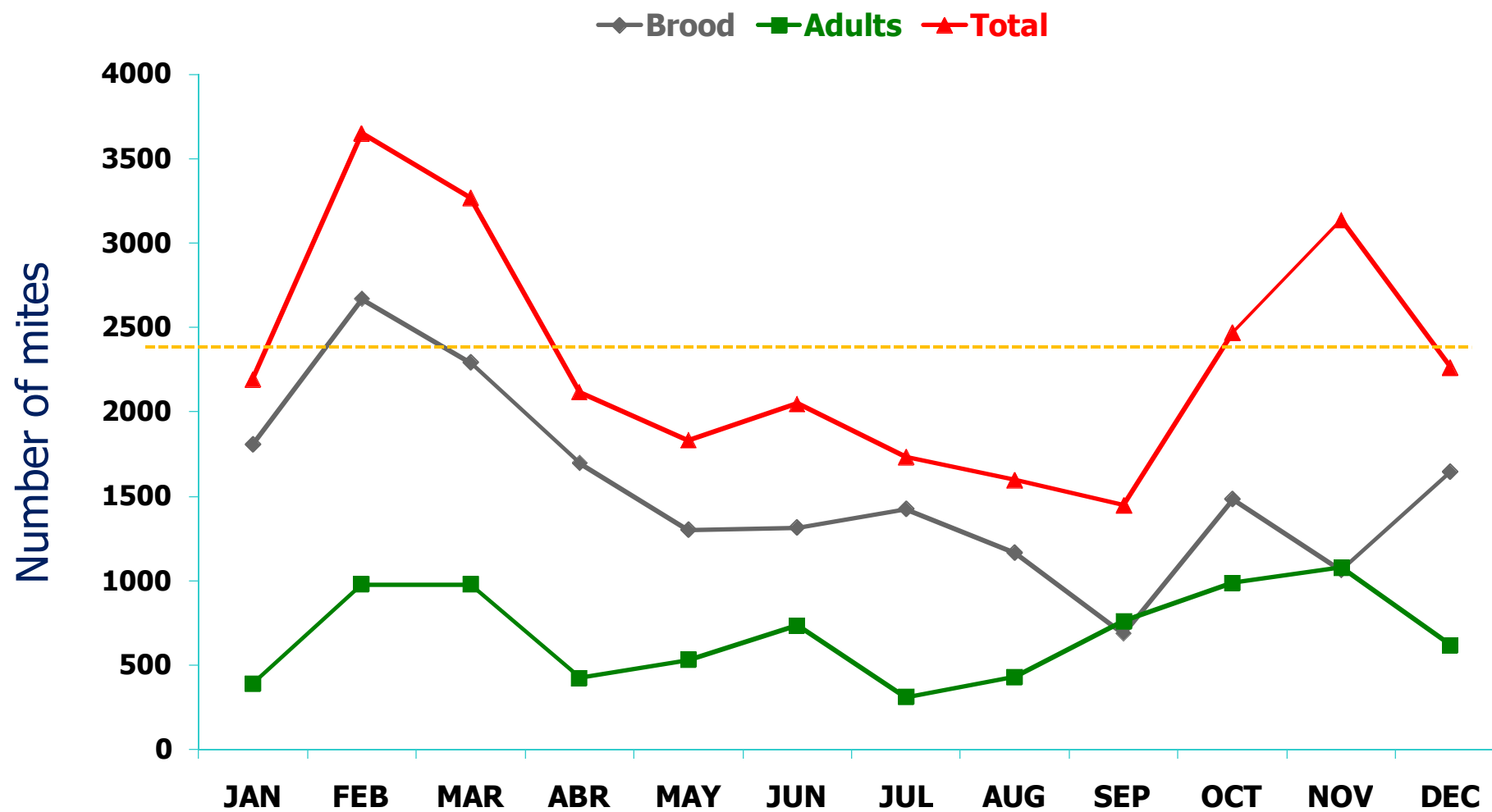
Reproduction of *Varroa destructor* females in AHB and EHB worker brood.

	Differences	
	AHB	EHB
Male mortality	43 %	20 %
% Viable Off.	40 %	75 %
No. viable daughters	0.73	1.1

Medina & Martin, 1999

## Predicted *Varroa destructor* population growth in European (EHB) and Africanised (AHB) honey bee colonies.





Medina, 2003



## Use of commercial pyrethoid strips



Apistan® (2 strips)

Bayvarol® (4 strips)

6 – 8 weeks

Continuous application of ONE chemical  
results in parasite resistance.

# Resistance of *Varroa* mites to fluvalinate

Pettis *et al.*, (1998)



## Apiculture Factsheet #223

### Pettis Test-Detecting Varroa Mite Resistance to Apistan

Pettis, J.; Shimanuki, H.; Feldlaufer, M. F. (1998). An Assay to Detect Fluvalinate Resistance in Varroa Mites. *American Bee Journal* 138(7): 538-541.

## Resistance of *Varroa* mites to fluvalinate

<b>Apiary</b>	<b>n</b>	<b>± EE</b>	
ACM 1	12	96.02 ± 2.15 <sup>a</sup>	<b>93.95 ± 1.98 %</b>
ACM 2	12	91.60 ± 4.73 <sup>a</sup>	
ACM 3	12	94.95 ± 2.82 <sup>a</sup>	
ACM 4	12	93.24 ± 3.91 <sup>a</sup>	
CFS 1	12	87.85 ± 4.84 <sup>b</sup>	<b>83.60 ± 0.51 %</b>
CFS 2	12	84.44 ± 4.12 <sup>b</sup>	
CFS 3	12	82.60 ± 4.41 <sup>b</sup>	
CFS 4	12	79.53 ± 4.39 <sup>b</sup>	

ACM = Use Alternative Control Methods; CFS = Use Commercial Fluvalinate Strips

# Election of alternative control methods

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- ✓ High efficacy
- ✓ Easy application
- ✓ Low cost of treatment
- ✓ Low risk of honey contamination
- ✓ No toxicity for bees
- ✓ Efficacy with the presence of brood
- ✓ No colony damage at high temperatures

**Organic acid = Formic acid**  
**Essential oil = Thymol**



## Efficacy of alternative control methods



Formic acid (60 ml al 65%), 3 application, weekly.



Evaporation of the Formic acid.

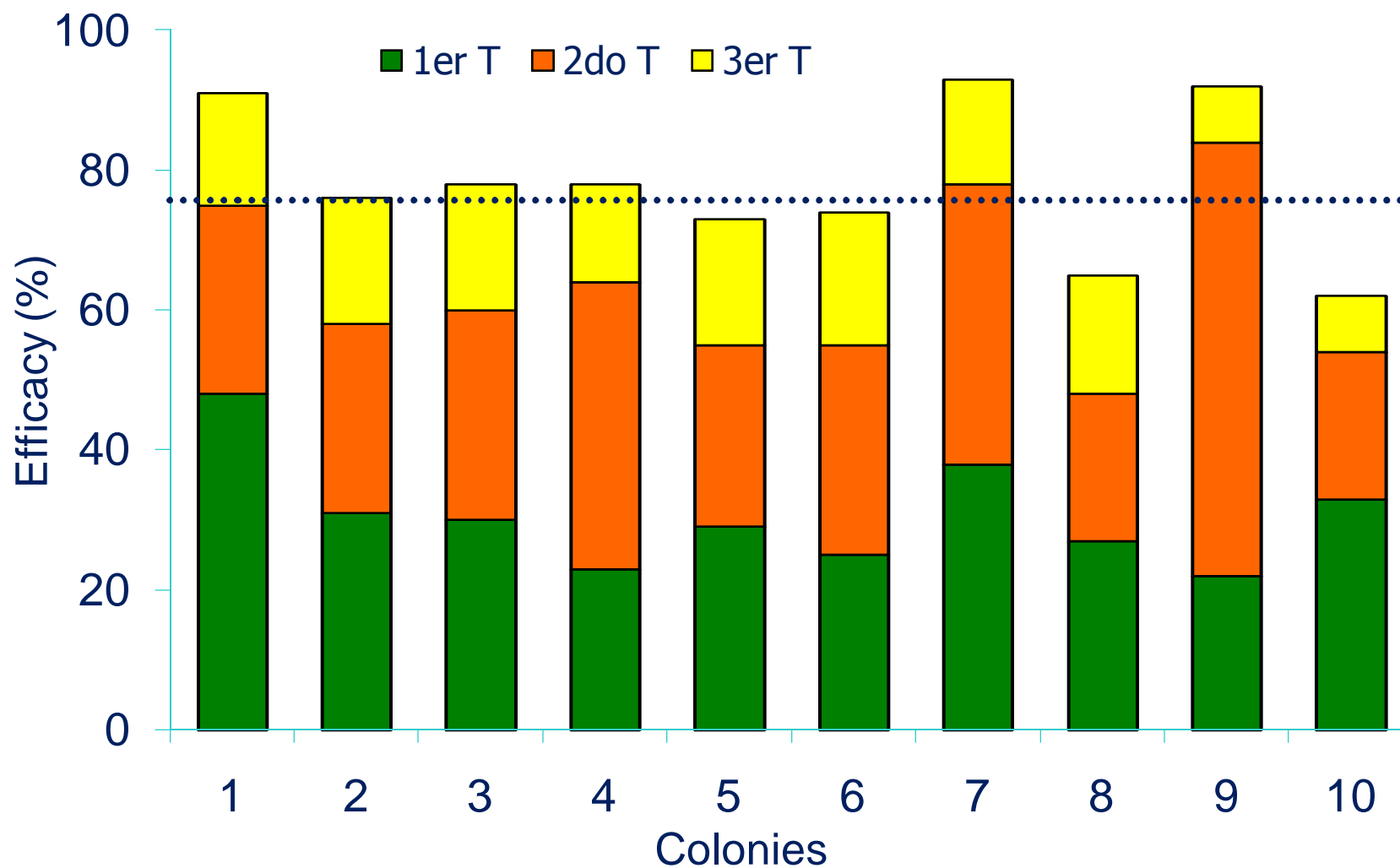


## Efficacy of alternative control methods



Dead bees, brood and honey areas were registered before and after formic acid application in control and experimental colonies.

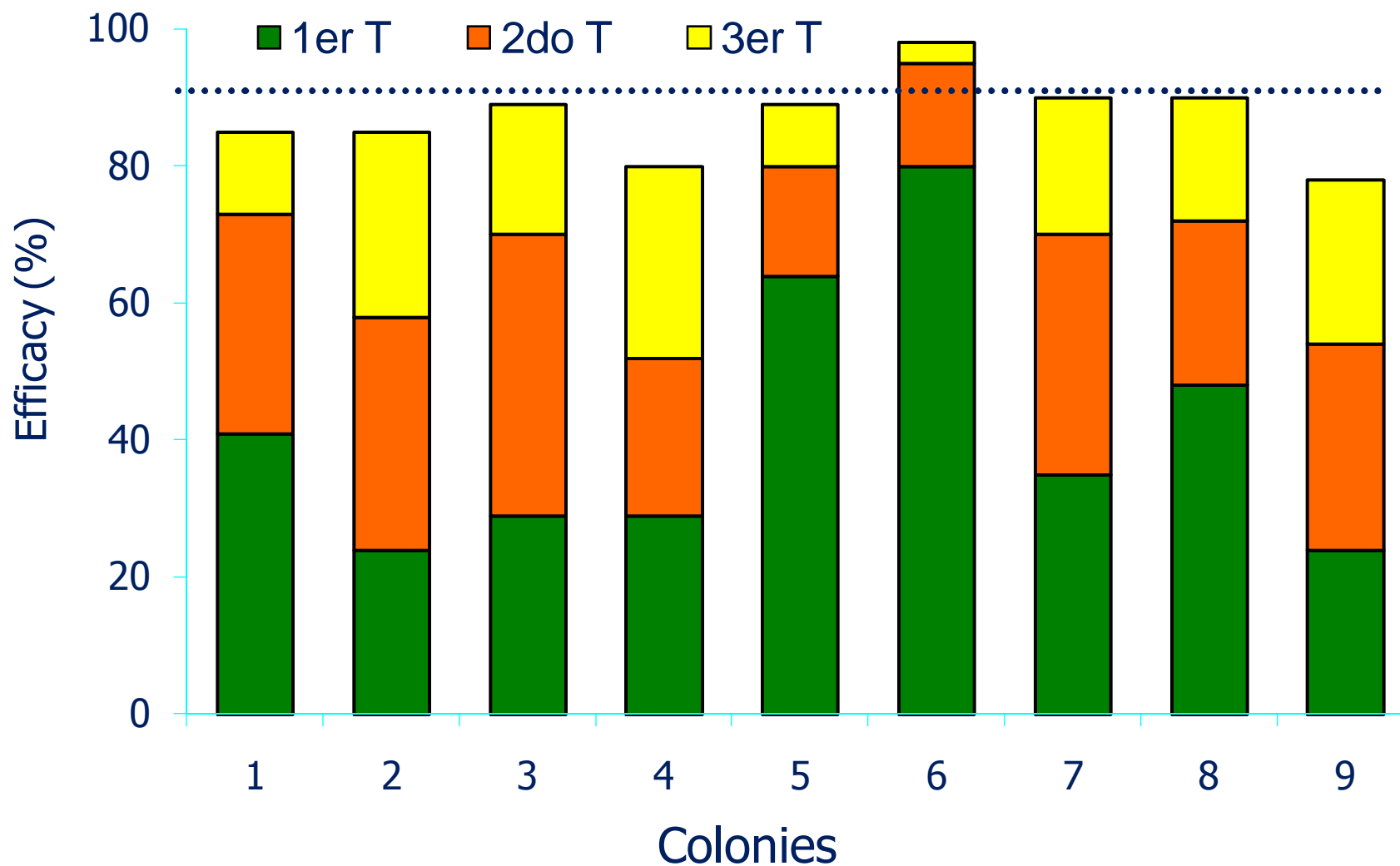
Efficacy (%) of formic acid  $X = 78\%$ .





Thymol crystal (0.5 gr per comb covered with adults bees),  
3 applications, weekly (According with Chiesa, 1991).

## Efficacy of thymol crystal (X= 89%).

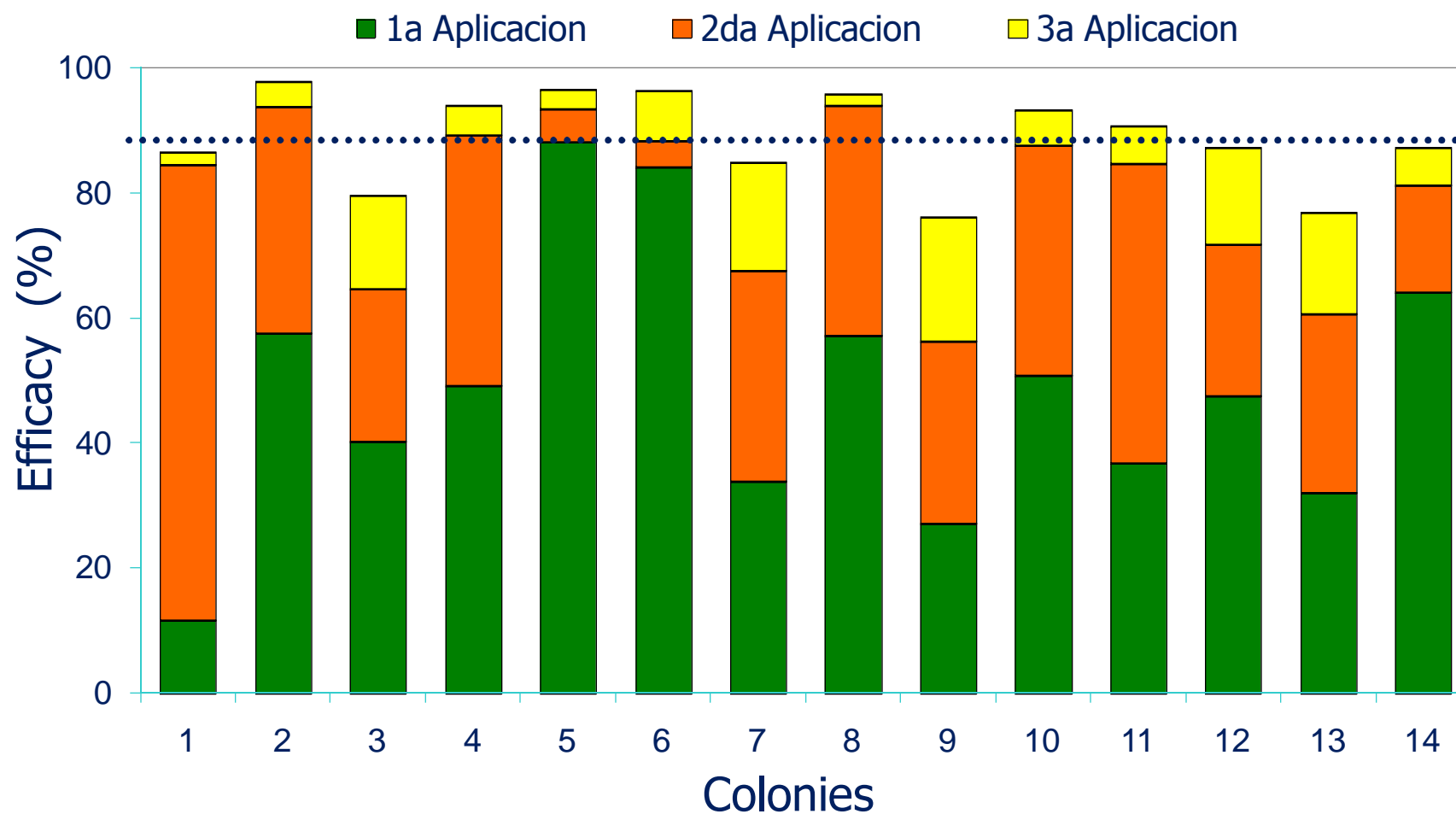






Thymol in oil (20 ml), 3 applications, weekly.

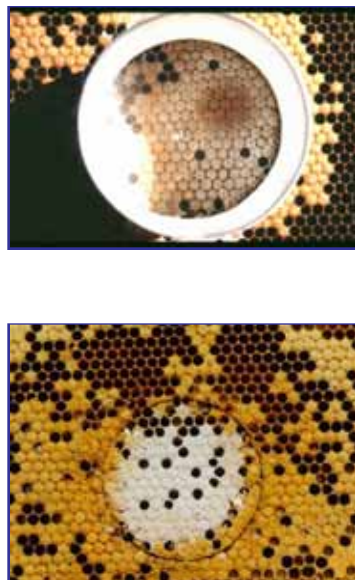
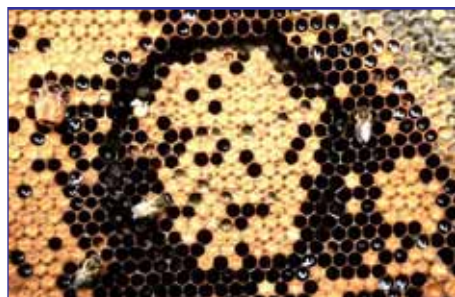


## Efficacy of thyme in oil (X= 89%).





## Other strategies to control *Varroa* mites in AHB's Yucatan

Hygienic behavior and *Varroa* mite infestation levels in AHB's in Yucatan

		
Low hygienic		Highly hygienic
Hygienic behavior (%)		
29 %		98 %
Brood infestation		
12.6 %		3.4 %

## CONCLUSIONS

- ✓ Spread of *Varroa* has been rapid in Mexico and Yucatan.
- ✓ Spread of *Varroa* in Yucatan = high colony densities + AHB's = swarming & migration.
- ✓ *Varroa* reproduction is low in AHB's.
- ✓ *Varroa* population develop less in AHB's.

## CONCLUSIONS

- ✓ *Varroa* mite resistance has been registered in ABH's.
- ✓ Efficacy of alternative control methods (FA & Thymol) = *Varroa* can be controlled with ACM.
- ✓ Hygienic behavior = reduces *Varroa* mite population, increasing tolerance to this parasite and other bee diseases.

## Acknowledgements

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