



# Breeding Tolerant Honey Bees (*Apis mellifera iberiensis*) Against Varroa Mite

**Francisco Padilla ([padilla@uco.es](mailto:padilla@uco.es)) and J. M. Flores.  
Zoology Department. Cordoba University (Spain)**

# Breeding Tolerant Honey Bees

---

- ▶ Varroa mite is the main pathological problem of our apiculture.
- ▶ Chemical treatments have allowed us to fight against the mite, but resistance appear frequently.
- ▶ Because the mites not to be eliminated, they must be controlled.



# Breeding Tolerant Honey Bees

---

- ▶ An alternative is the selection of tolerant bees, and the best example of tolerance is found in *Apis cerana*.
  - ▶ The parasite reproduction in practice only occurs in drone brood, because infested workers are quickly cleaned out.
  - ▶ Drone pupae with multiple varroa females often die.
  - ▶ The bees have a effective grooming behaviour.
- ▶ The ability to detect and remove infested larvae could be improved, because the property already exists in the European bees.



# Breeding Tolerant Honey Bees

---

- ▶ **Selection of tolerant bees:**
  - ▶ The Kefuss experience on the selection of resistant varroa European bees.
  - ▶ The studies of Fries et al. in the Gotland island.
  
- ▶ **The Bond Test: Live and let Die**



# Breeding Tolerant Honey Bees

---

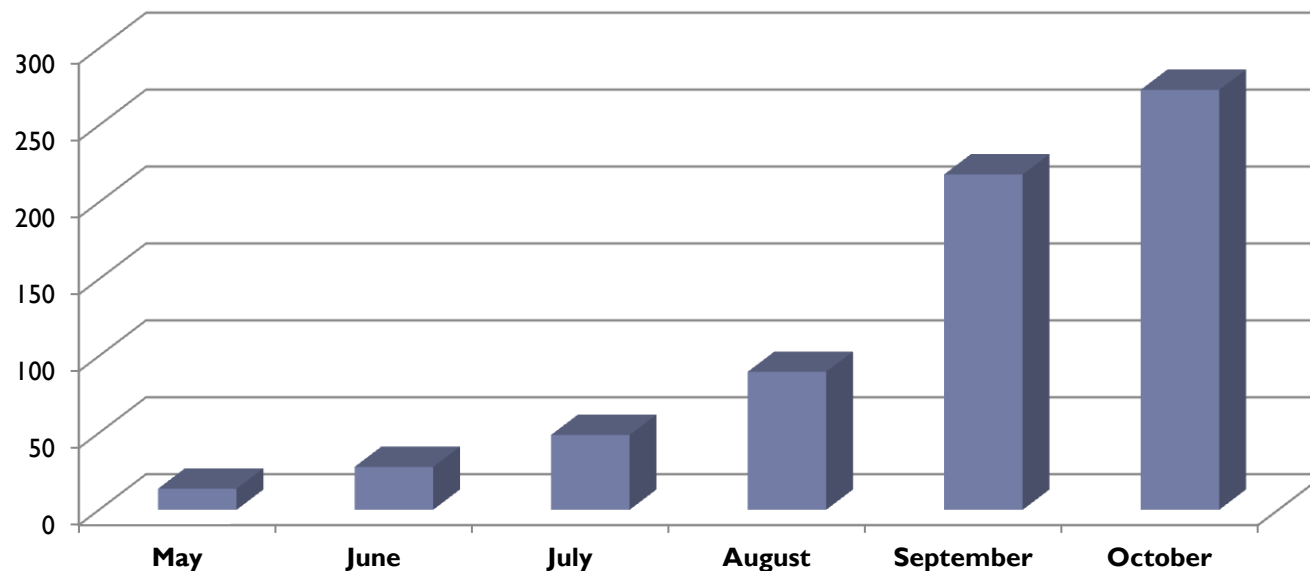
- ▶ **Keeping untreated apiary during 2007, 2008 and 2009**
  - ▶ In 2007 march we established an experimental apiary. The last treatment (amitraz) was applied in December.
  - ▶ 65 colonies from different origin were housed in Langstroth beehives, endowed with special bottom with grill that allow parasites fall to the debris.
  - ▶ Each colony was formed by 7 combs with adult bees (5 brood combs and 2 honey and pollen combs) and other three founded combs were added.
- ▶ **Bee season 2007.**
  - ▶ We valued natural fallen of mites on a bottom-board and natural history of the colonies.



# Breeding Tolerant Honey Bees

- ▶ Along of the beekeeping season we studied in 6 occasions the natural mite fallen in four days periods.

**Varroa mite drop**



Means ± s.e.	13,71±1,59	27,88±3,25	48,67±8,53	89,67±18,6	218,04±35,41	273,05±25,36
<b>Maximun</b>	59	124	352	1000	1459	873
<b>Minimun</b>	1	0	3	2	3	17

# Breeding Tolerant Honey Bees

---

- ▶ We considered that a colony had resisted to Varroa if survived the autumn, had a good overwinter and in spring of 2008 they had a normal development.
- ▶ Of the 65 original colonies only survived in good conditions 9 (13,8%).
- ▶ The progressive loss of colonies began in November. Most of them died between November and December. Stabilized in January, and in February the colonies began the recovery .



# Breeding Tolerant Honey Bees

---

- ▶ February (2008) to July (2009).
  - ▶ We studied the percentage of infested brood and the reproductive success of varroa in survival colonies.
- ▶ Non-reproductive success of varroa.





# Breeding Tolerant Honey Bees

---

DATE	SURVIVING COLONIES	OPEN CELLS	INFESTED CELLS	INFESTED CELLS WITH ONLY ONE FOUNDRIS	INFESTATION	VARROA WITHOUT REPRODUCTIVE SUCCESS IN CELLS WITH ONLY ONE FOUNDRIS
13.02.08	171	200	10	8	5%	12,50%
08.02.08	300	200	14	12	7%	41,67%
03.02.08	289	200	9	9	4,5%	11,11%
07.02.08	259	169	20	15	11,83%	20%
07.02.08	80	210	10	8	4,76%	12,50%
14.02.08	238	200	4	3	2%	66,67%
14.02.08	232	205	7	7	3,41%	57,14%
15.02.08	145	131	20	17	15,27%	47,06%
15.02.08	276	200	2	2	1%	50%

One interesting result is the low brood infestation in some colonies, in spite of the high infestation of the apiary last fall.

---



# Breeding Tolerant Honey Bees

---

- ▶ In 2008 we reared daughters queens from survival colonies of the first selection process.
- ▶ The descendants according to their origin were grouped in lines.
- ▶ In December 2008 the colonies were treated with an acaricide (Amitraz©) and in the spring we selected the hive that met the same conditions of the first experiment.
- ▶ The experiment finished in June 2011.



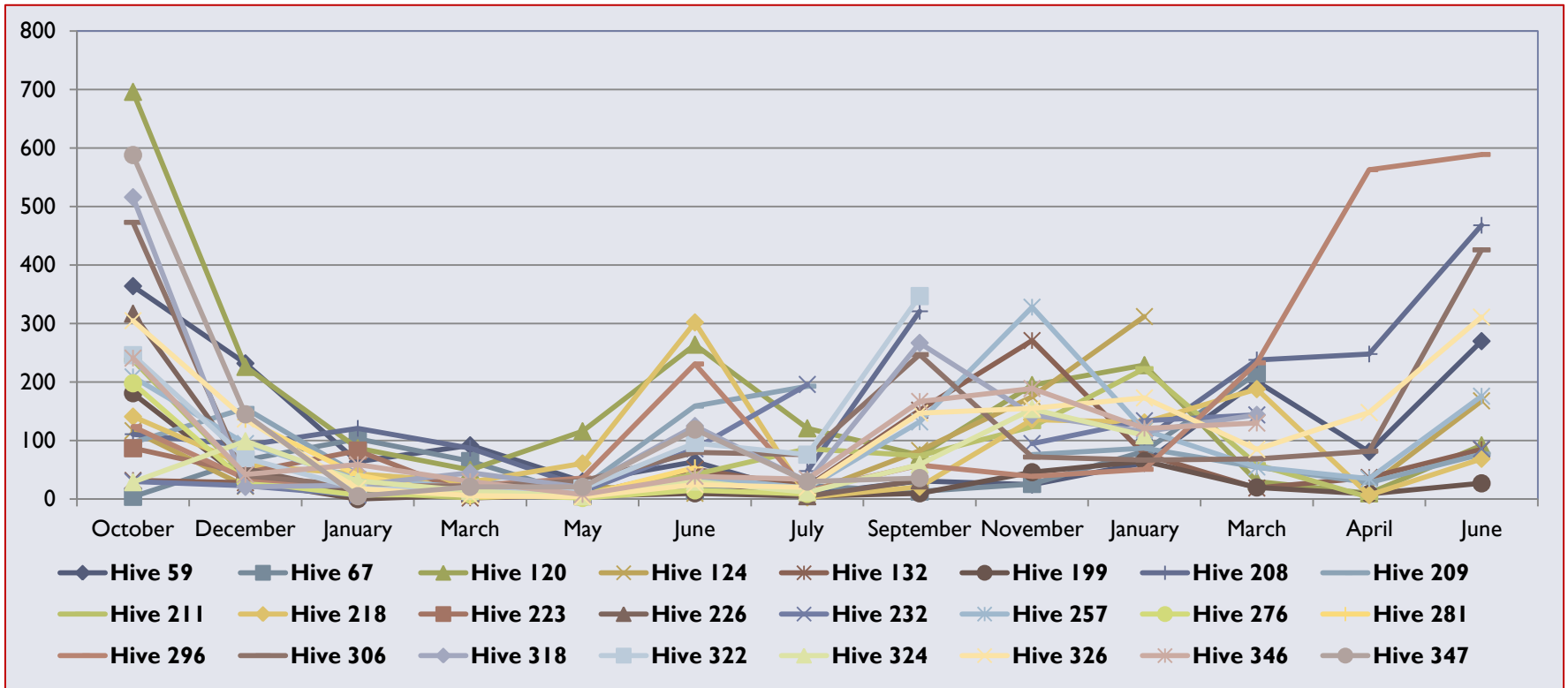
# Breeding Tolerant Honey Bees

---

- ▶ The 60 selected colonies were managed according to the criteria applicable to the management of a commercial beekeeping.
- ▶ Nowday surviving 24 of them that represent the 40% of the initial colonies.
- ▶ Along the time we valued in 13 times the natural mite fallen in 4 days periods.



# Breeding Tolerant Honey Bees

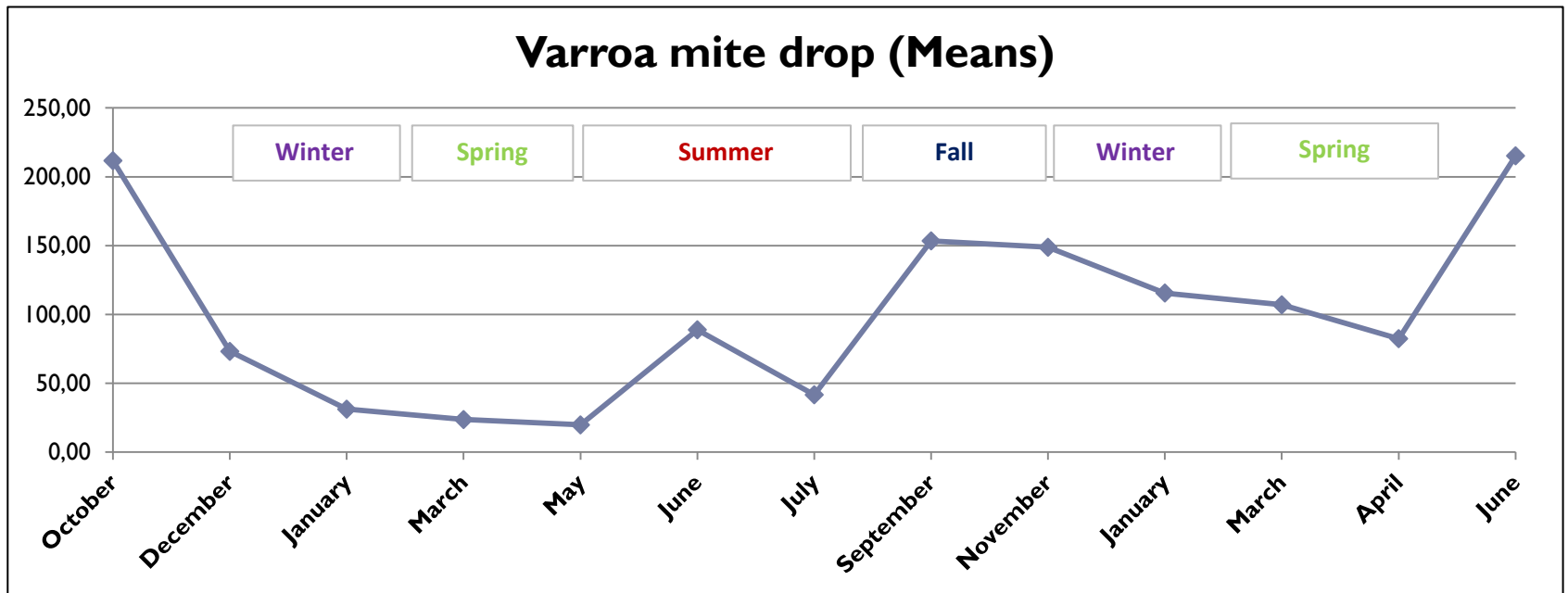


**Figure 1. Number of varroas dropping on the bottom-board in 13 controls realized: Oct/2009, Dec/2009, Feb/2010, Mar/2010, May/2010, June/2010, July/2010, Sept/2010, Nov/2010, Jan/2011, Mar/2011, Apr/2011, June/2011.**



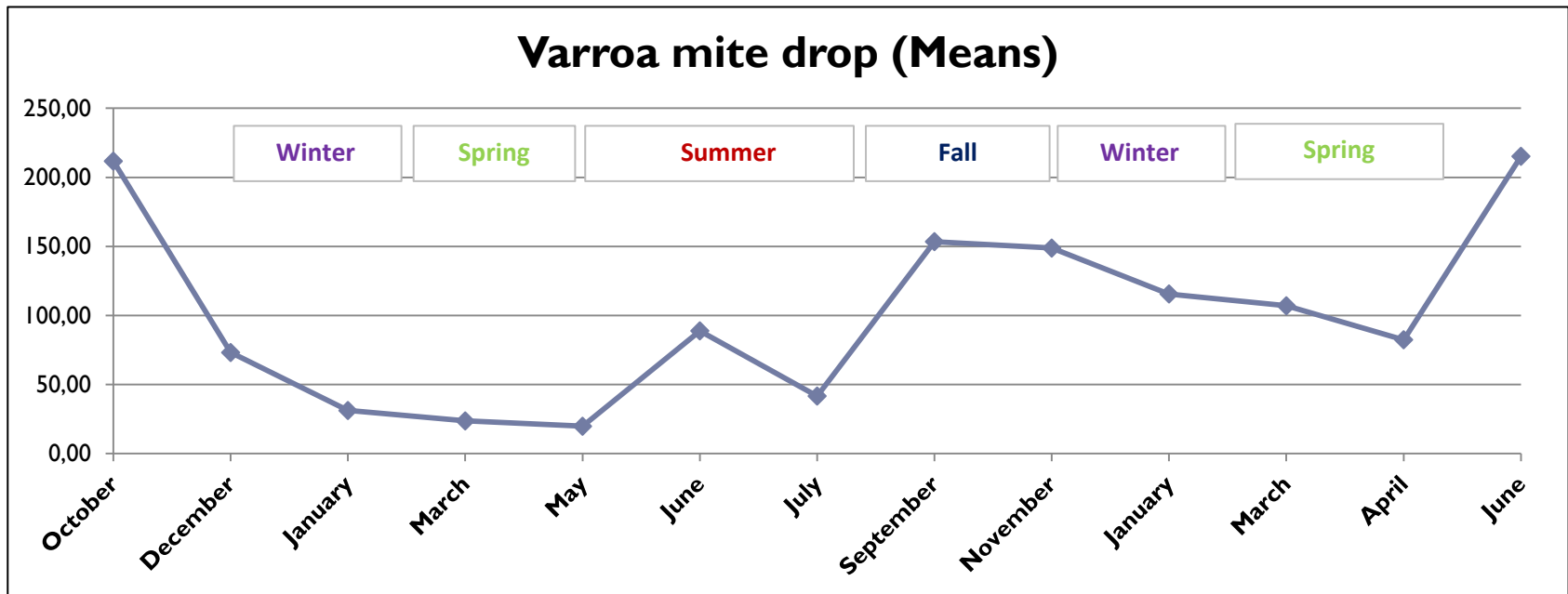
# Breeding Tolerant Honey Bees

---



# Breeding Tolerant Honey Bees

---

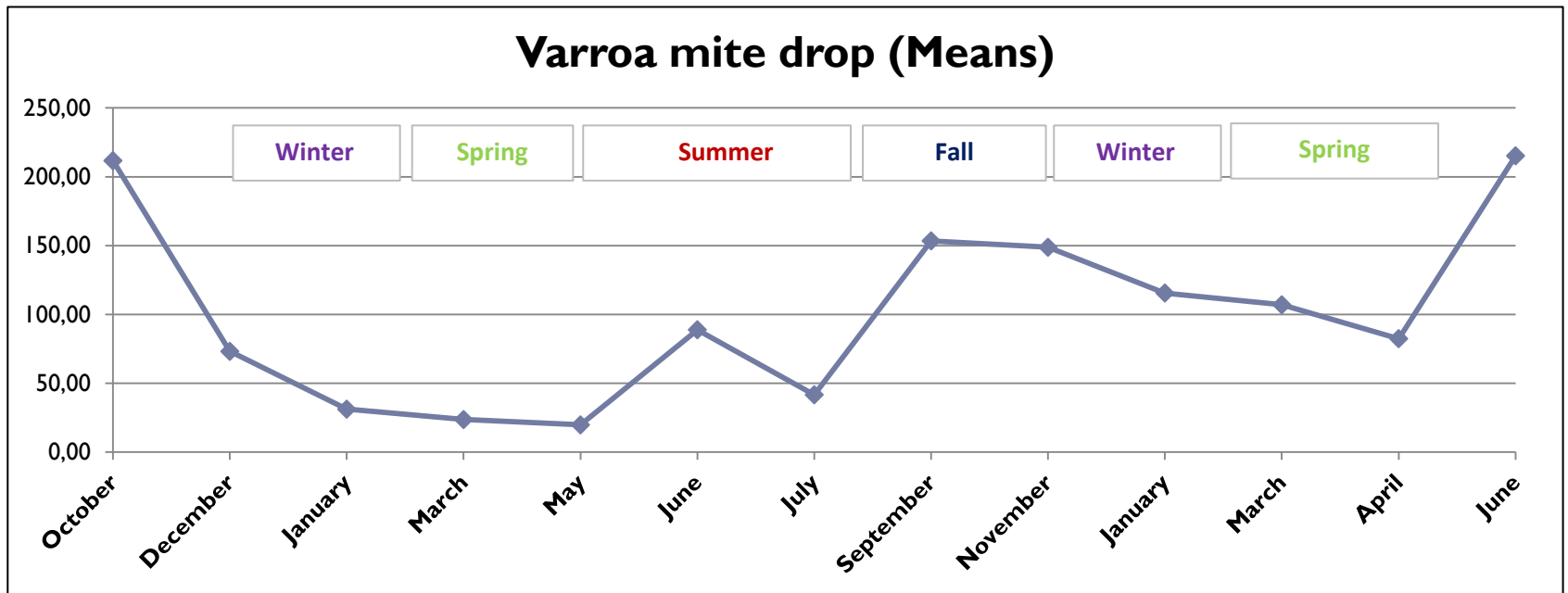


- ▶ Seasonal evolutions with maximum values in autumn and minimum from late winter to spring.
- 



# Breeding Tolerant Honey Bees

---

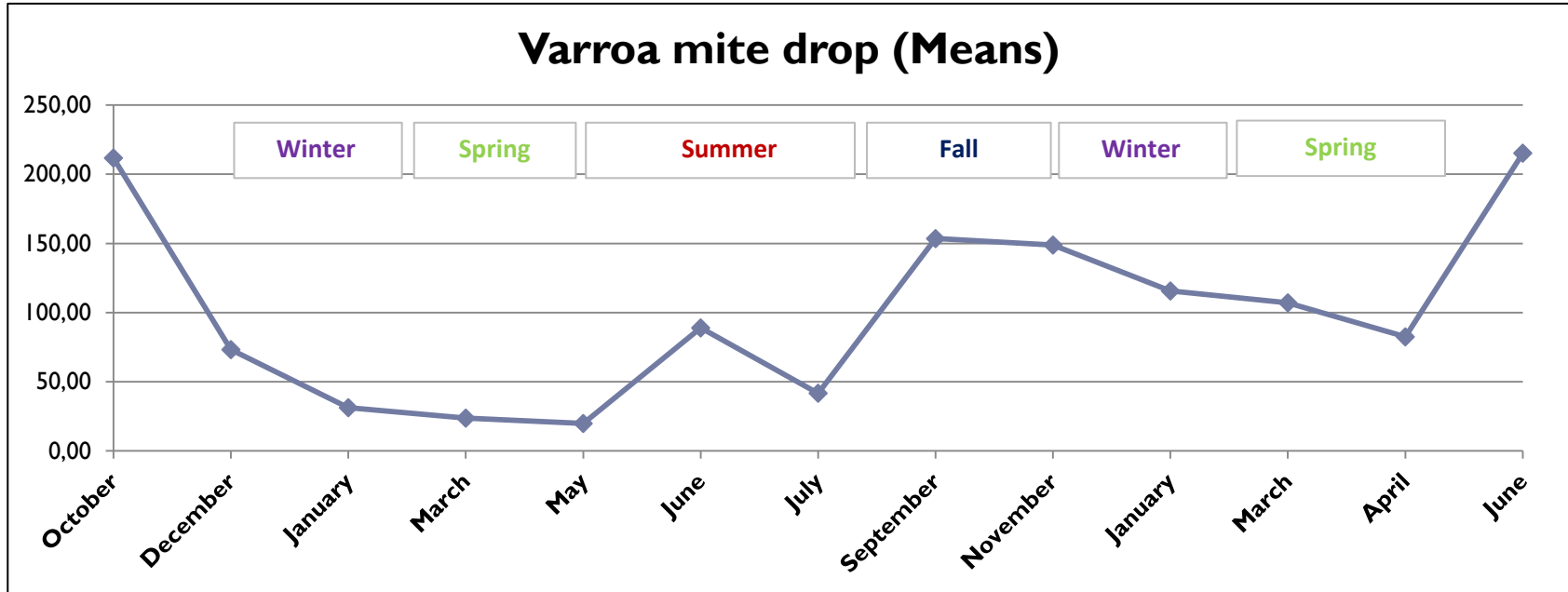


- ▶ There was a reduction of the population of varroa in the winter. We can deduce that the bees are able to support the parasite.
- 



# Breeding Tolerant Honey Bees

---



- ▶ Varroa population dynamics is similar in the two seasons. The mean values of the second annual increase over the first, so we don't know if the colonies will support other winter ("soft" acaricides?).
- 





# Breeding Tolerant Honey Bees

---

- ▶ Interesting traits showed by our bees.



# Breeding Tolerant Honey Bees

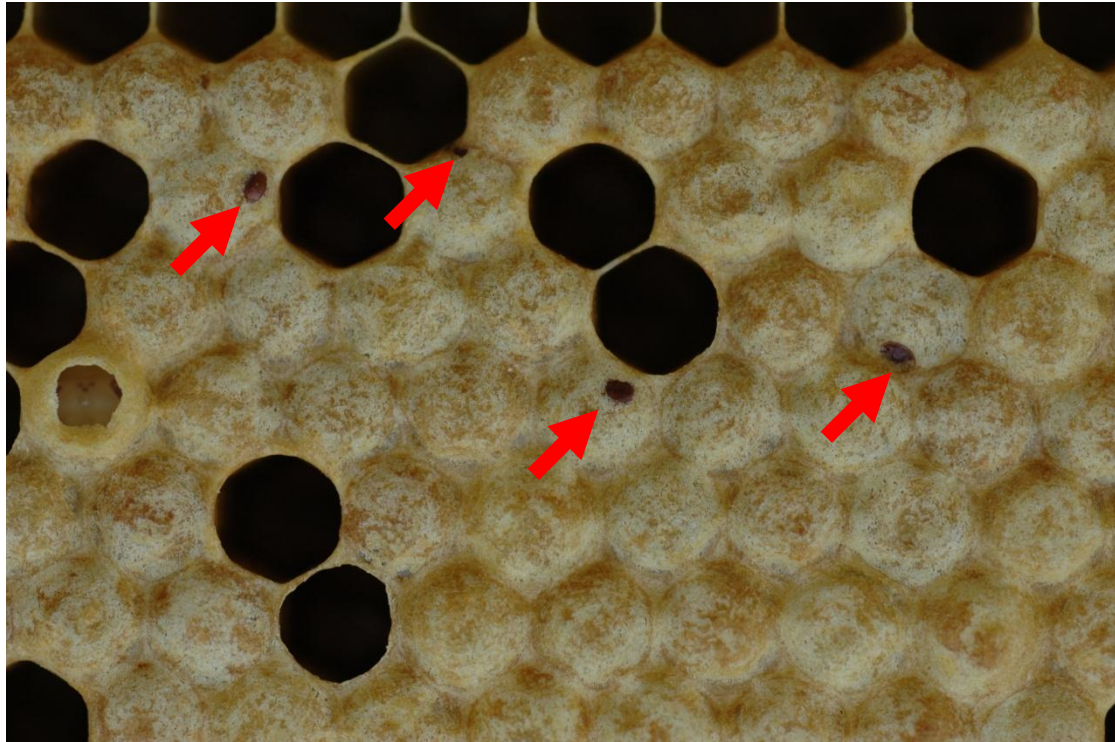
---

- ▶ **Natural Hygienic Behaviour (NHB).**
  - ▶ NHB increased when increase varroa population and other mites (wax moth).
  - ▶ NHB is showed frequently in colonies descending from our surviving colonies.



# Breeding Tolerant Honey Bees

---



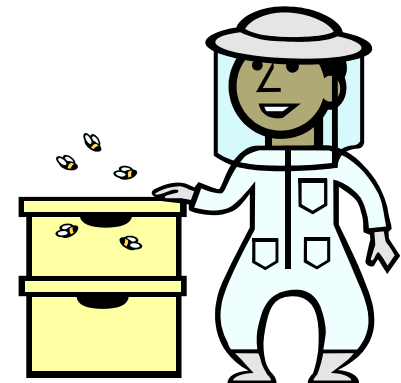
- ▶ Varroa dead within wax of the cap.



# Breeding Tolerant Honey Bees

---

- ▶ This year we have had queens daughters of the best queens surviving.
  - ▶ Low Varroa populations.
  - ▶ High honey production.
  - ▶ Gentleness.
- ▶ Next spring we will evaluate the colonies and perform a new experiment.



# Breeding Tolerant Honey Bees

---

