Different methods in conversion to organic beekeeping and acaricide residues in beewax

CRA
CONSIGLIO PER LA RICERCA
E LA SPERIMENTAZIONE
IN AGRICOLTURA

CRA-API
UNITÀ DI RICERCA
DI APICOLTURA E BACHICOLTURA

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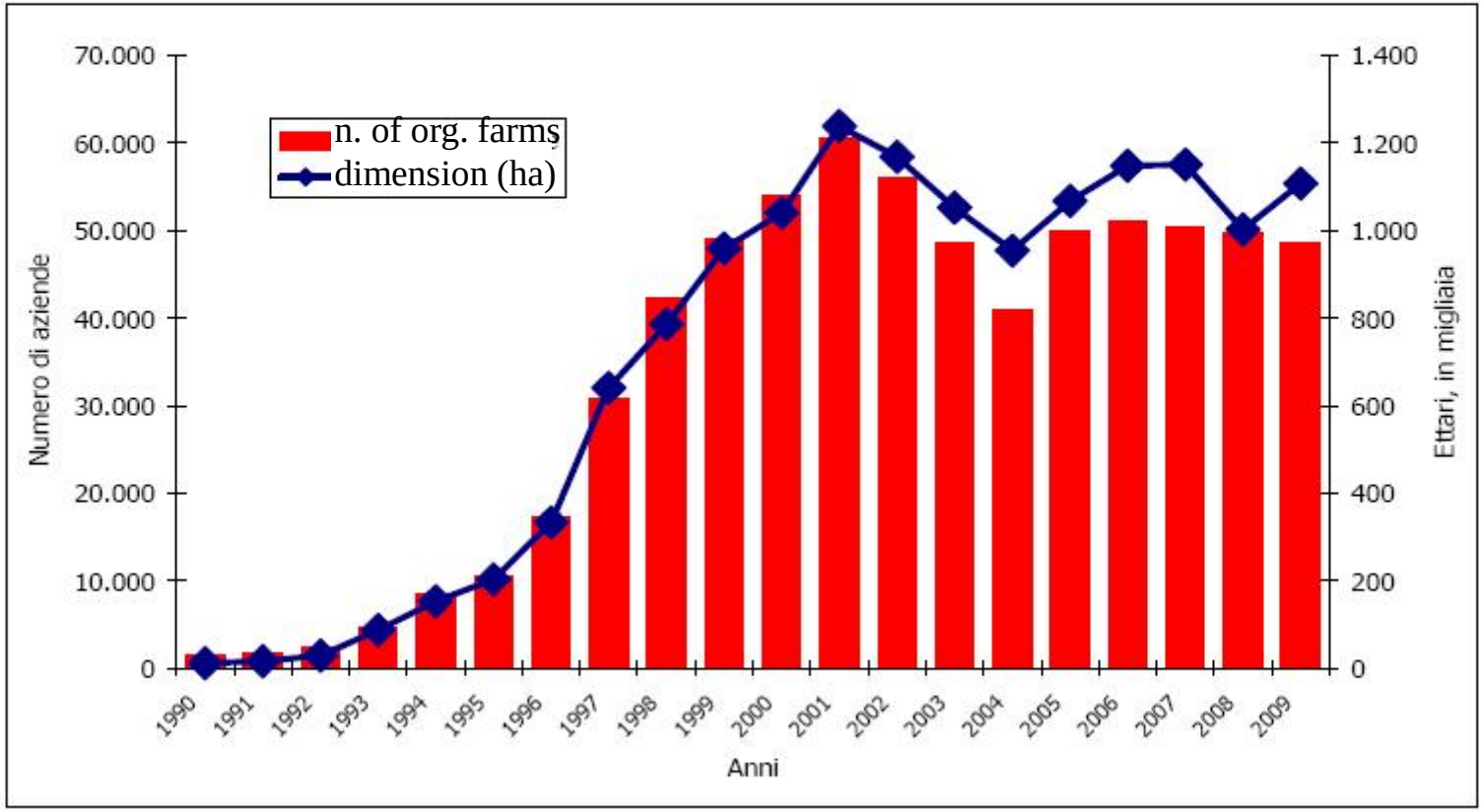
Organic farm in Italy in the last 20 years

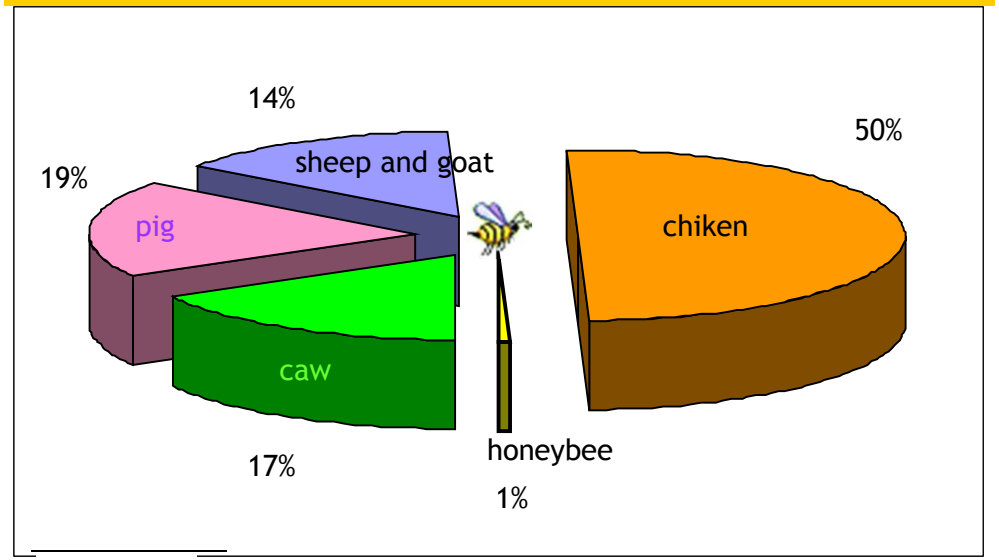
L'AGRICOLTURA BIOLOGICA AL 31/12/2009

Grafico 7 – Andamento di operatori e superfici in Italia dal 1990 al 2009

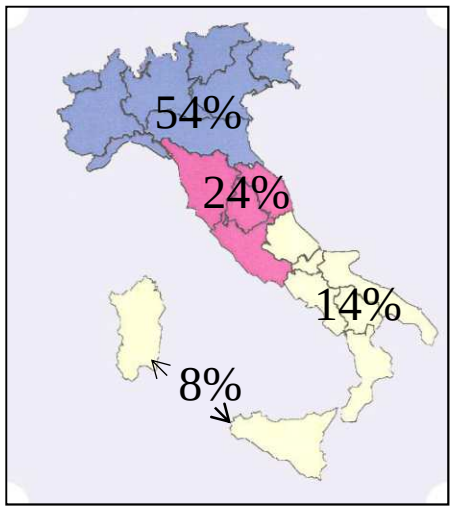


Dati 1990-1992: elaborazioni SINAB su stime diverse.
Dati 1993-2009: MiPAAF;

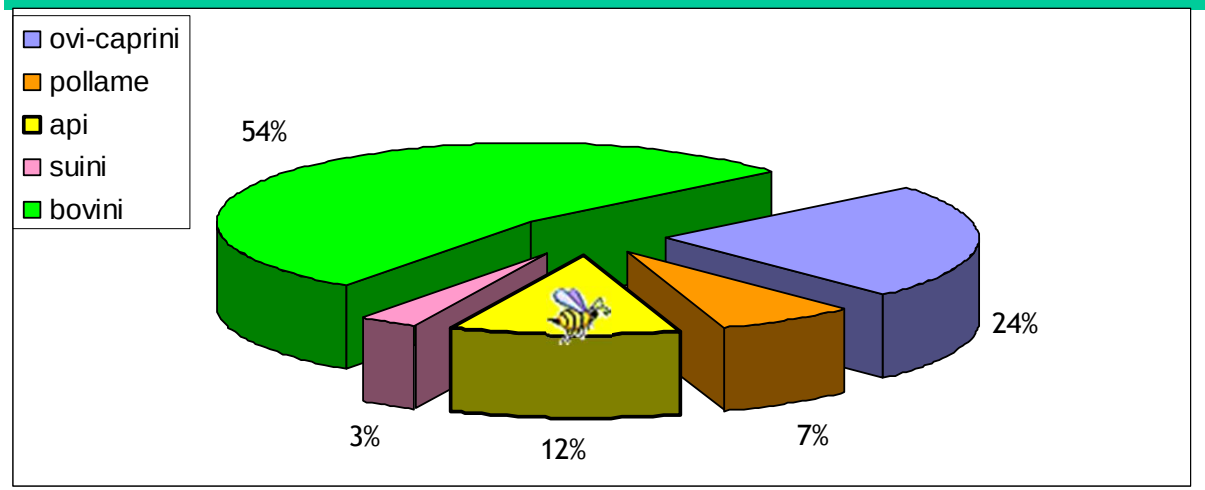
Percentage of **total** zootecnical farms: subdivision according to the animals



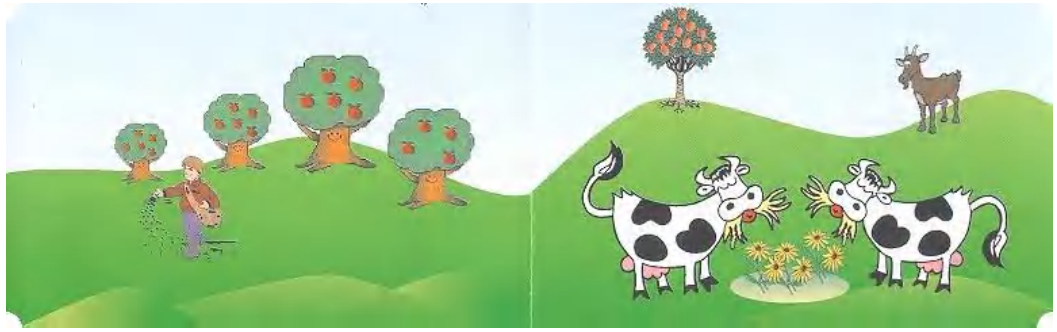
Distribution of the organic bee-farm



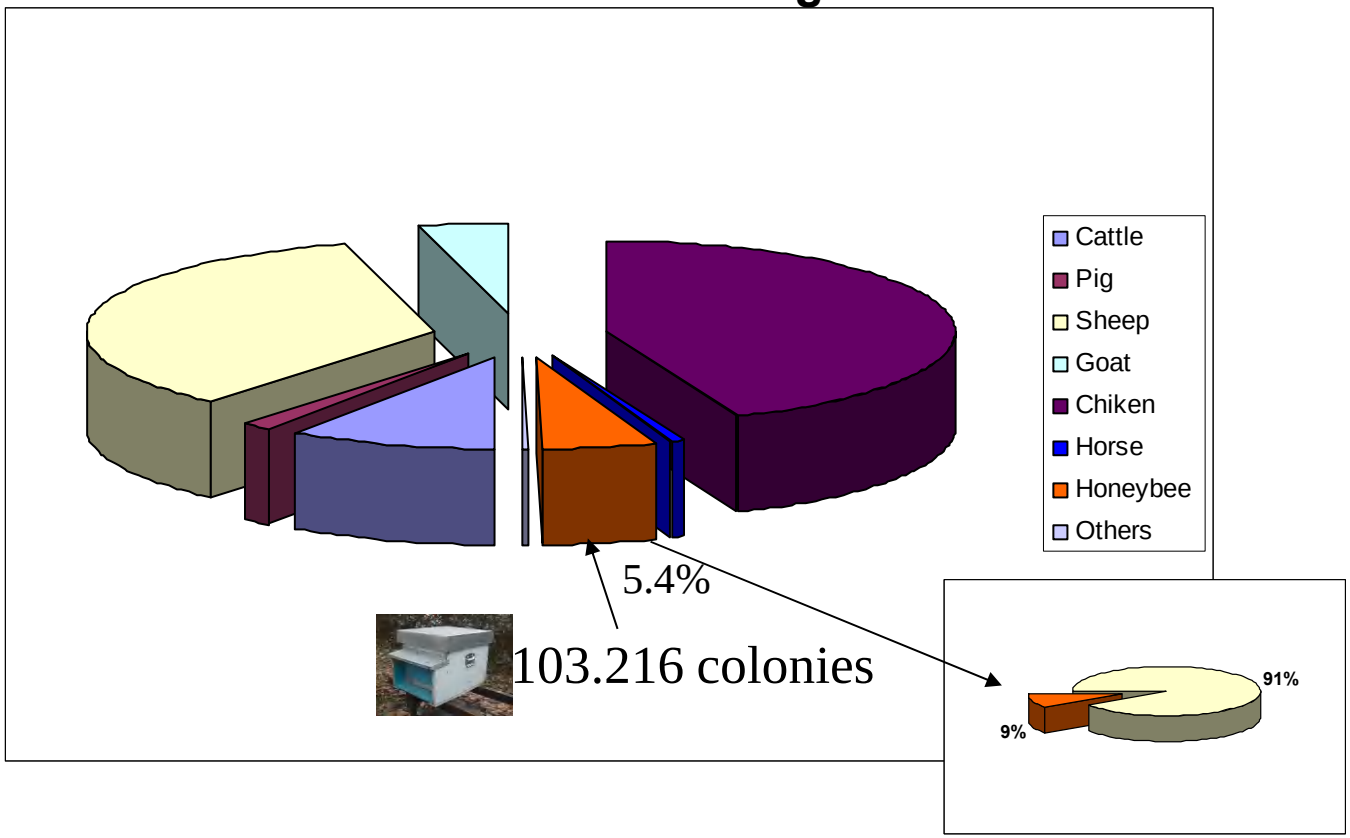
Percentage of **organic** zootecnical farms: subdivision according to the animals



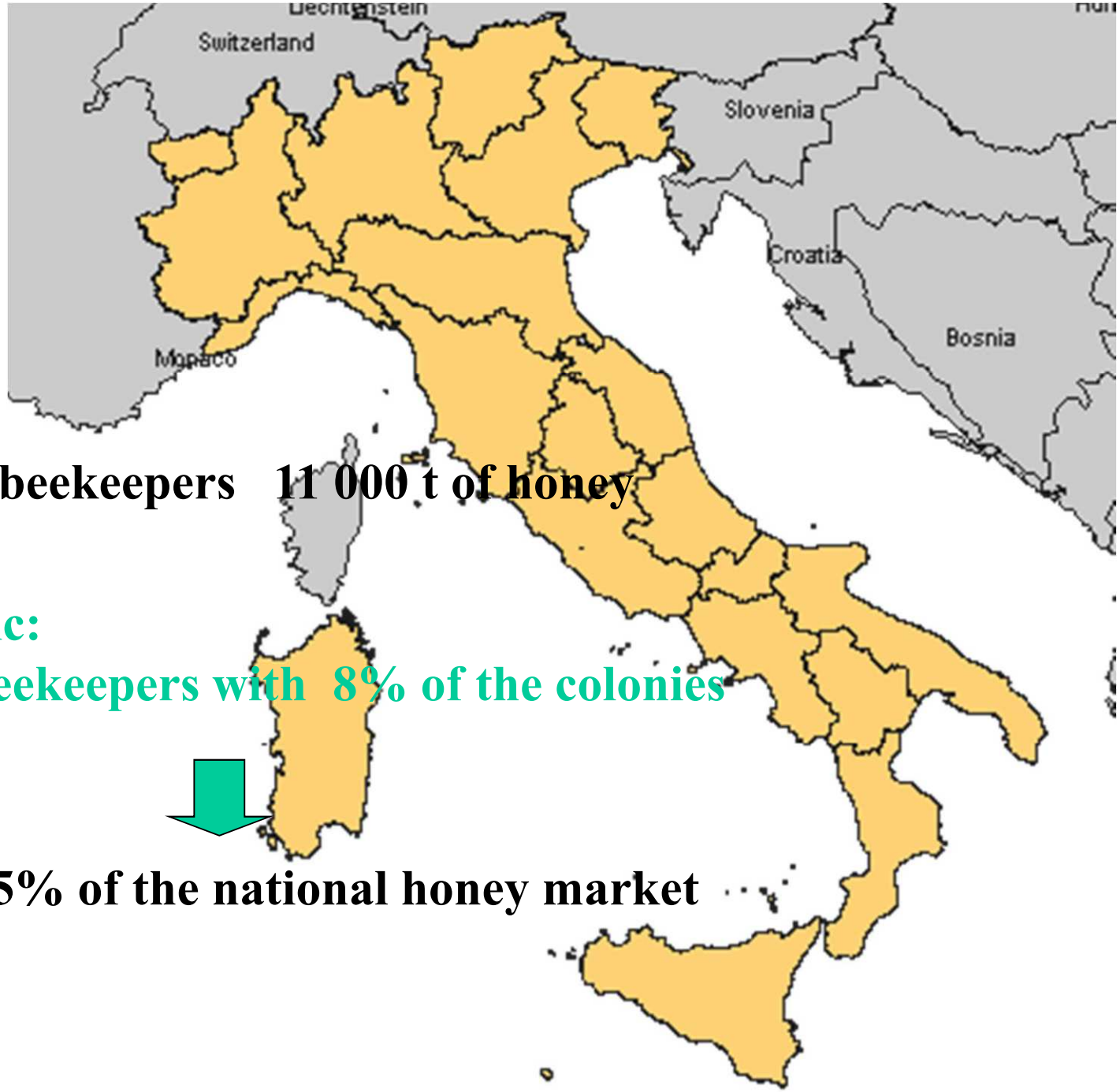
MINISTERO DELLE POLITICHE AGRICOLE
ALIMENTARI E FORESTALI



Number of animals reared with the organic methods in 2009



Italy



Total
75 000 beekeepers 11 000 t of honey

Organic:
13% beekeepers with 8% of the colonies

12-15% of the national honey market

Consumption trend of some organic products in Italy in 2009

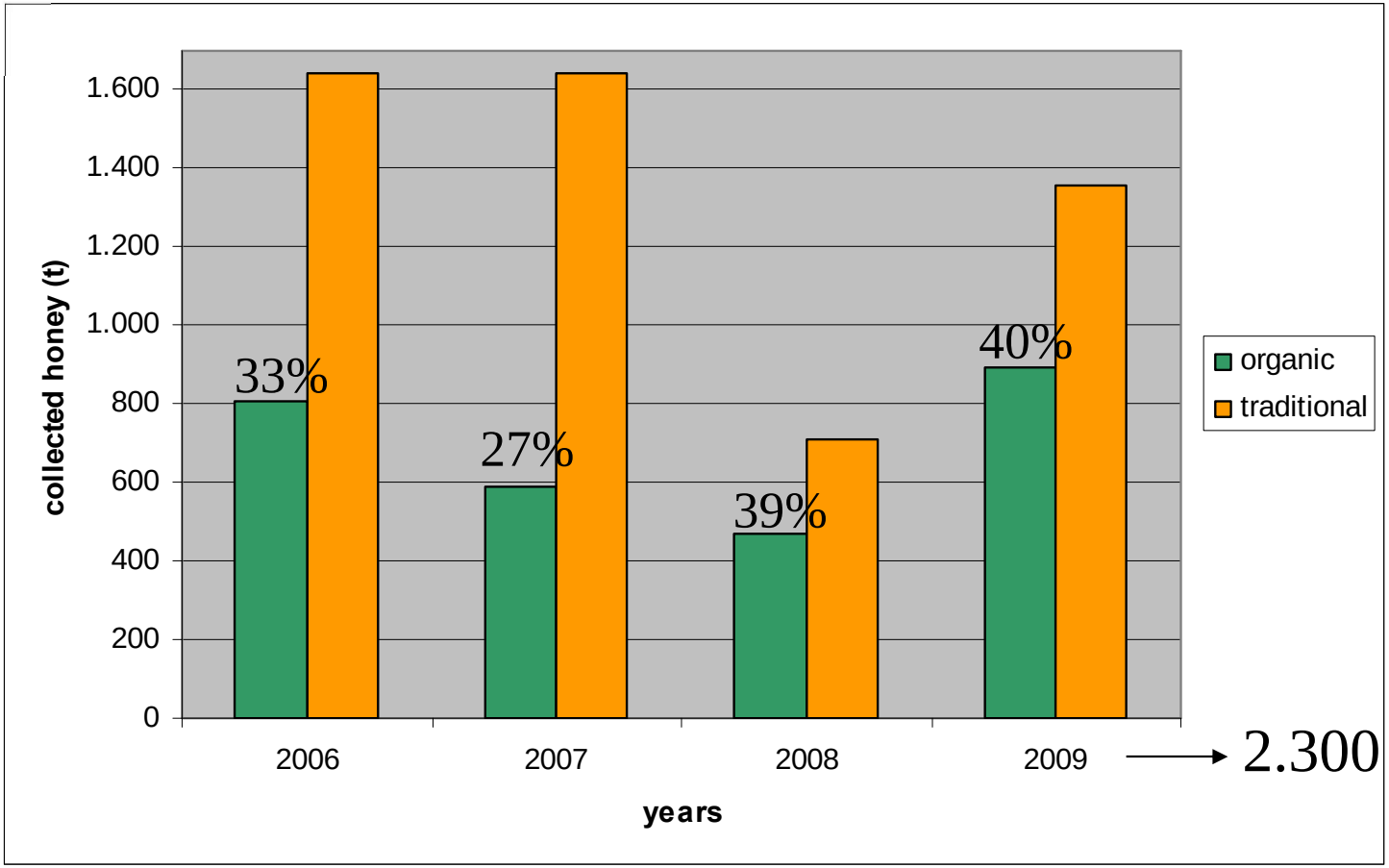
(% of total value)

	VARIATION (%) 2009/2008	proportion TOT
Fruits and fresh veg. e processed	37,8 %	25,2 %
Milk and dairy prod.	- 3,9 %	17,8 %
Breakfast prod.	- 2,8 %	12,2 %
Drink	11,6 %	10,0 %
Eggs	24,3 %	8,3 %
Bread and pasta	- 12,8 %	4,8 %
Oils	1,8 %	3,9 %
Honey	**10,8 %**	**3,6 %**
Icecream and frozen	7,1 %	2,4 %
Other Org. products	-2,0 %	4,6 %
TOT. Org. products	**7,4 %**	**100,0 %**

CONAPI
CONSORZIO NAZIONALE APICOLTORI

Mielizia

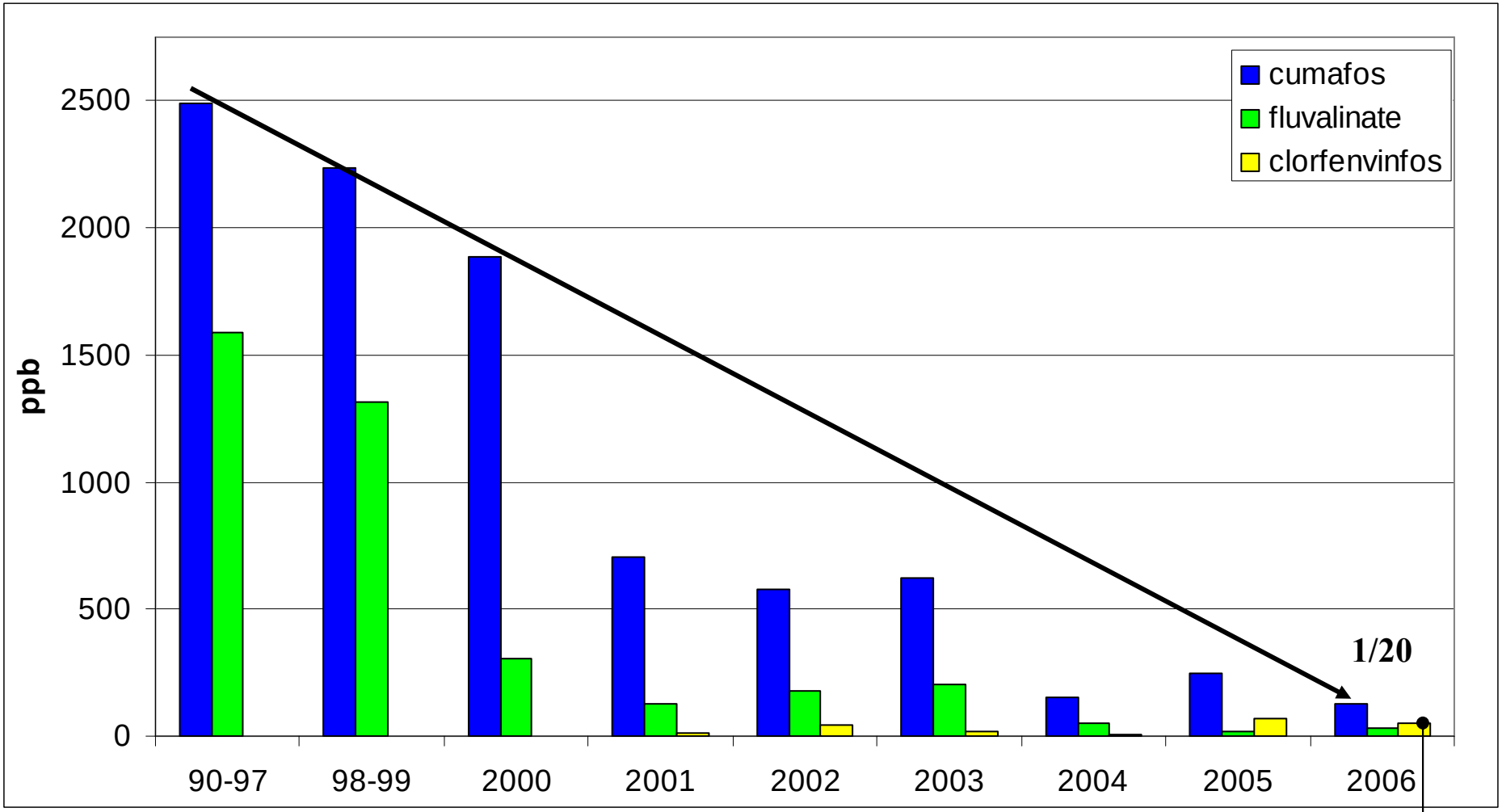
Beekeeper farmers cooperative



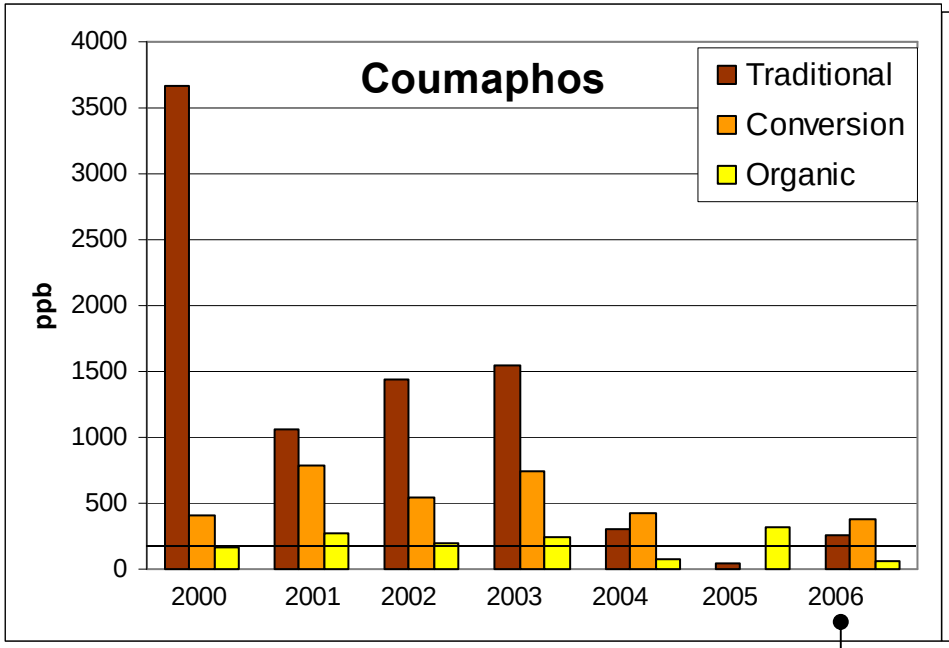
From conventional to organic beekeeping

- According to the EU Reg.834/07 the conversion of traditionally managed honey farms to organic production methods must be carried out by **substituting all the combs in the hive with foundations obtained from organic beekeeping**.

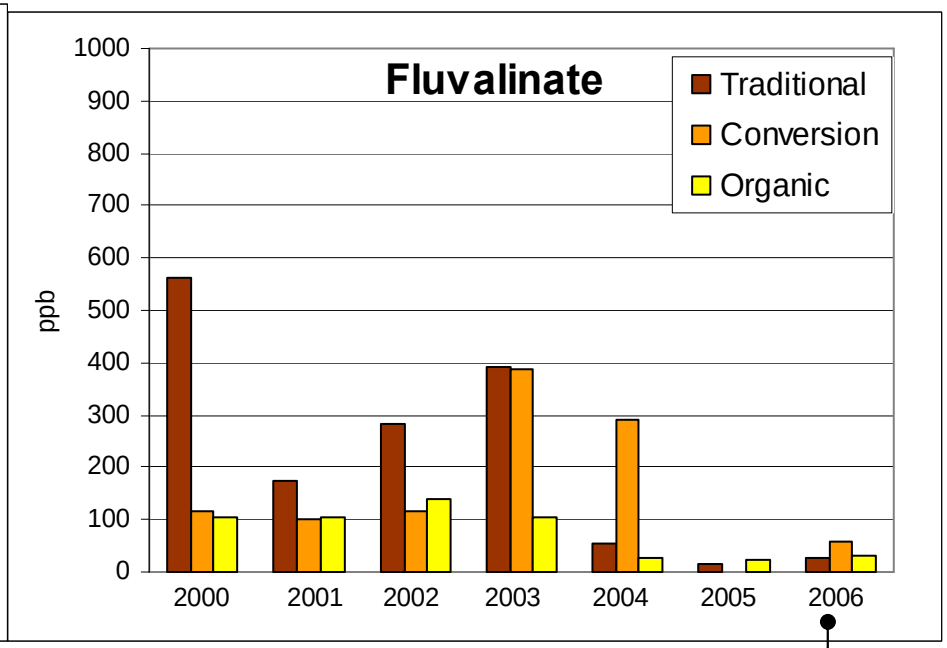
Residues of acaricides in samples of Italian beeswax from the 1990s to 2006 (pooled data from organic, conventional and converting samples).



Residues of coumaphos and fluvalinate in beeswax from different kinds of honey farms (conventional, converting and organic)

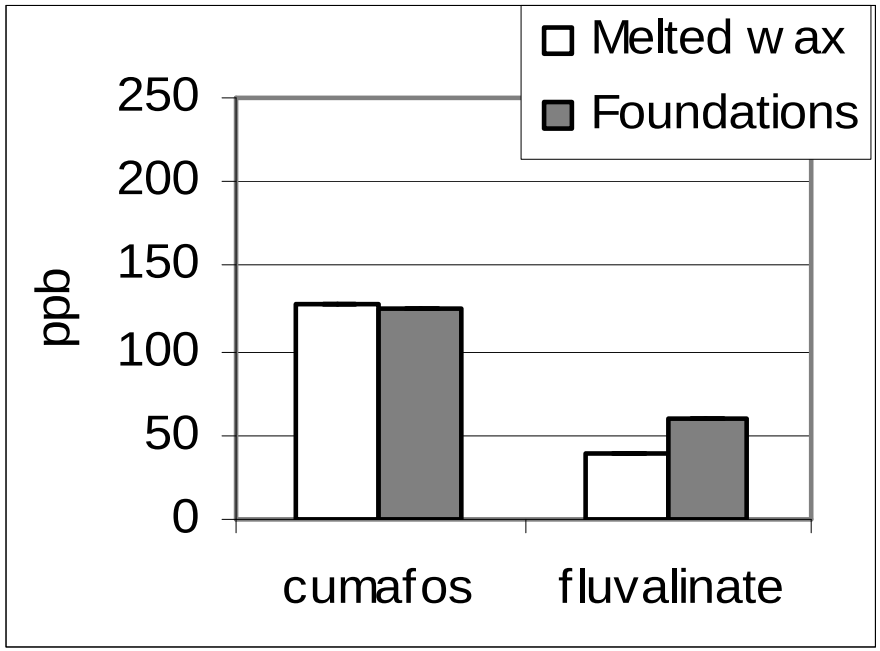


70% pos. sampl.

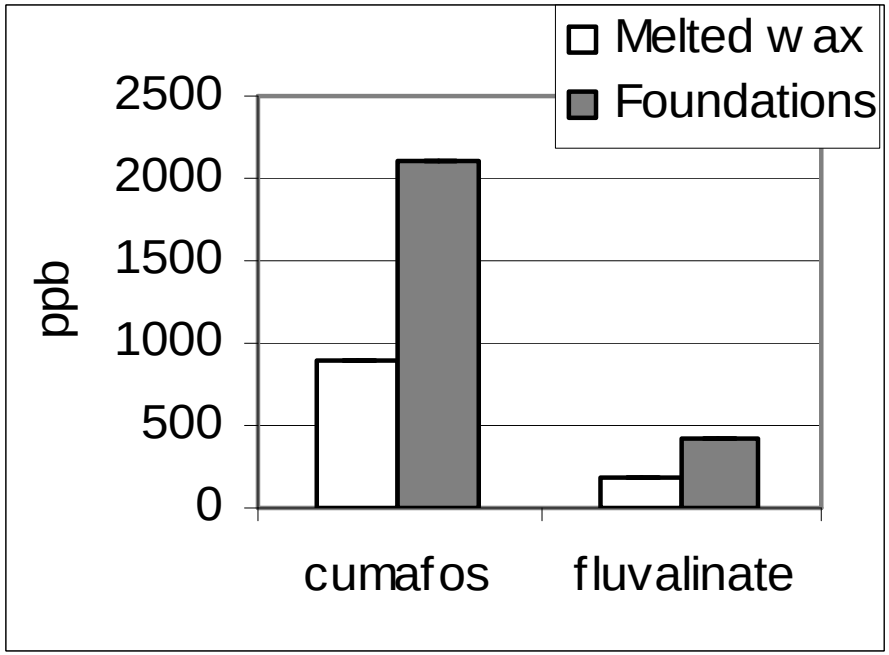


40% pos. sampl.

Residues of coumaphos and fluvalinate in organic (left) and non-organic (right) melted wax (from caps) and foundation sheets (2001-2006).



Organic



Non-organic

organic production methods have only partially decreased residues in wax.

Acaricide residues in wax

- acaricides, due to their **lipophilic nature**, can contaminate both the combs present in the hive during the chemical treatment (**direct contamination**)

  and the new combs built by the bees

  (**indirect contamination**)

  even 18 months after the treatement (van Buren, 1992).

Wax contamination

- The experiment gave us a chance to evaluate the differences in **direct** and **indirect** contamination of the selected acaricides, by analysing residue levels in **old** and **newly built combs** in the years following the interruption of traditional acaricide treatments.

How to substitute old combs ?

- The experiment aimed at comparing two conversion methods in which substitution of old combs took place over two or more years.

Materials and methods: acaricides

- 4 apiaries consisting of 15-20 hives each, in which the beehives had been treated with on of the following commercial products for at least 5 preceding years:

- **Perizin**® (Bayer), active ingredient: coumaphos. Registered for use on honeybees;
- **Asuntol**® (Bayer), active ingredient: coumaphos. registered for use on cattle, sheep and dogs. The beekeeper used 0.5 g of Asuntol 50 powder mixed with icing sugar to disperse over the combs;
- **Apistan**® (Vita Europe), active ingredient: fluvalinate. Registered for use on honeybees;
- **Supona**® (Cyanamid), active ingredient: chlorfenvinphos. Registered as a cattle dip. The beekeeper impregnated wooden strips with 1 ml of a.i. and placed them at the entrance of the hive.

Materials and methods: comb replacement

- The hives in each apiary were equally divided between two replacement methods, which differed in the time scale of comb substitution with residue-free foundations:
- **FAST**: the conversion took place in 2 years, replacing 5 combs each year
- **SLOW**: 2 combs per year were replaced

- During the experiment, *Varroa destructor* infestation was controlled according to organic beekeeping methods (thymol-based products in August and oxalic acid sucrose solution in November or December).

Wax samples and analysis

- Initial levels of residues were determined in year 2000 by sampling combs which had been present in the hive for at least 5 years (“old combs”).
- Samples from all combs described below were collected by cutting out portions measuring 15 cm x 15 cm.
- Honey caps and honey were collected after honey extraction.
- The samples were analysed for presence of residues of the acaricide pertinent to each apiary by the laboratory of the Istituto Nazionale di Apicoltura (certified UNI CEI EN ISO/IEC 17025).

Results: replacement method

Product	Comb replace-ment	Old combs (2000)	New combs (2001)	New combs (2002)	New combs (overall-end of replacement)
Perizin	FAST	272 ± 80, n=8	154 ± 69, n=8	N.D., n=9	21 ± 7, n=23
	SLOW	199 ± 63, n=7	329 ± 14, n=7	N.D., n=6	16 ± 3, n=18
Asuntol	FAST	4969 ± 590, n=12	973 ± 261, n=9	37 ± 14, n=12	183 ± 37, n=12
	SLOW	3588 ± 728, n=7	1260 ± 461, n=7	56 ± 20, n=7	213 ± 49, n=21
Apistan	FAST	3787 ± 1448, n=5	913 ± 247, n=6	139 ± 65, n=4	205 ± 44, n=10 [a]
	SLOW	3475 ± 886, n=8	1256 ± 303, n=5	316 ± 60, n=8	468 ± 87, n=16 [b]
Supona	FAST	673 ± 195, n=5	251 ± 76, n=7	76 ± 40, n=6	40 ± 11, n=16
	SLOW	793 ± 133, n=5	188 ± 50, n=5	34 ± 4, n=8	19 ± 3, n=17

Mean residue levels (µg/kg ± SE, n= number of samples) in the brood comb wax in the two different replacement groups (fast and slow).

•Residue levels due to **direct** contamination were found to respect the following order:

Asuntol > Apistan >> Supona > Perizin.

The overall value refers to comb wax built in 2001 and 2002 for the “fast replacement” group and in 2001, 2002 and 2003 for the “slow replacement” group. Different letters in the Apistan (fluvalinate) row indicate significant differences (P=0,034). N.D.= not detectable.

Results: direct and indirect

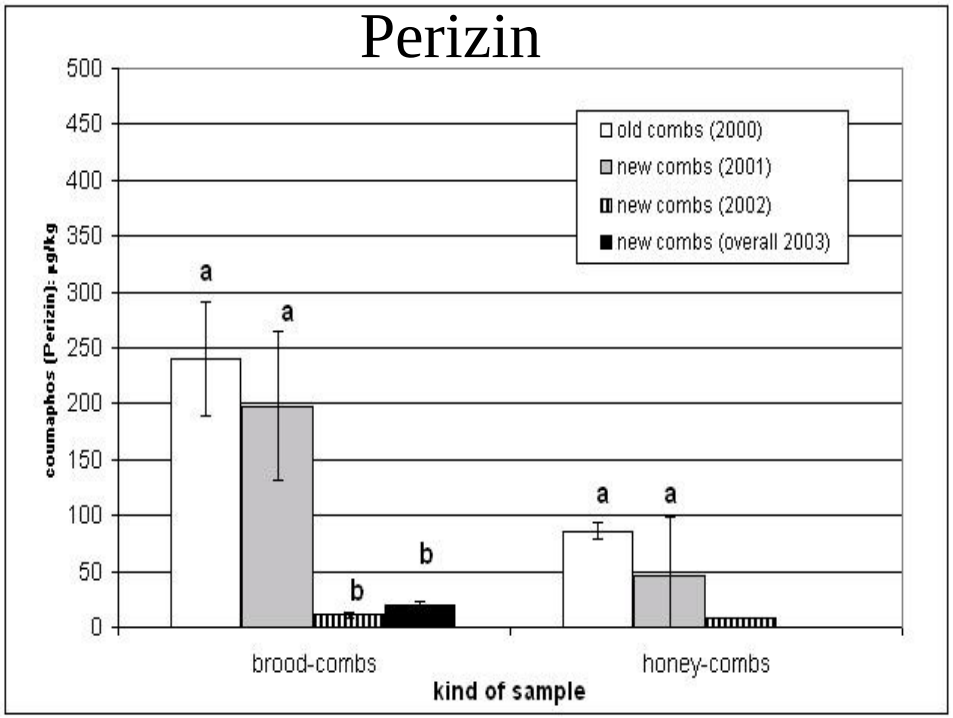


Figure 1: Wax contamination in hives treated with Perizin (coumaphos). Samples of honey-combs were collected from individual supers in 2000 and 2001, and as a single apiary sample in 2002.

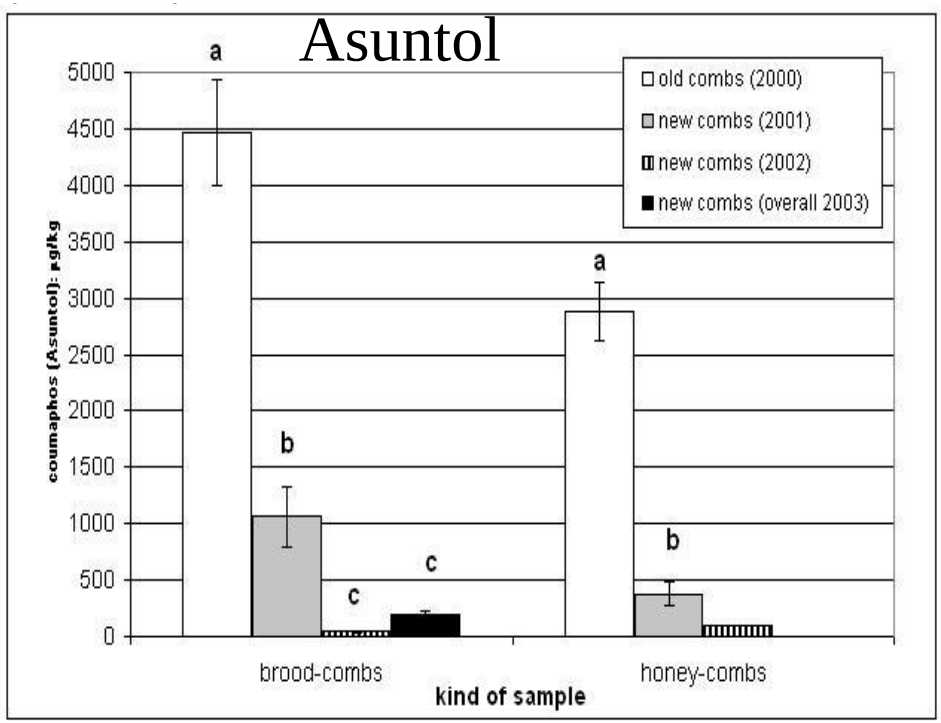


Figure 2: Wax contamination in hives treated with Asuntol (coumaphos). Samples of honey-combs were collected from individual supers in 2000 and 2001, and as a single apiary sample in 2002 and 2003.

Results: direct and indirect contamination

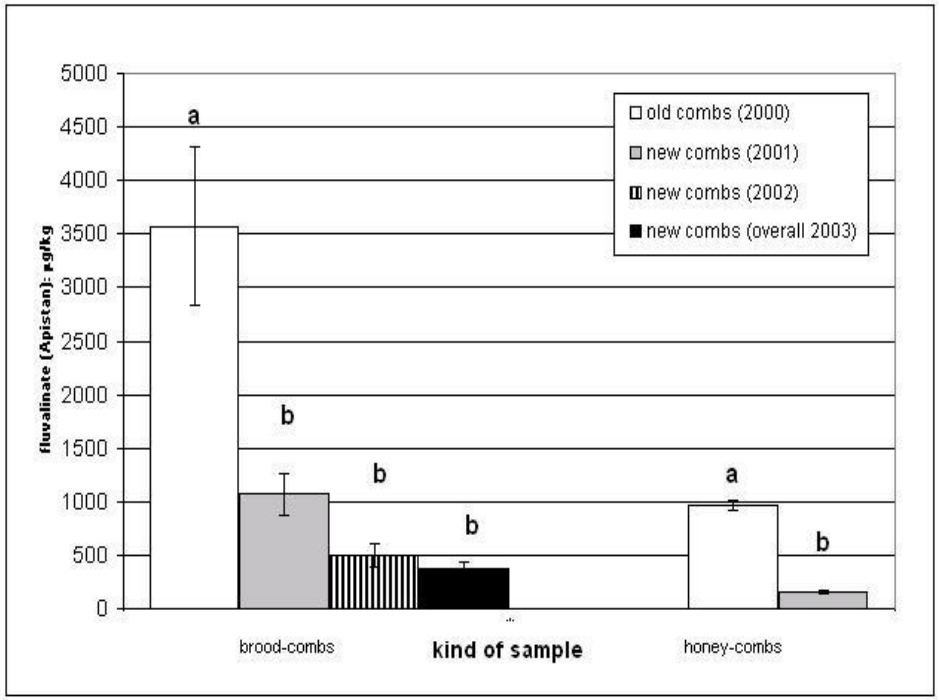


Figure 3: Wax contamination in hives treated with Apistan (fluvalinate) until year 2000. Samples of honey-combs were collected from individual supers in 2000 and 2001 (only new combs).

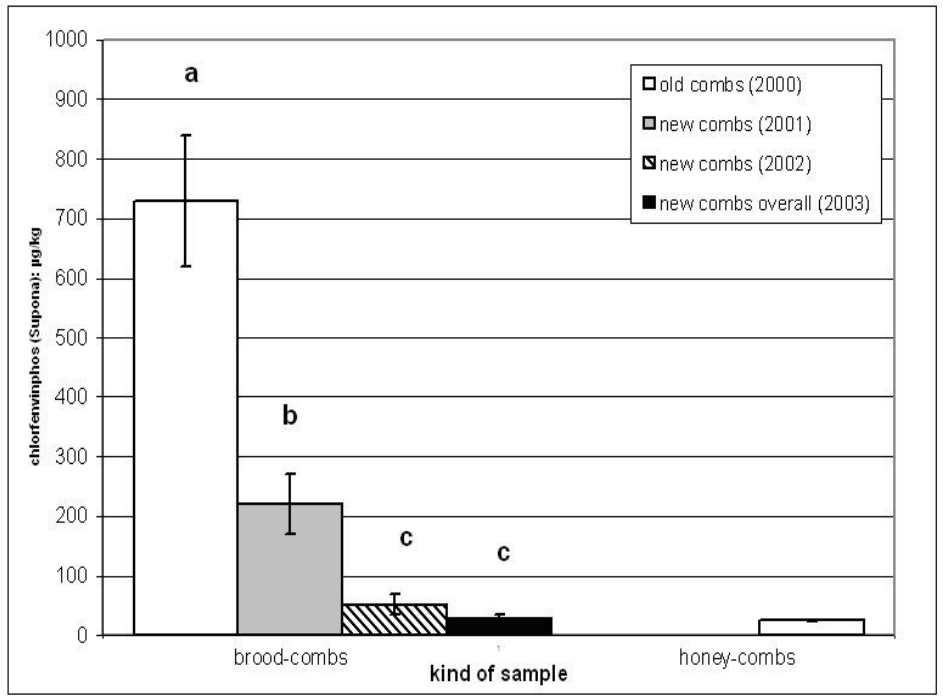


Figure 4: Wax contamination in hives treated with Supona (clorfenvinphos) until year 2000. Samples of honey-combs were collected from individual supers in 2000 .

Conclusions

- **New comb wax at the end of experiment contained residues of the previously used acaricides (compared to initial concentrations: 4% Supona, 5% Asuntol, 8% Perizin and 10% Apistan), independently from the speed of replacement.**

- **This confirms that a complete renewal of the brood combs in the hive over 2 or more years is not sufficient to guarantee complete absence of residues of some of the used products (not only for the unregistered Asuntol but even in the case of Apistan).**

- **The decision adopted by many Organic Farming Control Bodies in Italy, to accept certain levels of residues in brood comb wax in the initial years of organic management, therefore appears justified.**

- **The same allowance is also valid for the melted honey-cap wax used to be transformed in foundations by the converting beekeepers.**

- **The risks of using coumaphos in the unregistered products, in terms of high levels of residues which may contaminate honey for human consumption, are confirmed by this study.**