

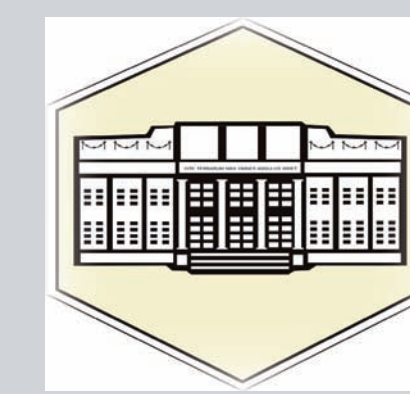
MASS LOSSES OF BEE COLONIES IN POLAND (2007/2008) - THE ANALYSIS OF PATHOGENS

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INTRODUCTION

In the period 1999-2009 highest colony losses in Poland were noticed from autumn 2007 to spring 2008. According to the estimation done by the Apiculture Division in Puławy - phone and questionnaire surveys of 30 beekeeping associations - between autumn 2007 and spring 2008 mean colony losses per province in Poland (data from 14 provinces) were 30%.

The aim of investigations was to identify the pathogens in honey bee colonies from apiaries in which collapsed at least 30% of bee colonies.

MATERIALS AND METHODS

Dead honey bee samples, sent by beekeepers from apiaries in which colony-losses exceeded 30%, were tested. On average ten bee samples from each apiary were examined separately. The presence of *V. destructor* and *Nosema spp.* was detected microscopically, chronic bee paralysis virus (CBPV), acute bee paralysis virus (ABPV), deformed wing virus (DWV) - using RT-PCR method. The *Nosema* infection level was evaluated by counting the number of spores:

- < 40 million spores/bee - low infection level
- 40-100 million spores/bee - medium infection level
- >100 million spores/bee - high infection level

The *Varroa* infestation level was evaluated by counting the number of *V.destructor*:

- < 10 *V. destructor*/sample - low infestation level
- 10-50 *V. destructor*/sample - medium infestation level
- >50 *V. destructor*/sample - high infestation level

RESULTS

According to the information obtained from group of beekeepers, in the summer season of 2007 they had 11300 bee colonies, of which 6600 (58%) collapsed between autumn of 2007 and spring of 2008. Losses of bee colonies in particular apiaries fluctuated from 30% to 100%.

In 2008, 2,009 bee samples, collected from 195 apiaries in winter 2007/2008 and spring 2008, were examined. The samples came from all sixteen provinces of Poland (8 area) fig.0, table 1.

Table 1. Specification of examined apiaries with severe cases of colony losses (= and >30%) in Poland from the autumn 2007 to the spring 2008.

No.	Area of Poland	No. of apiaries	Average no. of hives/beekeeper	No. of colonies in the summer 2007	No. of dead colonies in autumn 2007-spring 2008	Average losses %
1	North-west	29	75.5	2195	1332	60.7
2	West	22	42.8	943	517	54.8
3	South-west	16	19.1	305	155	50.8
4	North-east	7	93.3	695	265	38.1
5	East	22	74.9	1648	1255	76.1
6	South-east	54	33.8	1827	916	50.1
7	Middle-west	25	44.2	1104	586	53.1
8	Middle-east	20	49.6	991	571	57.0
	Total	195		9708	5597	57.6

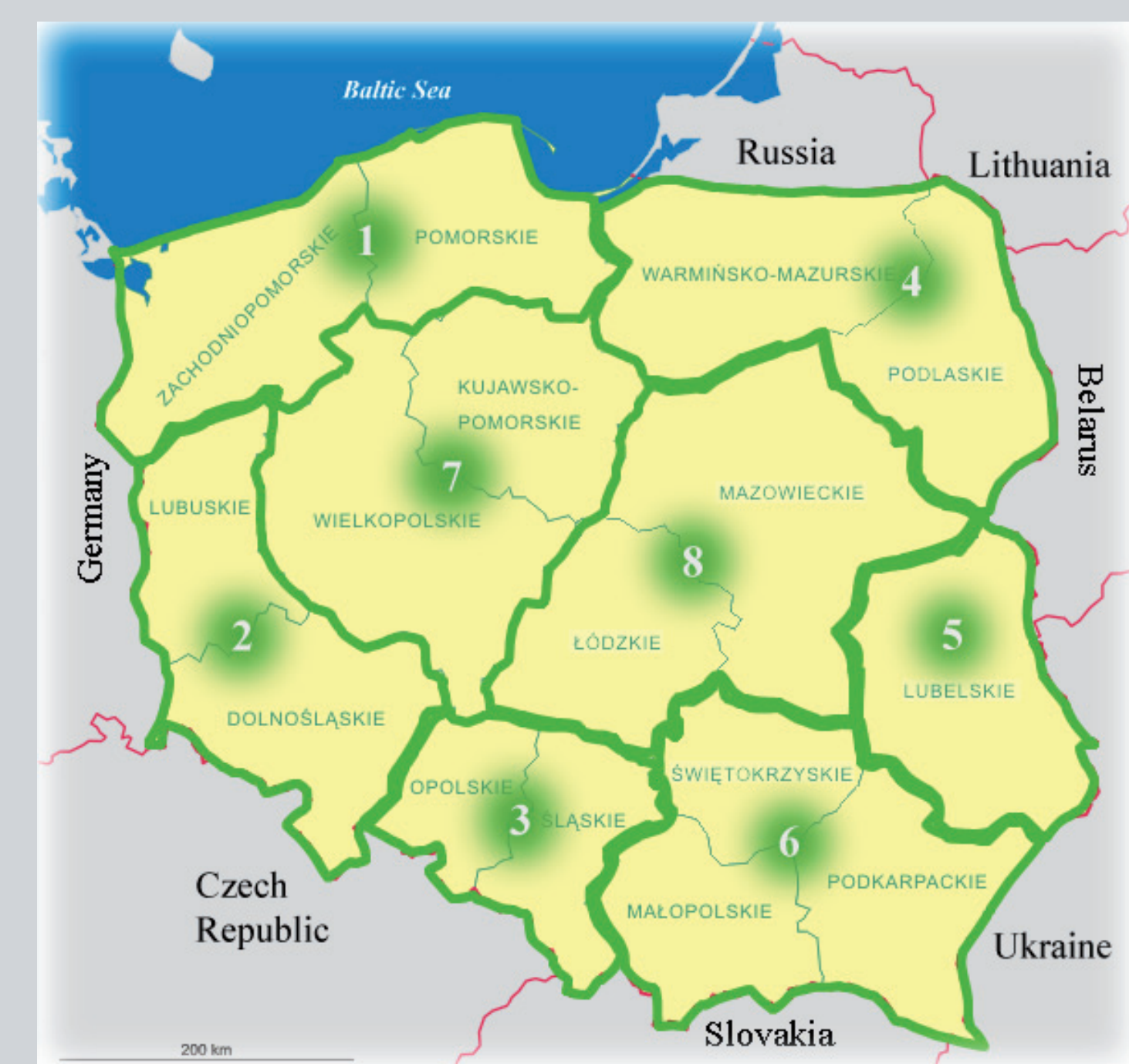


Fig. 0. Area of Poland

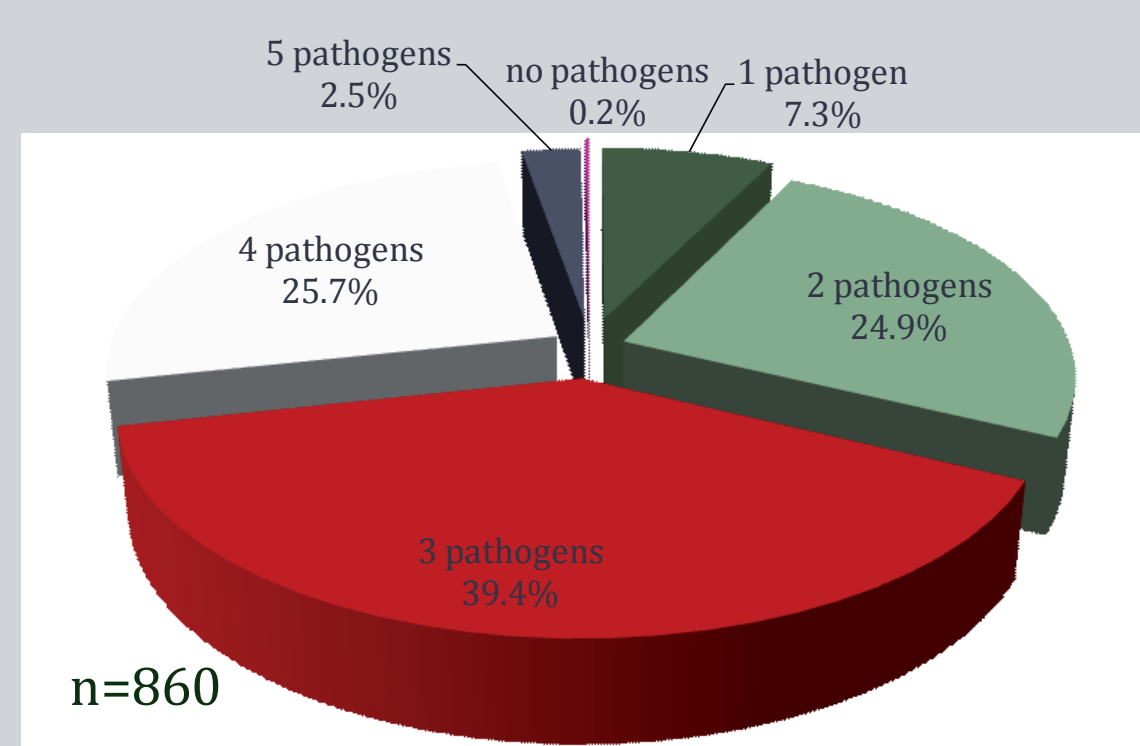


Fig. 1. Percentage share of colonies with different number of pathogens detected in the same samples.

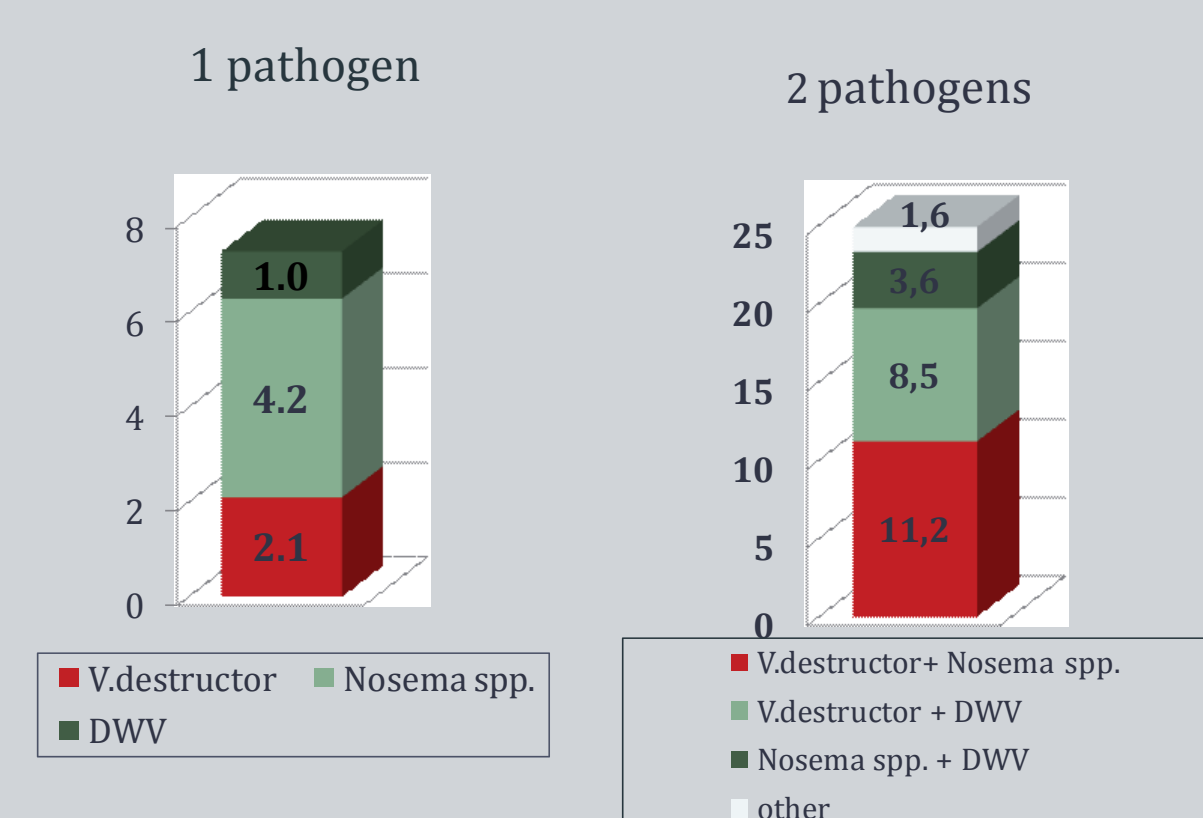


Fig. 2. Type of infections and infestations (%) n=860.

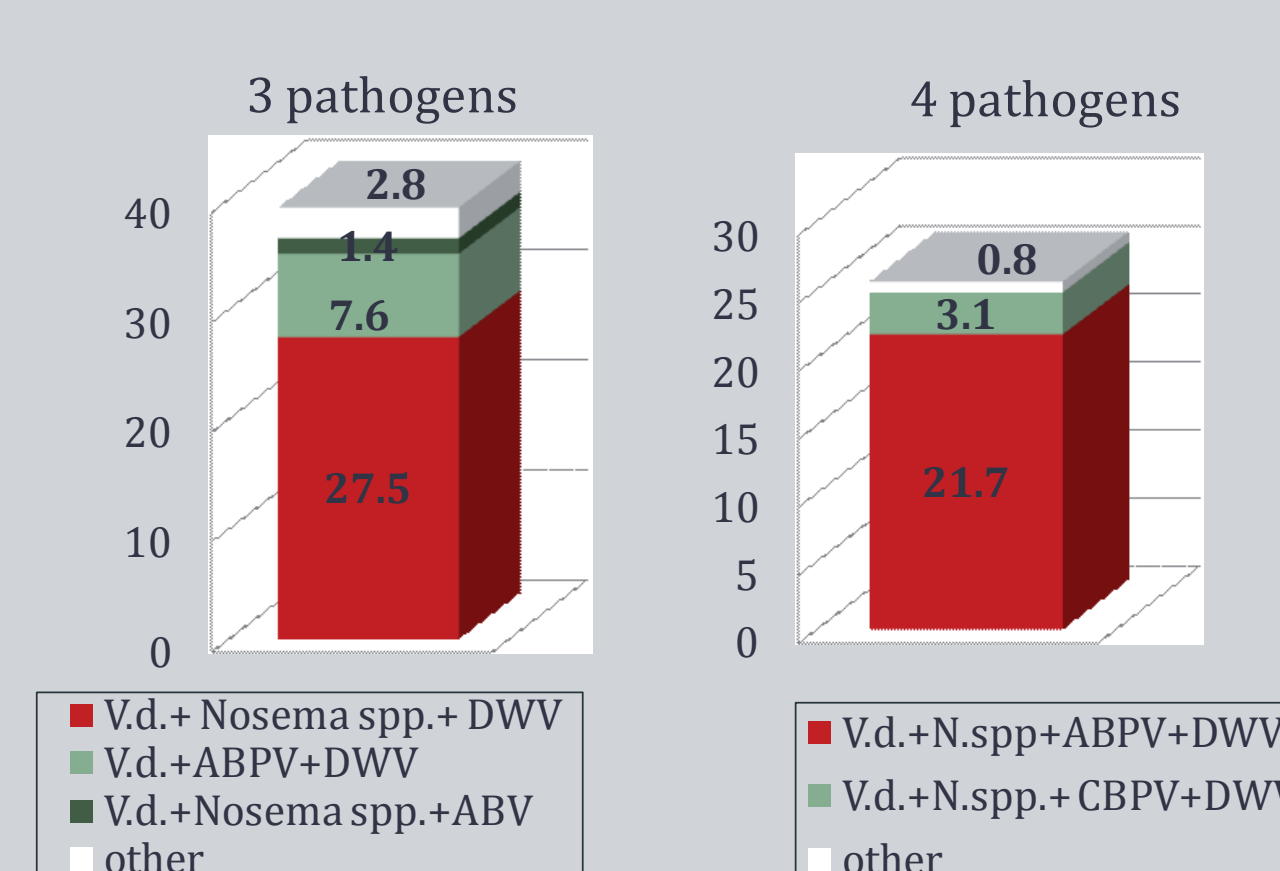


Fig. 3. Type of infections and infestations (%) n=860.

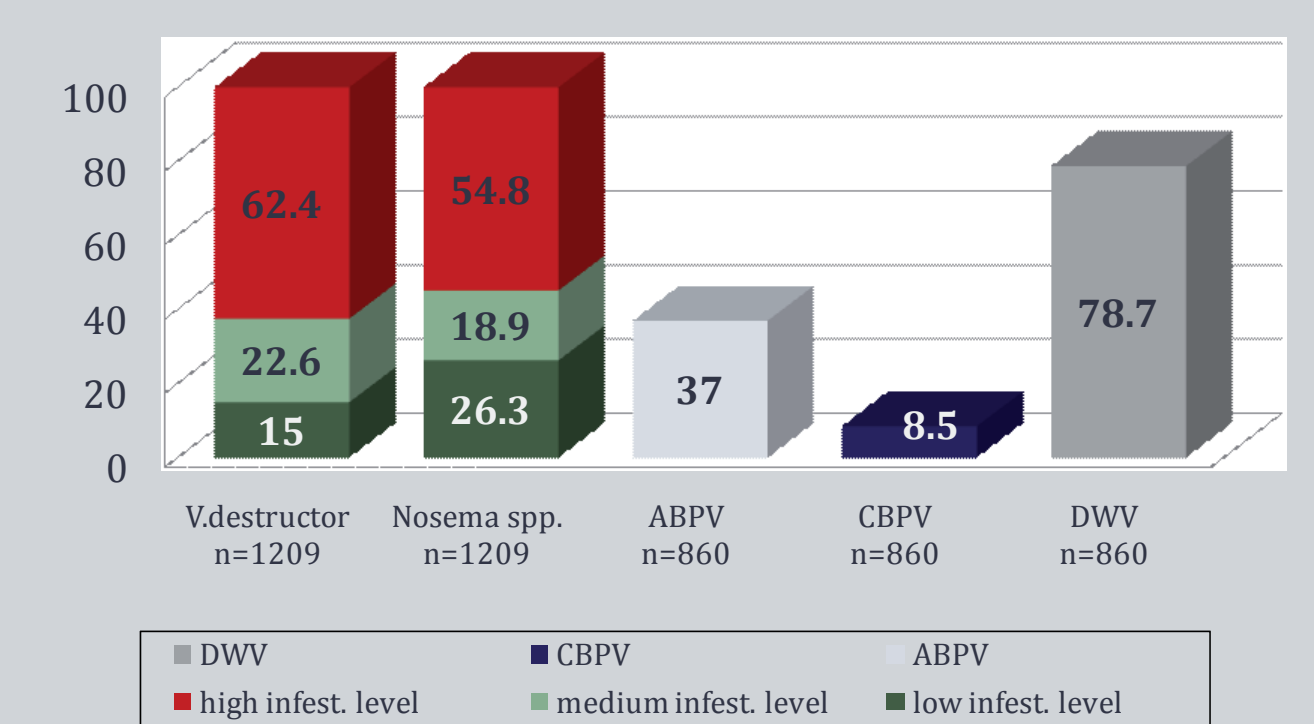


Fig. 4. Percentage share of viruses and parasites positive bee samples.

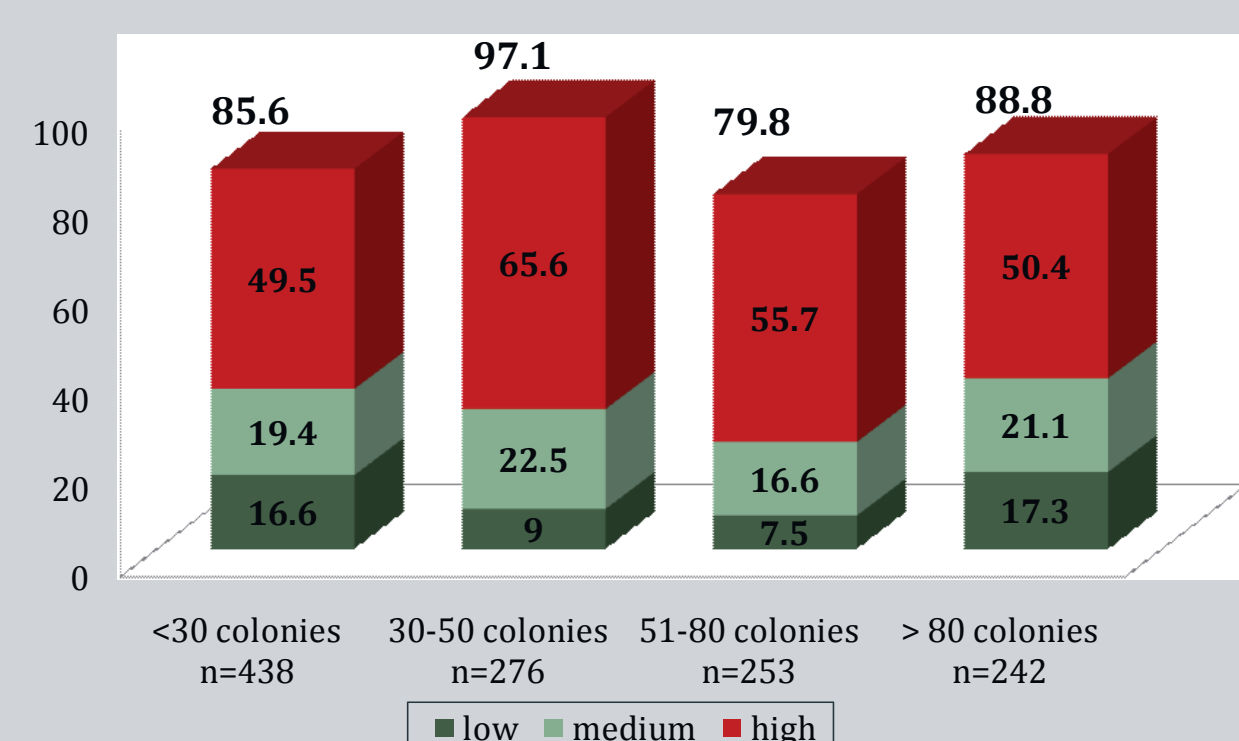


Fig. 5. *Varroa* infestation level in apiaries of different size (number of colonies) in %.

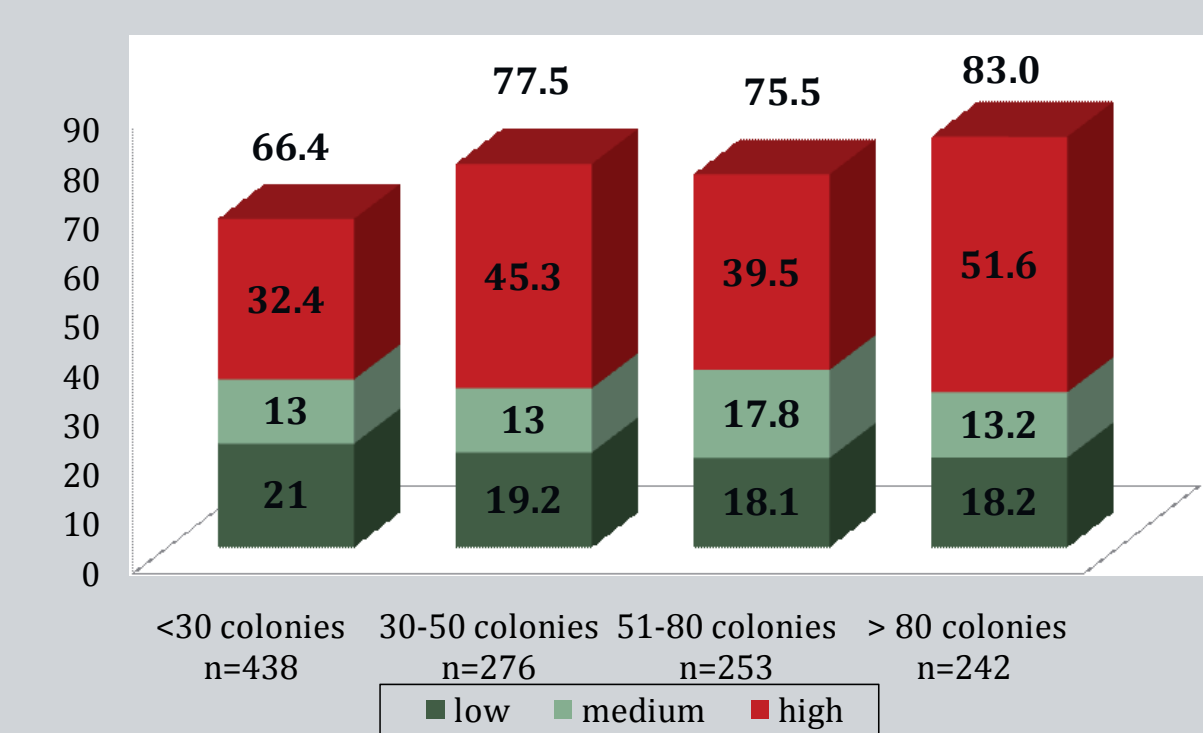


Fig. 6. *Nosema* infection level in apiaries of different size (number of colonies) in %.

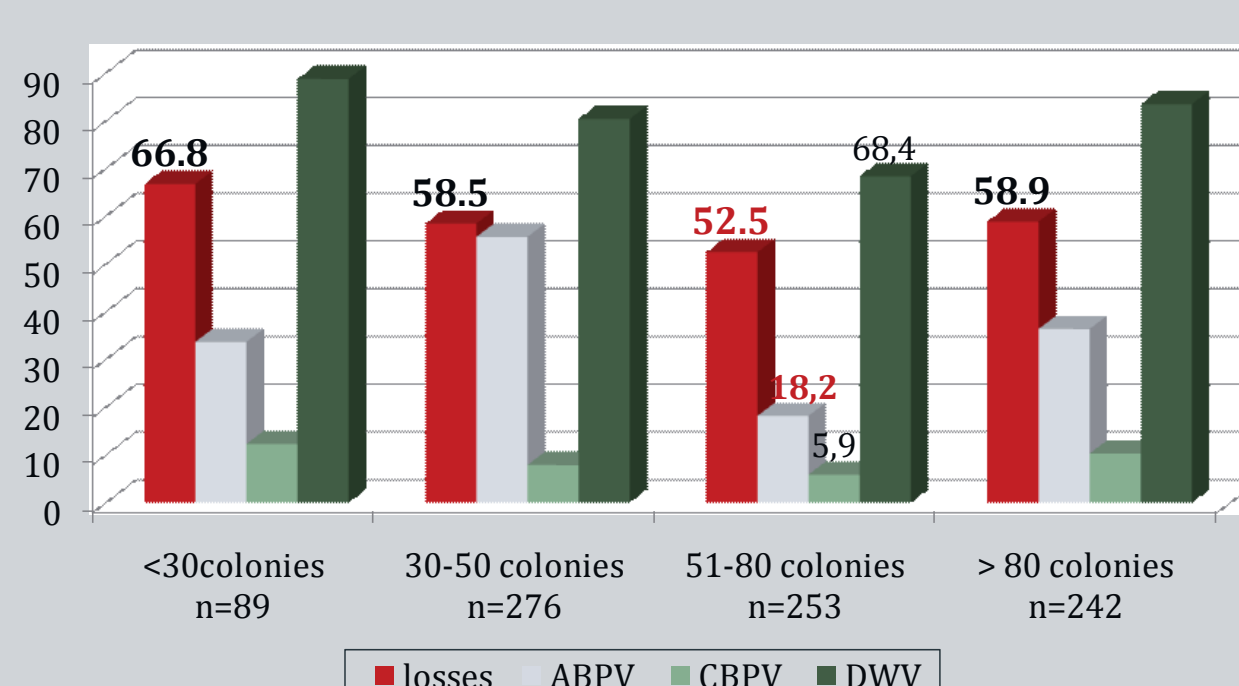


Fig. 7. Comparison of colony losses to the number of viruses positive samples (%).

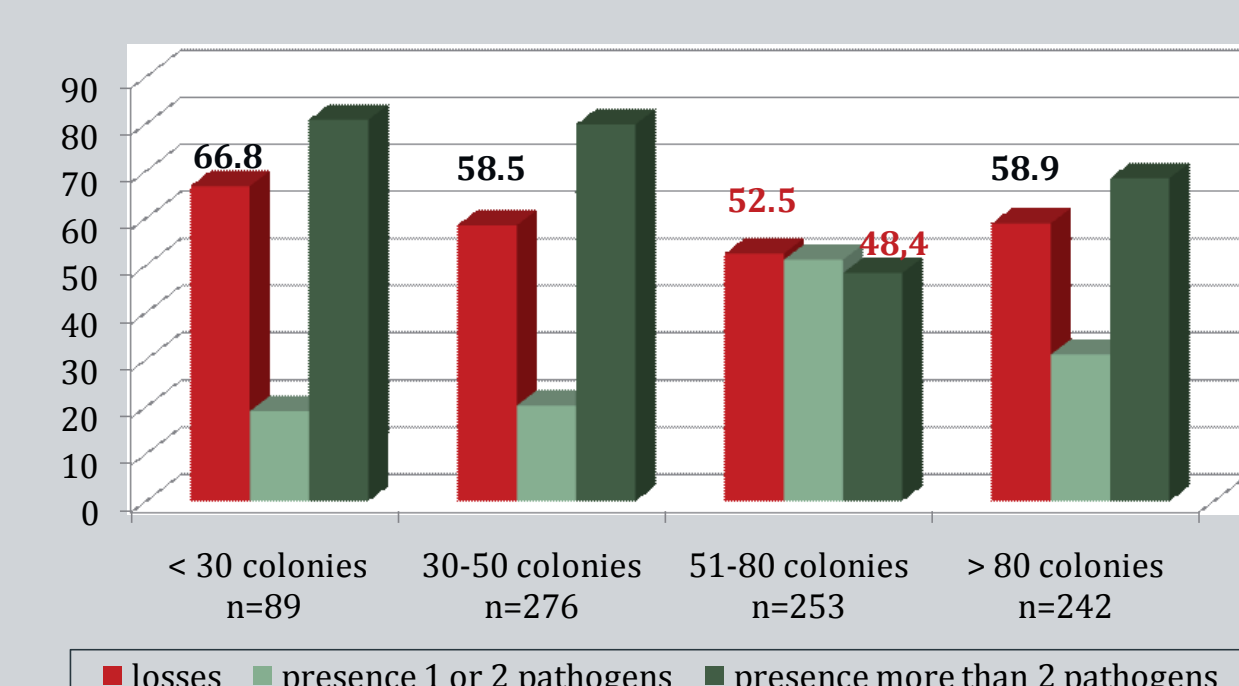


Fig. 8. Comparison of colony losses to the different number of pathogens in the same samples (%).

Table 2. Comparison of the *Nosema* and *Varroa* infection and infestation level in the different size apiaries (number of colonies).

No. of colonies/apiary	No. of colonies	No. of <i>V. destructor</i> /sample		No. of <i>Nosema spp.</i> spores/bee/sample (10 ⁶)	
		mean	±SD	mean	±SD
< 30	438	219.5	177.4	183.52	277.0
30-50	276	194.3	239.3	218.39	220.0
51-80	253	171.1	215.6	188.85	231.4
> 80	242	161.9	218.6	257.52	291.3
Total	1209	181.9	217.2	216.0	250.3

p ≤ 0,05, α = 0,05

CONCLUSIONS

Presence of two or more pathogens in the same colony could be the cause of the bee colonies collapse - as a consequence of the synergetic effect of influence of all pathogens. In order to indicate pathogens as the only factor causing the increased bee colony mortality, it is necessary to rule out the presence of other factors in the same samples.