

Comparison four races of bees in Finnish conditions

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Abstract: *Comparison four races of bees in Finnish conditions.* The aim of work was to investigate influence amounts of brood on production of honey at four the bees' races used in Finland. It was compared also wintering and spring development during three years. There was not found the influence of races on winter fall and nosema paralysis. The winter food consumption was dependent on race: Central European race – 1.04 kg, Carniolan race – 1.06 kg, Italian – 1.26 kg and Buckfast – 1.34 kg. The spring development, measured the quantity of sealed brood was the lowest in Central European race (33.7 dm², the highest in Buckfast (43.5 dm²). Central European race had the lowest honey production (33 kg). Races: Italian and Buckfast had similar honey production (38 kg), Carniolan race – 42 kg. The ratio of honey production to quantity of sealed brood was in Carniolan and Central European races identical (1.08 kg/dm²) and was higher than in Buckfast and Italian races (0.99 and 0.97 kg/dm²). There were not found statistically significant differences.

Key words: bees, brood, bee races, fall of winter, honey production.

INTRODUCTION

The subject of work was to investigate which of the prevalent races in Finland bees guarantee the best production results in the southern parts of the country in the region that is the biggest quantity of bees. During winter time was examined wintering period which identified bees Nosema paralysis and size of families and their productivity within three apiarian seasons.

In Norway and Finland till 1750 year there were no honey bee (Ruttner 1992). First mention of the bees in Finland come from the year 1761 (Huotari 1994). This Central-European bees were imported from Sweden. According to Alpatow (1948), Central-European bees populated in Scandinavia have a strong tendency to swarming. The Italian bee was brought to Finland for the first time in 1867 (Huotari 1994). Its massive inbreeding started in the 60s of last century (Vesterinen 1967). Bees imported from Italy, according to Brat Adam (1967), have little in common with the old, dark lines of Italian bees. According Ruttner (1988) some selected lines with appropriate methods of wintering give the best results also in Finland.

In the 70s – the twentieth century has also started to import Buckfast bees which, according to Brat Adam (1971) are: diligent, nonswarmly, economically managing supplies and fairly resistant to disease.

Size of winter fall was studied by Borisenko (1973), who argues that the main part winter fall which constitute bees with a sudden cooling and shrinkage of the cluster remained outside its boundaries. Root (1959) believes that in a healthy family during the winter may die up to 15% of the bees. Studies of

Madras (1999) conducted on Caucasian, Carniolan and Italian bees, the highest winter fall were found in Italian breed. Zmarlicki (1978) examining wintering in Langstroth hives stated that food consumption in insulated hives was 0.5 kilograms per comb and 0.68 kilograms per comb in no insulated hives. During wintering Nosema paralysis depends from climate and weather according Kostecki (1976). Gromisz and Bobrzecki (1984) obtained results: 64.3% in Carniolan bees and 37% in Central-European. The experience of Gromisz (1986) a leading position in terms of speed in spring development was taken by the Carniolan bees. Woyke (1981) stated dependence on the honey production to the length of the life bees. The average of length of bees depends from effort and body consumption during feeding larvae (Wille and Gerig 1976, Woyke 1980). Intensity of flights with foragers is genetically determined (Bratkowski and Wilde 1999). In studies of Timosinowa (1973) the most honey were obtained from Caucasians race, second place took Carniolan bees, the third – Italian and the last – local bees. Research of Levcenko and others (1972) points to the earlier acquisition and capabilities to collect nectar by Carniolan bees. This breed is highly evaluated by Vesely (1974) and Singer (1971). The last one is recommending her for breeding in different regions of the world.

MATERIAL AND METHODOLOGY

Research conducted in the breeding station – apiary Finnish Union of Beekeepers, located in south-western Finland. Apiary is located in many places distant from each other by a few to several kilo-

metres. Number of hives in one place did not exceed 10. Among bee plants occurring this area most important are: rape, clovers, willows, bilberry, raspberry and willowherb. Studies were conducted in the years 1997–1999. Compared the following breed bees: Italian (*Apis mellifera ligustica* Spin.) Buckfast, Carniolan (*Apis mellifera carnica* Poll.) and Central-European (*Apis mellifera mellifera* L.). Italian bees came from a line maintained for many years in Finland, Buckfast bees came from the Finnish breeder and lines received from Canada, the Carniolan bees were represented by the lines of “Willy” and line “Singer” – company from Austria, and Central-European bees were from three Finnish apiaries. Examinations were conducted in 1997 with 36 families, in the next year to 42 families and the third year for 40 families. Apiary consisted of multiple-storey Langstroth hives, with insulated walls. They were spending the winter depending on the size, on one or two 9-frame corps. On apiaries well protected from the wind hives spent the winter without additional shielding. On worse shielded places hives were being wrapped up with paper silo, who was being removed during the first spring inspection.

Spring precipitating of families development wasn't practiced. Contraction of brood nest wasn't being practiced. Preventing the coming into swarming impulse consisted in enlarging the capacity of hives with corps with foundation. The swarming impulse was being eliminated through shaking bees off to corps with foundation, and then corps with the brood were moved above queen excluder which was removed after few days. Honey have been taken away from

the hives once after the termination from main flow it means half of August. Replenishing winter supplies started in the second-half of August and they were finishing in middle of September. Winter food consumption was determined by weighing hives two times: in the last days of October and the second half of April at the first overview of the Spring. Measurement sealed brood was made for the first time in full blooming apple trees, which accounted for experiences during the 23 week of the year. Second measurement was made at 3 weeks after first.

Honey production was adopted as the sum of the quantities of the centrifuged honey and leftover honey in the hive. The ratio of the production of honey for brood quantities expressed in kilograms of honey per 1 dm³ sealed brood. Because of unequal size of families both: winter fall and winter food consumption was converted to relative values, i.e. in relation to number of combs. Nosema disease paralysis test results are given in the average quantity of spores to 1 bee.

Values of investigated properties were characterized by giving the arithmetic mean, standard deviation and standard error. There was conducted a analysis of variance. Statistically significant differences between the means was identified by a test of Student – Newman – Keuls with probability 95%.

RESULTS

Wintering

Average of winter fall per one comb was from 197 bees of the breed Carniolan to 269 for a group of Buckfast bees. However, there was no statistically significant

difference between races. The average size of winter fall for the whole apiary was not big between years (from 202 per comb during the winter of 1997/98 to 261 per comb during the winter 1996/97 and also the differences were not significant.

Nosema disease paralysis expressed by the mean number of spores per 1 bee was from 0.98 million for the Central-European race to 6.66 million for the race Carniolan. Extent of paralysis was comparative varied inside groups. Between the races there were no significant differences.

Winter food consumption ranged from 1.04 kilograms per comb in the group of families of the Central-European up to 1.34 kg per comb in the group of families Buckfast. There was found statistically significant difference between these groups. Also the consumption of food among the families bees Central-European was significantly lower than in the group of families Italian. Carniolan bees consumed significantly less food than Buckfast bees. Between the Italian and Buckfast bees was no significant differences. Also between Central – European and Carniolan race there wasn't statistically significant differences. Numerical values of parameters characteristic for wintering are summarized in Table 1.

Families spring development

The smallest number of brood within three years of comparisons, were Central-European bees (an average of 33.7 dm²), and the largest Buckfast bees (43.4 dm²).

Difference between these two races was statistically important. It was significantly more brood from Italian bees than Central-European. The Carniolan

TABLE 1. Wintering parameters characterizing the results, that is winter fall of 1 comb, food consumption per 1 comb, the number of spores per 1 bees and percent of colonies infestation, (Races: BU – Buckfast, IT – Italian, KR – Carniolan, PM – Central-European)

		Winter fall (bees/comb)		Consumption of food (kg/comb)		Nosema (number of spore/ /bee x 1 000 000)		% Affected families
Winter	Race	Limit values	Average	Limit values	Average	Limit values	Average	
1996/97	BU	20-1475	337	0.92-3.0	1.46	0-18.8	2.61	36.4
	IT	24-378	166	0.83-1.86	1.24	0-15.37	3.31	50
	KR	43-472	164	0.88-1.5	1.15	0-6.4	2.17	80
	PM	24-944	519	0.8-1.75	1.38	0.75-5.6	2.46	100
Average		---	261	---	1.32	---	2.79	54.8
1997/98	BU	83-545	199	0.81-2.0	1.09	0-0.125	0.043	45.5
	IT	79-944	259	0.89-2.4	1.24	0-71.6	7.94	63.6
	KR	59-581	179	0.63-1.23	0.98	0-43.6	8.72	20
	PM	67-511	164	0.72-1.5	0.98	0-0.138	0.034	25
Average		---	202	---	1.08	---	4.24	45.2
1998/99	BU	126-730	273	0.87-2.45	1.47	0-40.4	9.5	80
	IT	103-654	252	0.79-1.54	1.3	0.037-2.8	6.56	100
	KR	66-617	229	0.75-2.11	1.09	0-52	8.01	70
	PM	79-515	223	0.75-1.36	1.0	0-64	0.91	40
Average		---	244	---	1.22	---	6.2	72.5
Average of the three years	BU	20-1475	269	0.81-3.0	1.34	0-40.4	3.88	53.1
	IT	24-944	223	0.79-2.4	1.26	0-71.6	5.84	69.7
	KR	43-617	197	0.63-2.11	1.06	0-52	6.66	60
	BU	24-944	237	0.72-1.75	1.04	0-6.4	0.98	47.1
Standard deviation			215.3		0.39		1.13E7	49.5
Average mean			20.15		0.04		1.12E6	4.90

bees had significantly more brood than Central-European.

Average number of brood for all groups was little differed between years of research, despite the different weather. In 1997 was an average of 39.24 dm sq brood, and in 1998 was 41.05 dm sq and in 1999 – 39.44 dm sq brood. Statistically was no significant differences between years.

Honey production

Between 1997 and 1999 years examined four races bees in terms of honey produc-

tion did not differ significantly. In 1998 years the lowest honey production was a group of Central-European families breed.

Statistically more honey had race Carniolan and Buckfast. Low production of honey by bees of the Central-European race, in 1998 was the result of the swarming impulse. The arrangement of the weather in this season was particularly favourable for it.

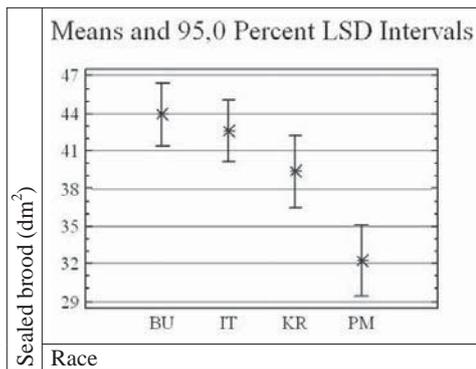
In the group of families of the Central-European race you could see the apparent lack of selection for swarming, these families during the main honey flow, per-

manently were in the swarming impulse, while the families of other races, was able to relatively easily eliminated.

In the period of 3 years of families breeds: Buckfast and Italian had an almost identical average honey production (respectively 37.9 and 38.1 kg), the Carniolan Bees produced an average of 42 kg, and the family of race Central-European – 33.2 kg. There was statistically significant differences between the group of families of the Central-European race which has the lowest production of honey and a group of race Carniolan which, in each seasons was characterized the largest production. There was no statistically difference in honey production between Carniolan races and races: Buckfast and Italian.

Relation of honey production to the amount of brood

There was calculated the ratio of the production of honey to the average amount of brood during the development of families, and thus the number of bees



BU – race Buckfast, IT – Italian, KR – Carniolan, PM – Central-European

FIGURE 1. Comparing the average brood areas during the spring development of families (in dm sq.)

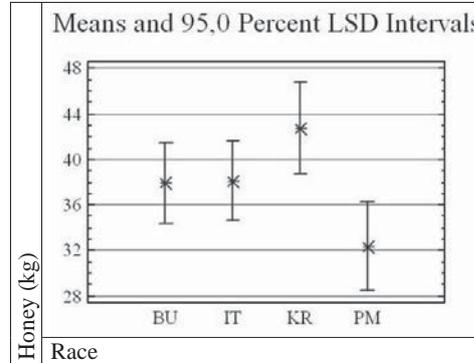


FIGURE 2. Average size of honey production in four breeds studied bees

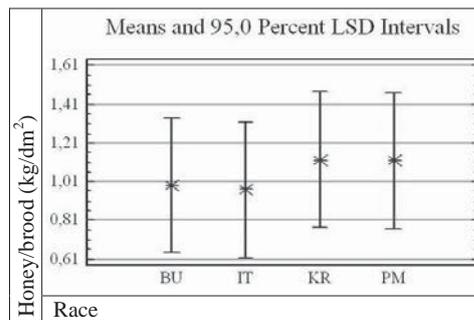


FIGURE 3. Average size compared to the amount of honey production to the brood in four test races

during the main honey flow. Results are illustrated in Figure 3.

The lowest ratio of honey production to the amount of brood was found in brood Buckfast bees (0.97 kg/dm² brood), the highest – with bees breed Carniolan and Central-European (1.08 kg/dm² brood). However, there was no statistically significant differences between races.

CONCLUSIONS

1. Breed had no significant effect on the size of wintering.

2. There were significant influence of race on the winter food consumption. Carniolan and Central-European bees consumed less food than Italian and Buckfast bees.

3. Paralysis Nosema disease wintering bees wasn't dependent on the breed.

4. Central-European bees had spring development lower than the other races. There were found significant differences between Central-European and Italian and Buckfast race.

5. The smallest brood had Central-European race what caused that they had the lowest production of honey. Bee races: Buckfast and Italian were very close to each production of honey and brood. Carniolan bees obtain in each year of the highest of all groups honey production.

6. Carniolan and Central-European bees had an identical ratio of honey production to brood. It was higher than Buckfast and Italian bees.

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Streszczenie: *Porównanie czterech ras pszczół w warunkach fińskich.* Celem pracy było zbadanie wpływu ilości czerwiu na produkcję miodu u czterech ras pszczół użytkowanych w Finlandii. Porównano także zimowlę i rozwój wiosenny w ciągu trzech lat. Nie stwierdzono wpływu rasy, zarówno na wielkość osypu zimowego, jak i porażenie nosemozą zimujących pszczół. Zimowe zużycie pokarmu było natomiast uzależnione od rasy i wynosiło, w przeliczeniu na obsiadany plaster: dla rasy środkowoeuropejskiej – 1,04 kg, dla kraińskiej – 1,06 kg, dla włoskiej – 1,26 kg i dla

Buckfast – 1,34 kg. Tempo rozwoju wiosennego, mierzone ilością czerwiu krytego, było najniższe u pszczół rasy środkowoeuropejskiej (33,7 dm²), najwyższe zaś, u pszczół buckfast (43,5 dm²). Rasa środkowoeuropejska miała również najniższą produkcję miodu (ok. 33 kg). Rasy: włoska i Buckfast, miały zbliżoną do siebie produkcję miodu (ok. 38 kg), rasa kraińska uzyskała średnio 42 kg. Stosunek produkcji miodu do ilości czerwiu krytego był u ras: kraińskiej i środkowoeuropejskiej identyczny (1,08 kg/dm²) i był wyższy, niż u rasy buckfast i włoskiej (odpowiednio: 0,99 i 0,97 kg/dm²). Nie stwierdzono tutaj statystycznie istotnych różnic.

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