

Bee Community as a Source of Energy in the Production of Food, Honey-plants in the Ecosystem of Croatian Forests' Hunting Grounds

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ABSTRACT

In addition to the process of photosynthesis, the bee community is the main source of energy in food production, honey-plants used by game and people in the hunting grounds ecosystem. It is a well-known fact that thousands of plant species depend on the presence of bee communities (pollination, fertilization). In this paper we studied the presence of the bee community in the hunting grounds of Croatian Forests, and their influence on the number of game (wild pigs), as well as the quality of honey, honey plants in the hunting grounds used by people and game. We established the total number of game (wild boars). The honey quality parameters were determined using the Harmonised methods of the European Honey (Bogdanov et al., 1997) and the pollen analysis by were conducted according to Harmonised methods of melissopalynology (Von der Ohe et al., 2004). Research results indicate that the presence of the bee community influences the number of wild boars from 3–18%, and the quality of honey is in line with the European and world standards. The SAS/STAT package was used for the statistical analysis (SAS Institute Inc., 2000). The significance of the differences among the groups was determined by Duncan test.

Key words: bee community, hunting-ground eco-system, honey plants, quality of honey, game – wild boars, people

Introduction

The presence of the bee community in the hunting grounds ecosystem as a source of energy for food production of game and preservation of honey plants is of great importance. We have conducted this research in the ecosystem of Croatian Forests' hunting grounds.

Materials and Methods

It has been examined the botanic origin of 133 honey samples obtained from different melliferous plants (Continental area: lime (*Tilia sp. L.*); desert false indigo (*Amorpha fruticosa L.*); acacia (*Robinia pseudoacacia*

L.); white clover (*Trifolium L.*); common apple tree (*Malus Mil*); common pear tree (*Pirus Lc.*); common plum tree (*Prunus L.*); bulb; sweet cherry (*Prunus avium L.*); clover (*Trifolium L.*); mulberry (*Morus L.*); abies (*Abies alba L.*); chestnut (*Castanea Mill.*); raspberry (*Rubus idaeus L.*); rowan berry (*Sorbus L.*); snowdrop (*Galanthus nivalis L.*); willow (*Salix L.*) – sub-Mediterranean area: oak (*Quercus L.*); Holm oak (*Quercus ilex Willd.*) – Mediterranean area: sage (*Salvia L.*); lavender (*Lavandula L.*); rosemary (*Rosmarinus L.*) and collected from beehives (Albert-Žnideršić, AŽ, Dadant-Blatt, DB, Langstroth-Root, LR) made of three different wood types (fir,

poplar, lime). The queen bees used in the researches were of different origins (natural and selected). The physical and chemical characteristics of honey (water %, water insoluble compounds %, acidity level, mmol of acid per kg, electrical conductivity, mS/cm, reducing sugar %, sucrose %, HMF, mg/kg and diastasic number) were determined pursuant to Harmonised methods of the European Honey (Bogdanov et al., 1997) and the pollen analysis by were conducted according to Harmonised methods of melissopalynology (Von der Ohe et al., 2004).

All bees used in these researches belong to Carniolan honey bee species (*Apis mellifera carnica*), the European bee species. The SAS/STAT package was used for the statistical analysis (SAS Institute Inc., 2000). The research results have been presented in the tables. Following statistics parameters have been shown: arithmetic mean value (\bar{X}), standard deviation (s), standard deviation of the mean value ($s\bar{X}$). The significance of the differences among the groups was determined by Duncan test. We established the total number of game (wild boars).

Conclusion

The presence of the bee community in the hunting grounds ecosystem of Croatian Forests-Continental, Mediterranean, Submediterranean depends on the period of the year (spring, summer, autumn, winter).

Wild boars population increases in 2008 by 3–8 percent. (1. Spačva 3%, 2. Kunjevci 2%, 3. Podunavlje-podravlje 6%, 4. Breznica 3%, 5. Kunjak 2%, 6. Lacići-Gložđe 4%, 7. Papuk 7%, 8. Zvečevo 6%, 9. Radinje 5%, 10. Pisanička bilogora 6%, 11. Žabljački lug Šesma 5%, 12. Peski 3%, 13. Repaš 6%, 14. Lipovljani 11%, 15. Posavske šume 11%, 16. Petrova gora 9%, 17. Pokupski bazen 9%, 18. Smrekova draga 6%, 19. Bjelolasica 4%, 20. Sjeverni Velebit 6%, 21. Ričičko bilo 6%, 22. Srednji Velebit 4%, 23. Ubaš 4%, 24. Bokanjačko blato 11%, 25. Oštrica 12%, 26. Biokovo 18%, 27. Sveti Ilija-Orebić 14%.)

The quality of honey is in line with the world standard. The botanic origin statistically has very high influence ($p < 0.001$) on the quality of honey and all its researched characteristics, except on the proportion of the non-dissolving substances ($p = 0.088$).

TABLE 1.
THE PARAMETERS OF THE HONEY QUALITY OF THE HONEY TYPES OF ALL TESTED SAMPLES (N=133)

Quality label	Statistical Traits	Honey types determined by the pollen analysis					p value
		Lime (n=12)	Holm oak (n=15)	Lavander (n=28)	Bulb (n=37)	Acacia (n=41)	
Pollen, %	\bar{X}	36.47 ^c	50.46 ^b	60.73 ^a	61.58 ^a	31.22 ^d	<0.001
	s	6.17	2.37	10.50	10.70	3.64	
	$s\bar{X}$	1.59	0.66	1.92	1.76	0.57	
Water, %	\bar{X}	17.11 ^{ab}	17.26 ^a	17.22 ^a	16.15 ^c	16.76 ^b	<0.001
	s	1.32	0.82	1.65	0.91	0.84	
	$s\bar{X}$	0.34	0.23	0.30	0.15	0.13	
Water insoluble compounds %	\bar{X}	0.024 ^a	0.015 ^a	0.017 ^a	0.022 ^a	0.015 ^a	0.088
	s	0.025	0.010	0.027	0.019	0.020	
	$s\bar{X}$	0.006	0.002	0.005	0.003	0.003	
Acidity level, mmol of acid per kg	\bar{X}	18.49 ^c	21.02 ^b	22.84 ^a	18.50 ^c	11.14 ^d	<0.001
	s	6.18	4.36	3.91	3.64	1.71	
	$s\bar{X}$	1.60	1.21	0.71	0.60	0.27	
Electrical conductivity, mS/cm	\bar{X}	0.285 ^a	0.251 ^c	0.269 ^b	0.210 ^d	0.141 ^e	<0.001
	s	0.025	0.051	0.031	0.038	0.024	
	$s\bar{X}$	0.006	0.014	0.005	0.006	0.003	
Reducing sugar %	\bar{X}	75.74 ^c	76.28 ^c	77.92 ^a	79.12 ^a	75.26 ^c	<0.001
	s	1.78	1.10	3.89	2.54	2.46	
	$s\bar{X}$	0.46	0.31	0.71	0.42	0.38	
Sucrose %	\bar{X}	2.16	1.77	1.73	2.29	3.02	<0.001
	s	1.10	0.55	1.12	2.17	1.05	
	$s\bar{X}$	0.28	0.15	0.20	0.36	0.16	
Diastasic number	\bar{X}	14.43 ^a	12.45 ^a	12.99 ^a	21.57 ^b	16.67 ^a	<0.001
	s	4.99	2.87	6.29	5.78	7.99	
	$s\bar{X}$	1.44	0.74	1.19	0.95	1.25	
HMF, mg/kg	\bar{X}	3.40 ^b	2.69 ^{cd}	2.30 ^{cd}	4.25 ^a	3.91 ^{ab}	<0.001
	s	4.42	1.34	1.43	1.21	1.45	
	$s\bar{X}$	1.14	0.37	0.26	0.20	0.22	

^{a,b,c,d} $p < 0.05$

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PČELINJA ZAJEDNICA KAO IZVOR ENERGIJE U PROIZVODNJI HRANE, MEDONOSNOG BILJA U EKOSUSTAVU LOVIŠTA HRVATSKIH ŠUMA

SAŽETAK

Uz proces fotosinteze pčelinja zajednica je glavni izvor energije u proizvodnji hrane, medonosnog bilja koju koriste divljač i ljudi ekosustava lovišta. Poznato je da tisuće biljnih vrsta ovisi o nazočnosti pčelinje zajednice (polinizacija, oprašivanje). U našem radu istraživali smo nazočnost pčelinje zajednice u lovištima Hrvatskih šuma, njihov utjecaj na brojnost divljači (divljih svinja) te kvalitetu meda, medonosnog bilja lovišta koje koriste ljudi i divljač. Metodom prebrojavanja služili smo za utvrđivanje broja divljači. Parametre kakvoće meda odredili smo Harmonised metodom of the European Honey (Bogdanov et. al., 1997.), a peludnu analizu Harmonised methods of melissopalynology (Von der Ohe et. al., 2004.). Za statističku obradu podataka korišten je SAS/STAT (SAS Institute Inc., 2000.) paket. Istraživanje značajnosti razlike između skupina određeno je pomoću Duncanovog testa. Rezultati istraživanja ukazuju da prisutnost pčelinje zajednice utječe na povećanje brojnosti divljači (divljih svinja) od 3–18%, a kvaliteta meda odgovara europskim i svjetskim standardima po pravilniku.