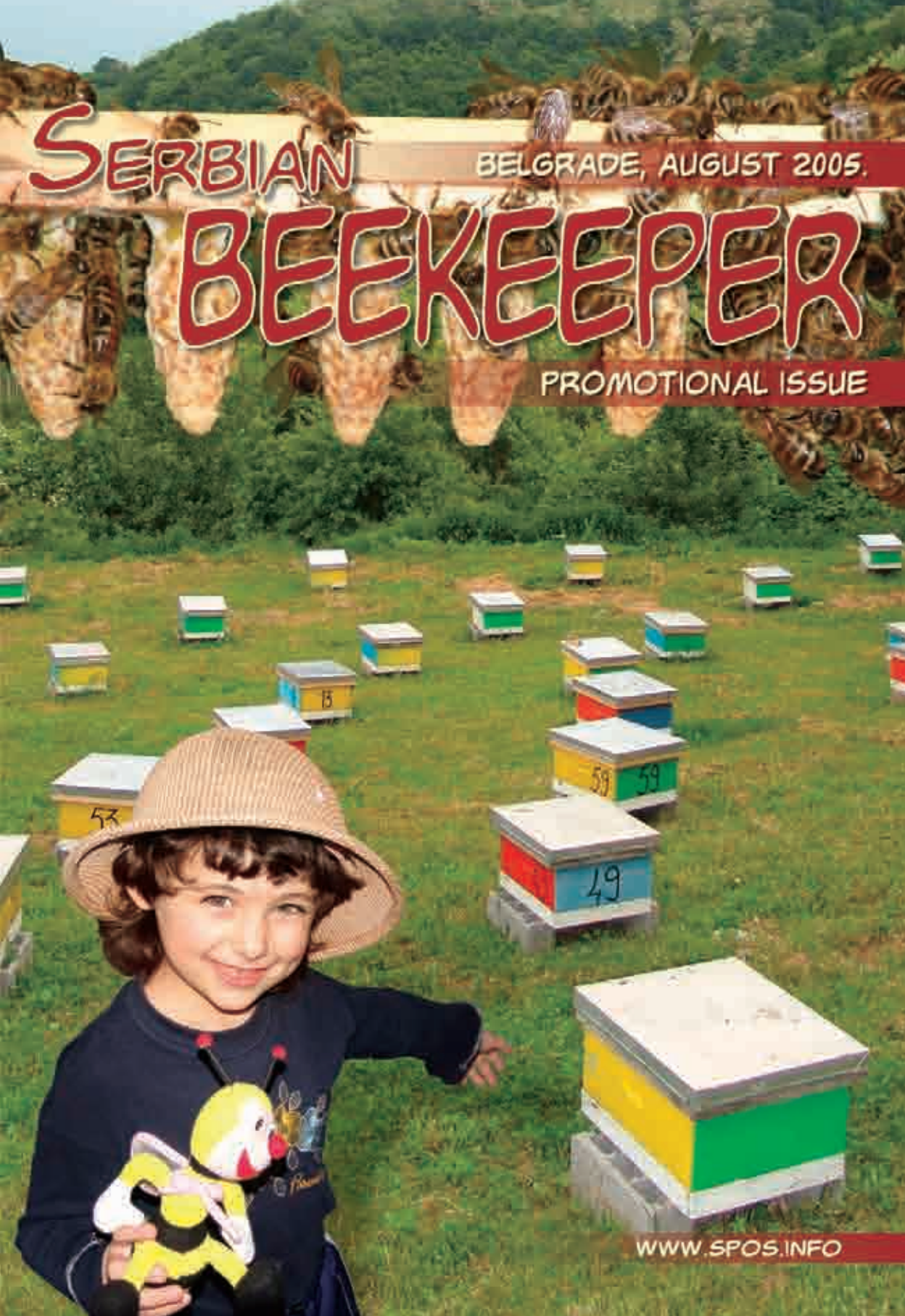
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Who doesn't know should learn
by reading the Serbian Beekeeper.
Who knows should enjoy in reading it again.
Who knows better should write it down.

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internet diskussion group: casopis-PCELAR@yahoogroups.com

Editor
Med. Dr. Rodoljub Živadinović
18210 Žitkovac, 12 Stojana Janićijevića st.
tel: ++381 18/846-734, ++381 63/860-8510 rodoljubz@ptt.yu

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Family Mirić's queen-mating station

Photographer:
Rodoljub Živadinović

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A word from the editor

Our dear friends beekeepers,

I have the great honor of adressing you on behalf of the Serbian beekeepers through this special issue of the Serbian beekeeping magazine called "Pčelar" ("Beekeeper"). You are just reading the issue published on the occasion of the Apimondia Congress in Ireland. The idea was to introduce the Serbian beekeeping to all the beekeepers of the world. Serbia has a very long beekeeping tradition. In the ancient Serbian state, beekeepers were favored and even exempted from military service. In the new age, Serbian beekeeping has been intensively developing. The number of beekeepers and bee colonies has been progressively growing. This is all followed by the development of beekeeping industry, thus, today, Serbia can be proud of companies producing beekeeping equipment upon world standards, but more competitive prices.

With this introduction of ours, our intention is to get to know you better, by making new friends that we will maintain by more frequent meetings and gatherings. The idea is to invite you to visit us, to meet our beekeeping potentials, to become familiar with Serbia, the country with ideal conditions for the development of beekeeping, with unpolluted nature, with immense meadows full of honey plants.

But the idea is also that you can count on us. We would like you to know that we plan to run for the host of one of the next Apimondia Congresses, but of any other beekeeping gathering, as well. In 1985, in Japan, the former Yugoslavia missed only one voice to win the organization of the 31st Apimondia Congress. Nevertheless, at the Warsaw Congress, Yugoslavia won the organization of the 33rd Apimondia Congress 1991. Due to an unfortunate combination of circumstances, this Apimondia Congress has not been held in our country.

We would like to spend time together in our country, as well, to give you a tour around our apiaries, to introduce you to good people giving all their love to bees, which has turned their apiaries into the oasis of peace and beauty.

Remember that the bee buzzing is specific in Serbia. If you don't believe it, visit us and hear for yourself. We will be good hosts.

Welcome to Beekeeping Serbia

Welcome to Beekeeping Serbia

Natural conditions, moderate continental climate and the richness of its flora provide excellent conditions for keeping bees in Serbia. In the area of 88,361 square kilometres, with 9.8 million inhabitants, there are nearly 430,000 bee hives. Honey potential enables a significantly bigger number of hives, according to experts, even over 1,200,000.

The spring development nectar flow consists of: willow tree, wood plants, fruits and oil rape. In some years, these plants also give honey to be extracted. The main nectar flows from which beekeepers extract honey are black locust, lime-tree, sunflower and meadow flow. Due to the difference in the altitude and blossoming time, the black locust nectar flow can be used through two flows, in lower and in higher areas.

For the good usage of a nectar flow, it is needed to move the hives. Beekeepers more and more use trucks, buses and trails with

installed hives for moving or they move them by cranes and hives on pallets. In Serbia, there are more than 800 vehicles with installed hives. In moving with pallets, there are usually five hives on a pallet, which are easily and quickly loaded or unloaded with an elevator. In order to improve the flow, more and more beekeepers breed honey plants such as phacelia.

Miljko Šljivić, president of the Serbian Federation of Beekeeping Organizations

Big beekeepers with more than a hundred hives and beekeepers doing the pallet beekeeping mostly have LR hives. Beekeepers with smaller number of hives and stationed beekeepers have DB hives, while beekeepers with hives installed on transportation vehicles have AŽ hives. Other types of hives are not so common. Yearly honey production in Serbia ranges about 5–6 thousand tones and is distributed in the domestic market. Yearly consumption of honey per capita is 0.7 kg. Considering the export of honey, not sooner than in the last several months have the conditions been provided in respect to the EU standards.

In Serbia, there are lots of domestic carnica, the Apis mellifera carnica race. Her most important features are extreme calmness, fast spring development, long life, good wintering with relatively low food consumption and extremely hygienic behaviour (Nosema and Acarosis). For years now, the "Apicentar" queen rearing centre in Belgrade (managed by the worldwide famous Prof. Jovan Kulinčević, PhD) has been doing the selection for higher crops, resistance to diseases and other features. The selection lines, some of which originate from as early as 1982, are in 14th or 15th selection generation. During 2005, started the exporting of queens to Jordan. At the moment, the capacity of the Centre is 10,000 queens a year. The price of a queen is equal to the retail value of 2 kg of honey. The demand for queens in Serbia is far beyond this, therefore new centres have started opening under the supervision of the Faculty of Agriculture from Belgrade (managed by Prof. Mića Mladenović, PhD). These are "Timomed" from Knjaževac, "Medoprodukt" from Vranje, "Pčelica" from Kraljevo and "Zadruga med"

Mića Mladenović

from Vršac. The insufficient number of queens in the market is misused by unregistered queen producers, who sell queens without any kind of selection.

The increased unemployment in the country has influenced more and more people to go in for beekeeping, either as the main or additional occupation. The development of beekeeping has resulted in bigger and bigger demand for colonies in the market (packed bees or on frames, usually 5 frames, 3 of which are with brood).

The demand for packed bees is also present in the areas of late nectar flows for the strengthening of production colonies. These colonies are acquired from the areas where the climate is more favourable and where there are early nectar flows. Adjusting to the market demands, a certain number of beekeepers have become focused only on the production of colonies. For professional beekeeping in Serbia, it is necessary to have more than 200 hives, and the number of this kind of beekeepers grows from year to year.

Out of 30,000 beekeepers in Serbia, about 9,000 are the members of 173 beekeeping organizations making the Serbian Federation of Beekeeping Organizations (SPOS). They pay the membership subscription equal to the value of 3 kg of honey, and as the members, they get the "Beekeeper", the Federations's magazine issued every month. The Federation influences

the education of its members regarding breeding bees and the citizens regarding the importance of bee products to people's health. In order to inform the consumers, the Federation starts up promotional campaigns. The most recent example is the issuance of two popular brochures, distributed to consumers for free: "Honey, miraculous food and medicine for healthier life", and "Ice-Honey" (summer pastry with honey).

A great attention is paid to the education of beekeepers, as a significant activity of the Federation. At the Faculty of Agriculture in Belgrade, there is a Beekeeping Department, and in schools of agriculture, beekeeping is an optional subject. Some of the schools of agriculture have their own apiaries. In order to conduct educational activities within the Federation, there is an active team of lecturers and trainers comprised of eminent experts in the area of beekeeping, as well as prominent beekeeping practitioners.

During winter, lecturing cycles are organized, and especially good results have been achieved by the debate clubs. There is not a beekeeping institute in Serbia. Through 96 local TV stations and 120 radio stations in Serbia, many beekeeping associations have their regular and occasional broadcasts. Considering cooperation and meetings, the Federation organizes various trips, excursions, visits to reputable apiaries, fairs and exhibitions.

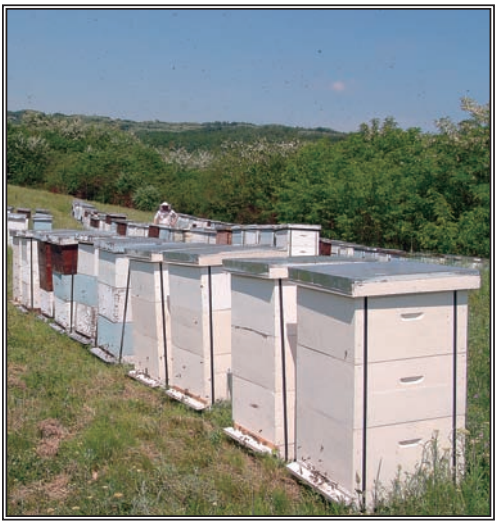
Searching for nectar flows, beekeepers move their hives and that way perform the pollination for free. Big farms have their own apiaries for the pollination of crops, while a certain number of producers of apple and seed sunflower pay for the pollination. Apitherapy as the

type of treatments with bee products is in Serbia considered to be an alternative medicine. It is not officially used in treatments, but certain doctors, upon their own initiative, suggest the appliance of bee products, first of all for prevention. Frequent exhibitions and education of citizens cause an increased demand for curative preparations and cosmetic products based on honey and bee products. This results in the occurrence of companies dealing with production and trade of medical and cosmetic products based on honey and bee products. There are 12 veterinary institutes situated throughout Serbia that participate in the diagnostics of bee diseases. The current Ministry of Agriculture has issued regulations where bee diseases become equal with other animal diseases, therefore we expect more help from veterinary services. Considering medicines for bee diseases, Serbia has several producers, the capacities of which surpass the demand in the country for several times, thus a big part of the products are exported.

A stormy development of beekeeping is followed by the development of equipment. There are more and more equipment producers exporting a significant part of their production.

A special place in the Serbian beekeeping belongs to beekeeping exhibitions, held once a year in every bigger town and lasting for 2 to 3 days. At the beekeeping exhibitions, bee products are sold, as well as beekeeping equipment. Additional activities of the exhibitions are lectures for beekeepers and visitors, round tables, visits to apiaries, press conferences.

The biggest beekeeping exhibition in Serbia. The Park of Tašmajdan, Belgrade.



Regional beekeeping organizations

There are other two big beekeeping organizations working through SPOS. These are Vojvodina Federation of Beekeeping Organizations (SPOV) and Southeast Serbia Regional Association of Beekeeping Organizations (RAPOJS).

Erich Shieferstein, PhD, in Serbia with Miljko Šljivić

Vojvodina Federation of Beekeeping Organization (SPOV)

Momčilo Končar, president of the Vojvodina Federation of Beekeeping Organizations

SPOV acts in the territory of the Vojvodina province, situated in the far north of Serbia. Vojvodina's beekeeping has a long tradition and the founder of modern beekeeping in this area was professor Jovan Živanović (1814—1916), a philologist of the Karlovac Classic Program and Theological School. In 1896, he started the "Serbian Beekeeper" magazine, which had been issued until World War II. As a professor of the Karlovac theological school, he opened the first beekeeping department in Sremski Karlovci, one of the rare in Europe. It soon became the nursery of beekeeping science and practice. By their personal example and work in apiaries, the priests disseminated the secrets of beekeeping, bee colony and popularized bee products among their parishioners.

His idea "honey produced on an axle" directs beekeepers to migratory beekeeping in searching for a richer nectar flow, which is today also the basis of modern beekeeping. As early as then, Živanović encouraged beekeepers to work together and founded the first beekeeping organization in Vojvodina.

A big contributor to beekeeping was also the academician Jovan Tucakov, our best connoisseur of medical plants. Examining the medical plants of Vojvodina, he put a special accent on honey species — especially those characteristic for Deliblat sandy desert and Fruška gora.

In 1982, the Faculty of Agriculture in Novi Sad opened its door to the first Beekeeping Counselling, which had the educational, exhibition and sale character. It was and remained the unique and the biggest exhibition of beekeeping by its contents and number of visitors. The statistics read that, in the last 23 years, the Counselling has been attended by about 25,000 beekeepers, scientists and businessmen from the country and abroad.

There are good conditions for beekeeping in Vojvodina, both climatic and land. At about 2 million hectares (about 5 million acres), there are optimal conditions for breeding one-year and several-year crops. This potential of Vojvodina has been used minimally and requires a better organization. Therefore, beekeeping, as an economy branch, has entered the long-term agrarian development of Vojvodina.

The first step of the Vojvodina Executive Board has been directed toward the protection of the geographical origin and creation of a brand for the lime tree honey from Fruška gora, since Fruška gora is the biggest habitat of the honey lime tree in the Balkans. "The Best of Vojvodina - Lime Tree Honey" anticipates a certificate guaranteeing the geographical origin and appropriate quality. Scientific researches have shown that in the lime tree honey from Fruška gora there is up to 90% of lime tree pollen, which gives the priority to this type of honey compared to others to which beekeepers move their colonies. In the near future, the goal is to protect the sunflower honey, as well. Every year, more than 250 thousand hectares (625 thousand acres) of sunflower are sowed on the field of Vojvodina. The areas under this crop are becoming bigger and bigger, because domestic selection experts produce hybrids resistant to

Dušan Vorgić, secretary of SPOV

many diseases. Daily intake of nectar can be about 8, and the total even more than 50 kg. The sandy deserts of Deliblat and Subotica are rich in black locust woods.

The Vojvodina Federation of Beekeeping Organizations has 55 member beekeeping associations, with about 2,400 beekeepers and 70,000 hives. The most common types of hives used for beekeeping are LR (more than 60%), AŽ, Farrar and long hives.

Southeast Serbia Regional Association of Beekeeping Organizations (RAPOJS)

RAPOJS is a relatively young, but very ambitious beekeeping organization, with the seat in Niš. It has 20 member beekeeping associations. It covers the territory of the districts of Nišava, Pirot, Toplica, Jablanica and Pčinj at the far south and east of Serbia. The estimate is that, at this territory, there are about 7, 500 beekeepers with about 112,500 colonies. The Association strictly deals with planned and systematic education of beekeepers, health care of bees and marketing activities.

Contrary to the major part of Europe and Balkans, the area of Southeast Serbia is still one of relatively unpolluted areas, which gives a significant advantage to food products. Agricultural production is still in its traditional form and has not been significantly affected by industrialization and chemicalization of the land. First of all, due to environmental reasons, in the last years (nineties), the appliance of chemical substances (fertilizers and for crop protection) has been decreased for about 70%, which has, truly, influenced the decrease in the yield, but from environmental aspect, it has contributed to 85% of the land be protected for the production of health appropriate food.

The biggest successes of the Association in the past period: regular yearly seminars on fighting bee diseases and preparing colonies for good quality wintering; courses about beekeeping techniques in the function of fighting Varroa and other bee diseases, with awarding certificates on the completed course for bee examiners by the Faculty of Veterinary Medicine from Belgrade; favourable yearly diagnostic examinations of bees and brood at the Veterinary Specialized Institute in Niš; recommendation for one-time treatment of bee colonies against Varroa in the territory of the Association; practical demonstration and training for the application of oxalic and formic acid against Varroa; First International Professional Seminar with lecturers from Germany (Ralph Buchler, PhD; Klaus Wallner, PhD) in 2002 (in cooperation with GTZ Gmbh); Second International Professional Seminar with lecturers from Russia (Prof. V. I. Lebedev, PhD; Prof. N. I. Krivcov, PhD) in 2004; Third International Professional Seminar with lecturers from Slovenia (Vlado Auguštin, Franc Prezelj) in 2005; Practical Queen Rearing Course in cooperation with the Apicentre from Belgrade and Veterinary Specialized Institute from Niš, with awarding certificates.

Klaus Wallner (left), Vlastimir Spasić, president of RAPOJS (middle), Ralph Büchler (right)

V. I. Lebedev

N. I. Krivcov

Vlado Auguštin

Franc Prezelj

The Association has become so popular in the Serbian beekeeping public, that in many areas the idea of regional organizing has appeared. In few days, the Regional Association of Western Serbia is to be organized, and there is the initiative in Šumadija and Banat, as well. They are all supported by the leadership of this association with a motto: "*We confess, we started first!*".

Authors:

***Miljko Šljivić**, graduate economist, president of the Serbian Federation of Beekeeping Organizations*
***Dušan Vorgić**, graduate engineer, secretary of the Vojvodina Federation of Beekeeping Organizations*
***Vlastimir Spasić**, engineer, president of Southeast Serbia Regional Association of Beekeeping Organizations*
***Med. Dr. Rodoljub Živadinović**, editor of the "Beekeeper" magazine*

Mileta Marković
14226 Jabučje
Tel: +381 14 74 581
Cell: +381 64 1917 333
mm@yu1ab.com

Mileta Marković was born on October 7th, 1947. He has been in beekeeping since 1982, and currently has 300 LR and 50 DB hives. He is one of the biggest producers of queens for Apicentre and Professor Kulinčević. He has 1500 LR nucleuses and, thus far, has reared more than 50,000 queens. He produces royal jelly, as well.

Spinner first, then the Colony?

I will always remember a conversation with now the late grandpa Mihailo Kulinčević from Rađevo Selo near Valjevo. He was a very respected man. His endless faith in God, ethics, courage, wisdom and unselfishness always made him a desirable adviser and man to talk to. Grandpa Mihailo lived for 98 years and died on Christmas 2000. In a moment of the conversation, this great optimist and enthusiast seemed as if he had become suspicious. To my question whether young beekeepers still address him for help and advices, he said with wistfulness: "Son, today many children start to breed bees, some of them love them, and the other buy a spinner and honey pots first, and then acquire a colony. It is not likely that they will become good beekeepers. This, my son, does not relate to you, for my Jova (Prof. Jovan Kulinčević, PhD.) says you are a very hard working person and if you keep learning and endure, you can achieve a lot in beekeeping".

I was very flattered. The words of grandpa Mihailo still live inside of me. I have been trying to work both more and better. Whenever I wish to write an article about beekeeping, I think of how nobody will need my findings, of course you should have a "spinner and honey pots". I hope that there are much more those who are interested in knowledge and experiences, because only through holding an abundance of information, and by your own selection, you can build a personal attitude and approach, because there are no many occupations as individual as beekeeping. I always have in mind that faith and love in any kind of job open the door of success.

How to achieve a success in the black locust and the following nectar flows?

The main prerequisite for considering this topic is certainly in previously provided conditions for good wintering, and therewith a successful wintering of all bee colonies. It would not be sufficient to once more remind of these conditions; although we are maybe late for this winter, we are certainly on time for the next one. Well, which are the requirements that need to be met:

– to have at least 20–25 thousand healthy long-lived bees in the winter cluster;

– to have a young, favourable selected, queen in the cluster;

– to have provided and correctly arranged reserve of about 20 kg of good quality honey;

– to have at least one kilo of stored pollen in the hive;

– to have a correct warming and ventilation of beehives provided;

– to have the apiary protected against cold winds, and still have it moderately aired;

– to fence the apiary in order to prevent the access of domestic and wild animals;

– to protect the hive entrances against mice and shrews;

– to have other conditions provided that could be specific for the locality at the which the apiary is situated.

If any of these requirements has not been met, you can not calmly and peacefully wait for the spring and the approaching beekeeping season. It is certain that the majority of professional, conscientious, experienced and responsible beekeepers have provided all these conditions on time, thus let's see what kind of spring development can be expected with them and with what kind of bee colonies we will enter the black-locust, but also all the following nectar flows. For the estimate of possible spring development in 2005, we will use data from 2004, collected at the Apicentre.

The size of brood was determined in 87 bee colonies in LR hives. The date of the first measuring was April 1st, 2004. The average total brood surface per a colony was approximately 80.5 dm^2, or 4.6 frames completely full with brood on both sides, meaning that from March 11th to April 1st (21 days) the queen laid approximately (32,200 cells laid in 21 days) about 1,533 eggs a day. On the day of the measuring, there were about 6.6 frames in the hives thickly occupied by bees, plus forages, which makes nearly 18,000 bees.

The date of the second measuring was May 1st, 2004. The average brood surface per one colony was approximately 129.5 dm^2, translated into frames, 7.4 fully laid frames on both sides. The conclusion is that (129.5 dm^2 of brood × 400 cells = 51,800 laid cells) from April 10th to May 1st (21 days) the queen approximately laid (51,800 brood cells : 21 days) about 2,466 eggs a day. On the day of the measuring, the hives had approximately 10 frames thick with bees, plus foragers on the outside, which makes nearly 30,000 of bees in total.

The average intake made for 3 days of black locust nectar flow measured in the period from May 12th to May 15th was 21.5 kg, reminding that in 2004 the majority of beekeepers did not make this kind of intake even in two black locust nectar flows. We should especially emphasize the fact that none of these bee colonies swarmed. It is interesting to state the data that in 44 colonies the queens were from 2003, and the rest of them from 2002, and that an insignificantly higher crop was achieved in the colonies which were in the second testing year, while in the previous years it was a much more common occurrence. We can approximately estimate or calculate with what number of bees these colonies participated in the black locust forage. If on May 1st, these colonies had the average of 30 thousand bees and over 50 thousand brood cells, then every next day we could expect the additional 1,500 bees. These are the bees laid after April 10th, when the average laying ability of the queen was about 2,000 eggs a day. At the same time, we can expect that the mortality is nearly 500 bees a day, and these are bees laid in the period from February 20th till March 10th, when the average laying ability of the queen was approximately the same.

With this kind of colony growth, by May 6th, (St George's day), there will be about 40,000 bees in a hive. In that period, in the large area of Serbia, the opening of first black locust blossoms start, but there are still about 7 more days till the full blossoming and nectar flow. If about May 6th, when both of brood supers of the LR hive are full with bees, we reverse the brood supers (due to arches of honey that will now be in the lower super) and add a honey supper, we have completely freed the passage for bees from the brood to the honey super. By this activity, without extracting the frames from the brood super into the honey super, we enabled the bees not overcrowd in the brood super and undisturbedly store the honey above it. Now we already have an expanded space of the hive, which will be filled with bees the number of which will by the full black locust flow be increased for about 10 thousand (7 days × 1,500 = 10,500). By blocking the brood gradually, due to intensive inflow of nectar, the comb surface with the young brood will become smaller, due to what several thousand bees will become free, thus the power of the bee colony will reach the absolute biological maximum of nearly 60,000 bees, and with timely adding of bee supers, it is possible to achieve maximum crops allowed by natural conditions in that period. After the black-locust forage and removal of honey supers, in the brood super, in addition to the remaining frames with brood, we will leave enough honey and empty frames for the queen to lay in order to maintain the biological power of the colony and successful forage for the following intensive nectar flows (linden and sunflower).

By the linden and sunflower nectar flow, a queen excluder and a honey super should be put on the brood super, because there is always the possibility of a not-so-intensive forage, and this

kind of forages can provide conditions for the queen laying in the honey super, which would be quite irrational.

In the linden nectar flow, and especially sunflower nectar flow, queen excluders can decrease the intake even for 20%, and at the same time provide enough space for the queen laying, which could influence the weakening of the bee colonies and the inability to breed enough bees, the main job of which would be to, after the return from the forage in the late summer, raise the sufficient number of long-lived bees with which the bee colony will enter the approaching winter. At the end of this article, I would like to thank Prof. Jovan Kulinčević, PhD, and his associates for data about the performed measuring that I presented in this text.

The fact is that the queens, the selection and testing of which are done at the "Apicentre", are reared upon the same technology and conditions as all the queens from the Apicentre meant for the market. Due to that, in the majority of the bee colonies where the queens from this program has been installed, should achieve approximately the same result, but it obviously is not like that. The causes should certainly bee looked for in the reasons such as:

– beekeeping with insufficiently functional beehives, in which the brood space cannot be expanded, if needed, and therewith create conditions for a full biological development of the bee colony;

– the unnatural and complicated technology of beekeeping;

– bad quality, insufficient or too abundant nutrition of the bee colony;

– unprofessional diagnostics of the diseases in bees and brood, and therewith the inadequate usage of medicines;

– insufficient care, omitting of needed actions and disharmony with the time, nectar flow and other environmental conditions, and similar.

As many other, for several years I have been looking for the most optimal and most profitable way of beekeeping. During all this time, I have done the beekeeping with various types of hives: LR, DB, DB of ten and long hives. I have applied almost all beekeeping techniques I have heard about at lectures or found in beekeeping literature. I dealt with double, two-queen, or beekeeping with several queens and with all other activities aiming the creation of some kind of phantom colonies that were supposed to bring tones and tones of honey. Finally, when I became the member of the "Apicentre" and gained some insight in their technology, I became aware of the uselessness of making these unnatural, disorganized and unstable artificial colonies that were the result of imagination, but with very weak backup of natural laws upon which bees behave and have been surviving for centuries. Finally, I realized that bees "do not read books" and make the beekeeper's wishes true, but behave upon their own instincts.

Many of us have had to pass a very long way in order to finally find what has been found a long time ago. I guess this is normal for people who do not know how much they know, but now, when we know how much we do not know, we can finally by the spinner and many more honey pots.

Branislav Karleuša
11000 Beograd
Đorđa Jovanovića St. No. 7
Tel: +381 64 20 40 60 4
karleusa@sezampro.yu

Branislav Karleuša was born on February 11th, 1956 in Belgrade. By occupation, a supervisor at the national air company. The first meeting with bees experienced at his grandfather's, and decided to start up his own apiary in 1977. Has 60 LR beehives. In the last twenty years has been trying to apply the gained experience in the work with about thirty colonies in hives made upon Farrar's measures.

Honey Production

You have an opportunity to peek into the reflections of Branislav Karleuša, the man who was the first in this area to dare say that a weak colony can produce honey as well. You can be certain that it is a privilege many beekeepers of the world would be envious of. The editor is kindly asking you to read the text at least twice, and then come to conclusions. Naturally, you should read the beekeeping elementary reader first.

Introduction

The planned actions we conduct with a previously determined goal are called methods. A series of interrelated actions a beekeeper applies in the work with a bee colony, aiming to obtain a honey crop higher than those the bees would make themselves, can bee called the honey production methods.

In accordance with the knowledge about the nature of bee being, certain actions through history have gained, i.e. lost their popularity in the wide appliance in beekeeping practices. The creation and development of honey production methods, as well as basic ideas that lead the beekeepers, will be addressed in the first part of this text.

Numerous experiences of peer beekeepers and my personal experience made me form a somewhat different way of thinking about the secret of honey production. I will be happy to share it with you in the last part of the text.

Methods of clear space in the brood super

The simple finding that more bees bring more honey, i.e. that good laying ability of the queen results in numerously stronger colony that will collect larger food reserves, completely changes the way of thinking of the beekeepers from the end of XIX century. In accordance with new opinions, the space of the beehive is expanded for several times, ways of rearing queens become more professional, and natural swarming gains the status of the unwanted urge of bees. New methods of honey production appear. Some of them, made by collecting the experiences of beekeepers of his time, were defined by

Beekeeping Elementary Reader

Considered through history, honey is the strongest stimulus for man's interest in the honey bee. Due to the lack of basic knowledge about the bee being, over the long period of nearly 8,000 years, the procedure of honey production anticipated patient watching over bee colony work in its natural habitat or primitively made beehive and, usually brutal, taking away of the stored food. Not earlier than XIX century did the progress in natural sciences, bringing a series of discoveries about the way honey bees live in a community, and trade development, forcing the interest in bigger production of honey and wax, create the preconditions for a different attitude of man toward this unusual insect. In spite of all these strong encouragements, bees would probably remain the angry and hostile inhabitants of dark cavities, hadn't it been for the wisdom of a hobby beekeeper, Lorenzo Langstroth, who gave the world of beekeeping the precise measures of their habitat. The "discovery" of the, so-called, bee space and the make of beehives with removable comb that started then, enabled the large number of beekeepers become familiar with the life of bee colony through practice. The findings that certain actions can have effect on the way bees behave, and some of them contribute

to the production of larger food storages, resulted in the creation of the first honey production methods. The findings of the Pole Dzierzon that bees fill a major part of the comb cells they occupy with honey in case, in the period of an abundant nectar flow, they are left without a queen, lead to the emerging of one of the first beekeeping "rules". Regardless the simplicity, the fact that the procedure was used upon a plan (in terms of time and goal), makes it a honey production method. Being such, it was quickly accepted by the European beekeepers, and according to the available resources now (Srpski pčelar, 1896, volume 3), we come to the conclusion that the professor Jovan Živanović named it the "Diamond Beekeeping Rule".

In order to understand the big popularity that the Dzierzon's method of honey production had in the beekeepers of our country, we need to, for a moment, go back to eighties of the nineteenth century, and remind of the used beehives. One of the most advertised in the magazines of that time was the "American" constructed by Aca Živanović. It had narrow and high frames 20 × 40 cm, warmly situated in relation to the entrance. Two models were made, with 12 and 16 frames.

The basic problem for beekeepers working with the hives of this kind of small volume was the fact that its space is almost entirely turned into the brood of an averagely fertile queen. Bees are left with only a few lines of top cells for storing honey, on which the "arches of honey" are formed and two to three frames on the side of beehive opposite to the entrance. By applying the "diamond rule" in working with this hive, the beekeeper changes the ratio between the size of the brood and honey super space. In a queenless colony, by the emerging of bees, the brood area becomes smaller and smaller, which increases the number of empty cells for storing honey. Bees are less active in collecting nectar, because there have no pheromone stimulus from the queen or open brood, but at the end of the forage, there is still more honey to be extracted.

Dzierzon's method of honey production has experienced many modifications, Eduard Lloyd Sechrist under the title of Clear Brood Nest Systems.

The successful management of a bee colony is generally based on the resolving of three problems: a) completely develop the colony before the beginning of the main nectar flow on the selected location; b) maintain the number of bees through the whole period of nectar flow without letting the foraging stimulus be suppressed by the swarming urge; v) preserve the vigour of bees during all other parts of the season in a way that will allow the colony become strong again at the right moment for the nectar flow. Eduard Lloyd Sechrist has found the solution for all the three problems in the undisturbed activity of the queen. Laying eggs, as one of the basic activities of the queen, will be supported by the bees as long as the colony has available sources of appropriate food and water. Under these conditions, only the swarming urge can affect the changes in behaviour of all the colony members toward this activity.

Behaviour of bees related to the storing of food is a stereotype. They will place the pollen as near as possible to the nest, and the unripe honey in every empty comb cell occupied by the colony, including those with open brood. The processing of pollen into stored pollen is performed in the cell where the

storing started, while the unripe honey will be "rearranged" to the very edge of the nest. When the crop surpasses the free space for storing or when the ripe honey around the nest is capped, every new crop larger than daily needs of the colony will be stored in the nest itself. The lack of free cells for storing pollen or nectar, within the space occupied by the colony, has the inevitable consequence of "queen blockage".

The method of clear space in the brood super anticipates the beekeeping ways in which the queen always have available number of worker comb cells which allows her lay freely, undisturbedly, as long as it is useful for the beekeeper.

Applied in practice, this basic idea posts the requests for a space of specific size in which the queen - brood will remain during the entire season. It needs to contain a sufficient number of cells, so that the queen lays as many eggs as needed for a colony of a standard power to develop and reach the desirable honey-production strength at the moment of the beginning of the main nectar flow in early spring. On the other hand, the size of the brood super needs to be such that, at the moment of the beginning of the nectar flow, the brood cells are arranged from one end of the super to the other, from the bottom bar to the top bar of the frame, thus they do not leave space in which bees would store ripe honey. For storing honey, the colony needs to have available honey super. Its position related to the brood needs to enable bees follow the natural urge for storing food above the top row of brood cells, and its size needs to be in accordance with the intake of nectar. With the honey area created this way, the colony maintains the sufficient number of empty cells in the brood space during the entire nectar flow, and the queen lays eggs undisturbedly.

One very simple way of producing honey upon the method of clear space in brood area is using one super of the LR hive for the activity of the queen (where the queen either remains in it for the entire season, or the colony develops in two, and during the nectar flow in only one brood super). It is interesting to look at how bees in seemingly small space establish a balance between the brood and food. The central frames of the brood super are always "clear" for the queen activity, ending frames are full of pollen, and honey can be spotted only in the shape of drops of a fresh forage. The balance can only be disturbed by a strong forage from abundant pollen flow or unskilful intervention of the beekeeper. The replacement of any of the frames in the brood super carries the danger of "introducing" the thus it remained in use also after the beekeepers have increased the volume of beehives for several times. Some of the known methods, applied even today, are based on the Dzierzon's way of thinking. As an example, I will mention the method of honey production presented by Josip Belčić.

In order to have beehives full of bees for the forage, two or three weeks earlier, Josip Belčić builds the power of the colony by adding brood frames (in long hives up to eight, and in LR multiple-storey hives up to 12 frames). The frame on which he finds the queen is put in the section of 5 frames (i.e. the third super in multiple-storey hives). The newly formed brood area is divided from the rest of the brood frames with a queen excluder. The queen undisturbedly continues with laying eggs into the cells of the empty comb, while in the other part the brood matures. In the beginning of the forage, he installs a net and opens the entrance of the section the queen is in, in order to have all the foragers come back through the entrance to the newly made honey section. This method of honey production was very popular in our areas in the seventies of the last century. The reasons for that are possible to find in the simple ways of building colonies strong and relatively easy establishment of very favourable relation between the size of the brood and honey space. The main disadvantage of the method is the way of resolving the problem of the swarming urge. The swarming urge during the nectar flow produces at least two negative consequences: significant decline in the activity of bees in collecting and processing of nectar and the declined power of the colony after swarming. With this method, swarming is successfully prevented by removing the foragers from the brood section, but due to the lack of the pheromone of the queen and open brood, the honey crop is not proportional to the size of the colony. The authors' opinion that the bees in the honey section "feel" the queen through the wire net, is easily proved wrong if you add to this section a frame with comb foundation and larvae favourable for breeding queen cells.

It is interesting to analyse this method in line with the method of producing honey by professor Jovan Živanović, with, as stated by the author, the reconstructed "American" beehive. After the initial overwhelming by the results of the "Dzierzon's diamond rule", irreconcilable about the practice of killing the queen before the forage, professor Jovan Živanović started with the reconstruction of his "American" having 16 frames of 27 × 26 cm warmly placed compared to the entrance. Instead of one frame, he installed a queen excluder into the hive and that way divided the space of five frames for honey storage. He opened a new entrance on the longer side of the hive opposite to the queen excluder, thus a part of bees entered into the part with brood, and partly in the "honey section". During the period of the colony development, he added new and new empty frames into the queen section, and the laid ones transferred behind the excluder. With the beginning of the forage, he would stop doing this, thus (during the forage) the queen laid in accordance with the number of available cells. It is not a problem to develop a colony that will during the forage occupy the entire space of a beehive this small. The maintenance of the working mood during the forage is left to the temperament of the bees, but in line with this, we also need to consider that, in the time when professor Živanović did his beekeeping, bee swarming was not considered a bee urge that needs to bee prevented. The relation between the size of the brood and honey space is very good for the nectar flow. If we compare the two, at first sight, very similar methods of honey production, we can notice that they differ in the basic idea they follow searching for big crops. Trying to improve the known ways of beekeeping, Josip Belčić firmly supported the Dzierzon's theory that the activity of the queen during the forage needs to be reduced to the minimum. Contrary to him, professor Živanović with his opinion that the secret of honey production is hidden in the harmonized work of the queen and the bees, has stepped far ahead of his own time.

colony into the swarming stage, unless you use the frame with a comb foundation.

If you do the beekeeping with some other type of beehive, the effect of clear space for queen activity can be reached with 18 frames of Farrar's height, i.e. 9 DB frames.

Where is the solution

The comparative analyses of actions applied for the nectar flow sometimes seems confusing. From the above mentioned examples, we can spot a group of honey production methods relying on minimal laying performance or total removal of the queen and open brood during the forage, while the others insist on its fully intensive performance (in order to reveal the essence, we should not compare the methods upon their efficiency). Regardless recent researches showing that the intensity of intake of nectar directly depends on the pheromone of the queen and the brood (according to V. I. Lebedev, immediately after the queen loss, the crop declines for 64.4% in the presence of open brood and without the queen is lower for 25.6%, while lacking both stimulus, the intensity of intake is averagely lower for 40.7%), we have to accept that the authors have chosen that way of beekeeping in accordance with their personal belief about what brings the honey and that they have really produced in favourable quantities. Even bigger confusion in the attempt of analyses can be caused by certain actions within the methods themselves. As an example, we can mention that, immediately before the flow, a certain number of beekeepers intensively feed their colonies, while the others extract the honey completely. Even the opinion, a great number of beekeepers agree with, that only (?!?) strong colonies

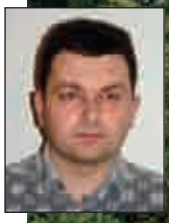
bring honey seems to be a controversy. While Farrar measures bees from the colony of 6 kg 4% more productive than the ones from the colony of 4 kg, Bretscko measures 44,5% (5 kg versus 3 kg), Lebedev 33 % (4.4 kg compared to 3.5 kg), Lunder finds out a completely opposite result upon which a bee of a weaker colony of 3 kg is 20.3% more productive than her relative from the 6 kg colony. Without intending to question the results of the measurement, it is inevitable to ask the question whether the registered intake requires a rational explanation (if considering the biological strength of individuals, or the number of foragers, the results of the measurement would have to be uniform even when including the race differences among bees). It seems that a strong colony keeps another secret. The only thing we can do is look closely into its habitat.

A bee colony reaches the peak development after seven weeks of maximal laying ability of the queen. In the first three weeks, areas under brood are becoming larger and larger. During the rest of the period, the size of the brood remains the same. The total comb area covered by bees (supposing that we always consider the same temperature) in the first three weeks is in accordance with the existing number of bees (either those which wintered, or those the number of which is the consequence of a slower dynamics of laying eggs by the queen). Three weeks after the queen entered the full laying ability, the comb area occupied by bees becomes larger and larger and reaches the maximum by the end of the seventh week. If we consider the relation between the occupied (by brood and pollen) and free (in which bees can place honey) comb cells covered by the colony, we can notice that, at this moment, it is the most favourable for the nectar flow.

Having this in mind, we can notice that what connects all the successful methods of honey production is basically the creation of favourable relation between the size of the brood and honey space occupied by bees. The secret of the diamond rule is not in "sparing" the bees from nursing brood and "saving" food. By removing the queen, Dzierzon has changed the number of occupied and free cells in his small-in-size, beehive. By simulating the relation between the space in extremely strong natural bee colony (2:1 to the benefit of honey), professor Jovan Živanović, with a colony of 20 thousand bees provided the possibility of collecting 16 kg of honey. The result worth the Masters of beekeeping.

At first sight, methods of clear space in brood super make impression of a harder way of producing honey, but uniform dynamics of laying eggs by the queen itself resolves the major part of the problem in practice. A strong colony of uniform age structure easily winters and develops quickly, and in the early season, the queen completely fills the brood super by brood. Its uniform laying ability during the nectar flow leaves always the same number of open brood cells which will serve the bees to put a part of daily crop in. With the queen's laying ability of about 1,200 eggs (a day), the brood super is a temporary storage of about 1 kg of unripe honey. At the end of the forage, event the last drop of ripe honey is placed in the honey super. The power of the colony is not crucial for the forage success even in these methods. Bees can bring as much unripe honey as can fit into free comb cells occupied by their colony, while the intensity of their work will be in accordance with the condition of individuals and encouragement of the colony. Tomorrow, when the researches offer us an ampoule of synthetic queen pheromone, open brood, pollen, we will count out a wanted number of bees from hives for reproduction and place them on a virgin comb aiming to get the biggest possible yield. Till then, let us rely on bee instincts and habits and natural sources of, for us (being insufficiently sensitive), mystical substances controlling their world.

Complex Beekeeping Technique with Farrar's Hive in the Function of Fighting Varroa and Other Bee Diseases



Med. Dr. Rodoljub Živadinović
18210 Žitkovac
12 Stojana Janićijevića St.
Tel: +381 18 846 734
Cell: +381 63 860 8510

Med. Dr. Rodoljub Živanović was born on February 20th, 1973. He has been in individual beekeeping since 1992, currently with the, so-called, Farrar's hives. He is the editor of the only beekeeping magazine in Serbia. Thus far, he has held 103 professional beekeeping lectures to the beekeepers of Serbia, Macedonia and Bosnia and Herzegovina, to about 8,800 beekeepers in total. He is the author of three beekeeping books, and the forth one is to be printed in a few months. He is the vice president of the Southeast Serbia Regional Association of Beekeeping Organizations, in charge of education and marketing.

In Serbia, there is a slow spreading of the beehive with low supers, known as Farrar's hive. The external height of all the supers is 170 mm, while all the other measures are identical to the LR hive. It is very adjustable to all climate zones. All the actions of the beekeeping technique are done easily and quickly. Nevertheless, only strong colonies are to be bred in it. Only that way it can give the right results.

Beekeeping principles

I am convinced that knowing the bee biology is the basis of good beekeeping practice. There are many misconceptions among beekeepers, at least regarding the Carniolan bee bred in Serbia. The first problem is the strength of the colony. Most of beekeepers believe that colonies reach the power of at least 60,000 bees, which is not correct. It happens very rarely. Researches prove differently. Friedrich Rutner claims that, during the season, colonies number 32–48 thousand bees. According to the papers of the Liebefeld Institute Beekeeping Department (Switzerland), signed by A. Imdorf, M. Rickli, P. Fluri and L. Gerig (1996, 1999), for the conditions of Switzerland, the official average strength of a colony is 25–40 thousand bees. Gerhard Liebig (1989-1993) claims that the average strength is about 30 thousand bees, while the number of 40 thousand is rarely reached. The similar thing is with the life duration of bees. Most of beekeepers believe that it ranges even up to 6 weeks, thus, based on that, they plan various beekeeping techniques. A. Imdorf, M. Rickli, P. Fluri and L. Gerig (1996, 1999) claim that, from May to June, the life duration of bees is about 20 days. Gerhard Liebig (1989–1993) presents the results of his four-year research that bees, in the time of peak development, live for 2–3 weeks. He presents

the example of a colony that, according to the brood size (in case we accept that bees live for 6 weeks), should have 80,000 bees in the peak development, and not "only" 42,000 it has (meaning that bees live for 3 weeks in the peak development of the colony). After all this data, we see that professor Jovan Kulinčević (2005) justifiably claims that, in summer, Carniolan bees live for 21–35 days, averagely 25–28 days. This kind of data changes some former beliefs from the roots, but the work in apiaries, as well. We should know that what affects the life duration of bees the most is the nutrition in the larvae stage (Krešak, 1973, Kulinčević, 2005), but also the exhaustion from breeding a big-size brood (Anna Maurizio, 1955). I would like to mention another misconception, and it is the numerousness of Carniolan colonies during winter. The number of wintering bees is not a relevant factor, since numerous researches have shown that both very strong colonies and the colonies of medium strength can come out of the winter with the equal number of bees. The conclusion is that bees have to survive till February (in Serbia the beginning of more intensive laying eggs by the queen) with the minimum of 10–12 thousand bees in order to reach the optimal development). Not sooner than we know this can we create the beekeeping technique appropriate for our conditions.

Yearly cycle of single-queen beekeeping

Although today bees have much more enemies than several decades ago (Varroa destructor, spraying plants with pesticides during blossoming, very changable weather conditions and similar) and therefore, without our help, colonies rarely reach the optimal strength for early nectar flows such as black locust flow, I have still decided to do the single-queen beekeeping. I believe that, with a correct beekeeping technique, colonies can be brought to the desirable strength, with strict following and keeping the track of the local nectar flow conditions (therefore I will mention them throughout the text).

In the Central Serbian area, where I do the beekeeping (200 m above sea-level), the main nectar flow is the black locust flow (Robinia pseudoacacia L.) in the beginning of May. After it, there is the wild blackberry flow (Rubus caesius L.) at the end of May and the beginning of June, as the continuation of the long-lasting and not abundant meadow flow. If you move the apiary, you can use additional two nectar flows in Serbia, the lime-tree (Tilia spp.) and sunflower (Helianthus annuus L.) flow.

The goals of my beekeeping technique are:

– replacement of 50% of the brood combs during the year;
– protection of bees against diseases by the right beekeeping technique;
– protection from Varroa mite (Varroa destructor);
– honey as the food for wintering;
– honey is not the purpose for itself.

I will start the description of the beekeeping technique from the end of October. The stage I will describe was created by the end of the summer, and how, you will learn from hereon.

At the end of October, at the bottom board, there is one super of selected honey combs with a good quality worker combs installed. Above it, there are two supers in which the brood was bred at the end of the summer. I do not care how much honey there is, because, above it, there is a full honey super (with honey from all the flows during the year, always on the top of the hive with this kind of stationed beekeeping). The bottom board is screened and completely opened from October till the first half of February, regardless the severity of the winter. During November or December, where there is

no brood, the colonies are treated with oxalic acid by the instilling method (3.5% oxalic acid dihydrate).

In the beginning of February, the screened bottom is closed by a drawer. By that time, the colony has already occupied the top honey super. By the end of February, a great deal of them moves into it, while they will completely abandon the lower super of the former brood. At that time, that super is removed from the hive and taken to melting. That way, the volume of the hive is reduced for 25 % (a way of keeping the hive worm), and the old combs are removed (and with him potentially present causes of various bee diseases).

By the end of March, the colony is intensively developing in the upper two out of three remaining supers, where there is a lot of honey and optimal microclimate. At the end of March and the beginning of April, in my area, important honey plants start to blossom, blackthorn (Prunus spinosa L.) and winter-cherry (Prunus cerasifera Ehrh.). In favourable years, the intake of nectar and pollen into the hive is very abundant and it is necessary to provide the space for its storage. Due to changeable weather conditions, the reversing of supers, as a measure of stimulating the development, has not provided good results in the majority of years. Therefore I use a simple manoeuvre. The super with a good quality worker combs that spent the entire winter on the bottom board and served as the protection against strong wind strikes through the open screened bottom, is now moved to the top, while the two supers in which the brood developed during the spring are put down on the bottom board, without reversing them. During the next moth, during the fruit nectar flow, the top super will serve as the honey storage. Depending on the strength of the colony, the queen will move to it and lay eggs. About ten days before the black locust flow, it will contain several frames with certain quantity of brood encircled with honey. At that time, between the top and medium super, we put the queen excluder, without looking for the queen. We will come back to the apiary in five days and look for the eggs. Where there are eggs, there is the queen. If it is in the lower two supers (under the excluder), which is usually the case, we reverse them. If the queen is in the top (third) super, we put her in the lower two and also reverse them. By reversing the two lower supers, the lower one, which is already partly released from the brood and has lots of empty cells, comes to the upper position and the queen has enough space for laying eggs, which influences the reduced occurrence of the swarming urge. Immediately at the beginning of the intensive black locust flow, just above the queen excluder, we add an entire super of comb foundations. The bees won't mind it, on contrary. In the immediate surrounding of the brood, they will have an opportunity to build a big number of comb foundations, which also affects the reduction in the occurrence of the swarming urge. During the nectar flow, if needed, we add more honey supers from reserves with built comb.

I apply similar principles in the following nectar flows. In order to have the development of the colony as optimal as possible, about forty

days before the expected beginning of the next flow, I reverse the brood supers.

I the mid July, I start with preparations for wintering. I perform the last reversing of brood supers. The super that at the beginning of the black locust flow was placed above the supers with comb foundations, remains on the hive for the entire year and no honey is extracted from it. It is situated on the top of the hive. By the end of July and the beginning of August, that super is the only one left above the queen excluder and serves as the honey reserve for the winter. In the two brood supers, the bees nurse the brood and store pollen, as well as smaller supplies of honey. I am never worried how much honey there is in the brood area ready for the wintering, because the super above the queen excluder is full of honey. The goal of this kind of work is as much as possible quality bred brood during August and the subsequent getting of as many good quality winter bees as possible. According to experiences from Israel, the brood becomes significantly enlarged also when we provide the bees with easy access to clean water within the hive during August. At the end of July and the beginning of August, we again treat with by instilling the oxalic acid solution, and by a long-term treatment with formic acid against Varroa mites (when allowed by the air temperature).

The apiary is situated at a place rich with pollen flow throughout the year, thus the bees enter the winter physiologically prepared to a maximum degree. Varroa mites are under control, and the winter treatment with oxalic acid reduce them to a minimal number.

If there is drought during August and therefore there is no significant motivating nectar flow, the bees are fed with honey originating from healthy colonies. It is mainly honey extracted from the strongest colonies immediately before the black locust flow that the bees brought in during the fruit forage. That honey is extracted from the brood super which is, at this time and in this kind of strong colonies, usually blocked with honey and pollen, and therefore not for sale. This way, I have found a great appliance for it, because I return it to the brood and it serves for breeding winter bees. We do not disturb the bees before October, assuming that we have provided all the factors mentioned above.

In case during late winter the bees happen to eat almost all the honey and come to the top bar on the top of the hive, the hive is expanded on the top by an empty super, in which I put a small can with black locust honey. On its lid, we pierce about twenty holes. The can is turned upside down, and the lid is put on the top bars of the top super. Through the holes, the bees eat the honey. This kind of single-queen beekeeping technique without moving the hives provides the yearly crop of 20–40 kg of honey, with several-year average of 25–30 kg per a wintering colony. Considering the efforts put, it is not little. With a little bit more efforts and one moving to another black-locust flow (in favourable years, in Serbia, you can use even three black locust flows if you have enough empty supers with built comb), the crop can be increased for 50–70%.

Milan Matić
15000 Šabac
77 Vojislava Ilića St.
Tel: +381 15 323 599, +381 14 56 138
Cell: +381 64 296 78 15
pcelas@yahoo.com

Milan Matić was born on July 19th, 1943 in Varna near Šabac. By occupation, he is a Serbian Language teacher, but he prefers calling himself a professional beekeeper, because, today, he keeps about 150 colonies in LR and Farrar's hives. He graduated from the school of beekeeping in Zagreb. He is a years-long lecturer of SPOS. He has published three beekeeping manuals, one of which ("Directing the work of bees") has had two editions abroad. He is the winner of the SPOS Gold Badge and Apislavia's Gold Medal.

Mystery of Swarming from Unknown Depths of Beehive

Beekeepers familiar with my series of works could notice that the work methods I apply in my apiaries fit into general principles of beekeeping, but are used in general and without a recipe upon which beekeeping "should" be done. That is why the flexibility of my beekeeping methods leaves space for individual knowledge and intuition of each beekeeper to, in his/her own conditions and upon his/her own abilities, manage his/her colonies in the most rational way. That is the point and all the charm and the key of success of a modern beekeeper.

The beekeeper is the only one knowing the biology of the bees, who feels the "spirit" of the colony and who can, in various situations, predict their behavior and react appropriately, with a big possibility of achieving the purpose he does the beekeeping for. All the others expecting to get everything in writing or said about how to do a successful beekeeping, almost never do it. That is why I will use one more opportunity to, in my own way, answer the question asked by several beekeepers from the middle of May till the middle of June. Why the bees swarm, although they have undertaken all the measures for preventing swarms — in the way the books read?

It is nice and useful for beekeepers to read and learn from other people's experience, but beekeeping is not a read book, because unknown "depths" of beehive have kept the secrets of bee colonies for centuries. One of them is natural swarming, which is especially important to beekeepers, therefore they do everything they can to reveal it. Many scientists have been examining the pre-swarming and swarming stage of colonies and have come to diverse theories. Gerstung (1891) suggested a theory presenting a colony with maximum population of nursing bees, which make the critical factor of swarms, because they produce the surplus of food for proportionally reduced area of young brood. Demuth (1921) thought that the overcrowding of the hive's brood area by brood and bees is the main cause of swarming. Colin Butler (1952) established a theory upon which queens produce the substance known as Queens Mandibular Pheromones (Q.M.P.). When this substance is available for worker bees in sufficient quantities, the bees do not build queen cells. On contrary, when they get the substance in insufficient quantities, swarming occurs. This theory has been proved experimentally. I accepted it personally and have been successful-

ly using it in the forming of nurse colonies with a queen. I limit the queen in the bottom super, above the excluder I place two honey supers with frames full of open honey. Above them there is a rearranged brood super full of young nurse bees. The Queen substance can not reach them or is below the needed threshold. The result of that is the acceptance of grafted larvae and the breeding of queen cells. Derek J. Gue (1998) published his new theory about causes of bee swarming. He claims: "Pheromone of a swarm is produced by nurse bees in a numerous, healthy colony during the swarming season and this pheromone is stronger than all the other factors".

Many recognized beekeeping practitioners stated their opinions about the causes of natural bee swarming, but it still remains the mystery in the unknown depths of beehive! In my modest opinion, bee swarming is a law of nature and bees swarm because they want to swarm! They swarm because the reproduction of the species is the most sublime goal of their existence. There is not only one cause of this ancient urge, but is necessary to, in certain circumpstances, fulfill several favorable conditions. Fist of all, it is necessary that the bee colony reaches its full development according to its genetic features, but also in accordance with the size of the habitat they live in. Nature arranged that the maximum development of bees fits into the period when at certain area there are enough honey plants blossoming, at which both the swarm and the parent colony will provide sufficient food reserves for their survival. The bees will not miss this kind of concordance of conditions, since the crown of their hard work, for centuries adjusted to many factors, are finished preparations and the act of swarming itself! Behind the stage in a crowded habitat, swarming bees take the reserve food from the comb that they will soon leave. When this happens, there is nothing else to wait for! With their mother queen, a crowd of bees burst out of the entrance of the hive and rush into the endless blue of a sunny day and the beginning of a new life together. The beekeeper watches them and realizes that, in front of him, in the crowd of agitated, almost in a trans, bees, something extraordinary, something sublime happens. He needs to understand their joy and endless happiness charming them in their circling flight, by which they end the ancient wish of all the generations - to survive as long as there is sunlight and eternity!

And how can a beekeeper hold out, if by this fascinating swarms going out he loses his entire yearly profit from beekeeping? If you don't make mistakes, you don't make anything, but we can also learn from our mistakes and they should not be repeated. Therefore, a beekeeper for his future work needs to learn more about the life and rules of bee colony and to use his own and the experiences of other beekeepers. In addition to this, a modern beekeeper needs to know that corrections are necessary in beekeeping, even in the beekeeping "truths", always in accordance with the time and always changeable conditions he does the beekeeping in. Beekeeping is a craft and art in breeding bees and their management, and the channeling of the laws of bee nature and subjecting them to the interests of beekeepers is not an easy job at all.

But when a beekeeper learns how to bee happy for his success and to bear bad beekeeping years, his omissions and disappointments, then he is already a real beekeeper, and the real beekeeper cannot be shaken by the mystery of swarms from the unknown depths of beehive!

A special attention needs to be paid to each of the periods of the colony development. The works need to be adjusted to current circumstances we do the beekeeping in, because every beekeeping year is a story in itself. In the years like this one, when favorable time and nectar flow conditions accelerate the spring develop-

ment of bees and maximize it before the main flow, for maintaining their working mood, the usual works such as expanding of the brood super, making young bees busy with building combs and adding of honey supers, are not enough. Demaree's method can for a while postpone the threatening swarming urge, but these are obviously extremely swarming years and it will not be a guarantee that the bees will not start the nursing of queen larvae.

The beekeeping literature describes many methods of using nectar flows and preventing of natural bee swarming. The most frequently recommended is that, before the beginning of the nectar flow, the queen needs to be limited, which is supposed to provide a rational usage of the nectar flow and prevention of natural swarming. In my opinion, it is completely wrong and, in modern beekeeping, irrational. My beekeeping practice convinced me that before the beginning of the main nectar flow (black locust, meadow, lime-tree) the queen does not need to be limited but provided with space!

About twenty days before the expected nectar flow, the first main flow, bee colonies that have been developing successfully have almost or entirely reached the maximum in the brood. Starting from then, the surface of young brood becomes decreased any way, without any kind of our intervention, therefore the mass of just emerged bees is left without employment. The brood super becomes too tight for them, and in the honey super without nectar there is no more work for them. Therefore they usually stand still in clusters in the space between the frames and the floorboard, waiting for the maturing of the queen cells and the call of nature to go on with the prolongation of the species. There won't be long until a swarm appears "out of the season"!

Instead of limiting the queen and feeding the bees with syrup (about twenty days before the expected nectar flow) I provide the queen with a space for expanding the brood, and in bees I simulate the swarms they want.

On the previously modified brood super (in my case consisting of a standard LR and one Farrar's super), I add one additional super with well built empty comb and one frame of young brood, in order to have the bees with the queen occupy it as soon as possible. When this happens, I divide the former brood super and newly added super in which the queen already lays eggs by a queen excluder. I keep this kind of stage for the following 5–6 days, to provide the bees in the lower part of the quenelles brood super with a close contact with their queen and that the young brood they are nursing become too mature for the possible breeding of queen cells. Then, above the former brood super, and below the excluder and the added super in

which the queen is intensively laying eggs, I add a honey super. With its volume and young comb it definitely divides the two brood supers. The colony is practically divided, without any kind of barrier, except for one queen excluder. Bees in the lower quenelles brood super cover and keep the mature brood warm, and the young bees coming out of it are recruited for the nursing of the bigger and bigger young brood, with their queen, but in "the other house". This kind of directing of the work of bees in a strong colony activates all the bees and keeps them in a maximum working mood. In case, in swarming years like this one, the bees "get crazy" and decide to start swarming and nurse queen larvae any way, they can do it only in the upper brood super where there is the queen and the young brood, i.e. where, upon my wish, they created the base for the future young colony.

This kind of, most frequently, good quality swarming queen cells in the newly-formed brood super can be used, because, by the beginning of the nectar flow, I divide the newly formed swarm from their parent colony. I return the queen from the swarm to the former brood super of the production colony, the bees of which accept it as a savior and with incredible working enthusiasm they start the renovation of the colony and using of the nectar flow.

Beekeepers and my students familiar with my working technique most frequently ask: How much honey will the weakened parent colony bring after the removal of a swarm in the main nectar flow? My answer is that it can never be predicted for sure, because the intake of nectar depends, first of all, on weather conditions during the blossoming of honey plants. There is

the possibility of a bad summer flow, thus there might be no enough intake even for the bees themselves. In that case, by removing of a swarm from a strong colony before the (never secure) nectar flow, we get something after all. In the years when the nectar flow is successful, my production colonies that have given a swarm will bring inside somewhat less honey than the others in full power and working mood, but the given swarm and the complete control over colonies in their swarming urge are sufficient compensation for maybe somewhat smaller honey crop from the main flow. In addition to that, if I later put the early swarm with a young queen together with the parent colony, this kind of colonies can bring extremely high crops in summer nectar flows and they enter the winter period very strong and with sufficient food reserves.

This does not mean that this is the only way it should be done. I myself always adjust my working technique to the circumstances of any kind I do my beekeeping in, thus, I would like to suggest everybody to adjust his/her beekeeping to the conditions and abilities. But, regardless all the differences, the dilemma remains about how to use intensive nectar flows with strong colonies in the most efficient way, and still keep the swarms under control, because, if there is no swarm control - the beekeeping lessons will be quite expensive!

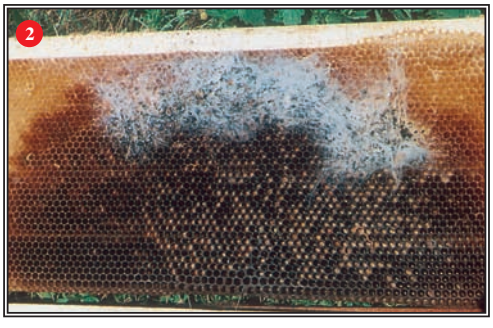
Ivan Brndušić
19210 Bor
46/9 Dobrivoja Radosavljevića Street St.
Tel: +381 30 435 128,
+ 381 30 33 810
Cell: +381 63 40 66 73
brnda@ptt.yu
http://solair.eunet.yu/~brnda

Born on September 20th, 1949 in the village of Homolj. Works and lives in Bor. Adores nature and bees in the nature. Have taken 150 bee colonies out of tree trunks.

What is Wood to Fire that is the Big Wax Moth to Wax

In the past ten years, I haven't found anything in the magazine related to fighting a big wax enemy. I am not offering an exclusive fight by this article, either; I would just like to, through photographs, warn of what we are to expect in case we allow the big wax moth an undisturbed development.

The big wax moth – Galleria mellonella L. (photograph 1) is a night butterfly of greyish-greenish colour (the colour of ash). The development capacity of this parasite is huge. If we consider only three generation of one butterfly, the parasites could destroy about 400 kg of wax. The butterfly lays eggs, which wait for favourable temperature and start their development on a deserted old comb where there used to be brood and obligatory some stored bee pollen (photograph 2). Once the eggs hatch into



larvae, the unmerciful destroying of wax begins. If we are late with melting the wax from empty frames, moths quickly invade the entire frame (photograph 3). After 30 days, the sufficiently grown larvae turn into nymphs, sticking to the frame itself (photograph 4). If the temperature is favourable, nymphs spin cocoons on a drawn comb on which there have never been a brood (photograph 5). For about 14 days, butterflies come out and the process repeats. The frame

invaded by moths turns into ash and, if touched, it looks as in the photograph 6.

After all the incompletely explained, we come to the question, how to protect against the moth?

It is very difficult to answer this question, since the wax moth attacks all wax foundations, drawn combs in which there have not been any brood, and how it looks like where it used to be a brood, we can see from the photographs.

We know that bees are the best protection for a comb. It happens that bees die and that we get a surplus of frames that are not for melting. In this case, I took the frames without honey and stored pollen in them, and which are not for melting, and sank them in a tub with cold water, where they stay for 24 hours. After that, they are taken out, the water is shaken out of the cells and they are left in a shade to dry. They should be turned so that their top bar is pointed downwards.

I was forced to do this washing of frames also due to biological fight against Varroa, because I needed smaller cells, which is the case in an older comb. In this washing process, it is surprising what cold water can draw out of an old comb. In the water, you can find even wax moth eggs laid during the previous or the current year. Those who want to fight moths this way, after the frames dry, please, smell the washed frames. You will be surprised.

Milan Jovanović was born on March 23rd, 1974. He has been in beekeeping since 1994, continuing the family tradition, currently with 50 DB and 50 LR hives.

Trojan Tragedy of Bee Colony

Milan Jovanović
37/16 Radoja Krstića St.
37240 Trstenik
Tel: +381 37 713 335
Cell: +381 63 8325 970
apiaryum@ptt.yu
www.apiaryum.co.yu

The fall of Troy happened when Troyans brought a wooden horse into their fortress inside of which the enemy was skilfully hidden, after which Troy was destroyed.

The key role was played by the "gate", spotted by the enemy as the weakness. The first thing they did after going out of the horse was to eliminate the gate keepers and open the gate. All this would not have happen if they had not taken the horse inside their fortress, i.e. the gate had not been open. Maybe the bee colony experiences the same destiny with Varroa. You wonder how?

Black bees

According to the findings of Taranov, considering foragers, the most important role in finding nectar is entrusted to the bees losing their tomentum and becoming darker in the first days of their forage.

He called them scouts and according to his findings, these bees are in charge of informing where and at what distance there is nectar in the nature. While waiting for the scout information, foragers are situated under or with the brood.

When a scout finds nectar and brings it in her honey sac, she goes straight in the centre of the foragers and among them, on the comb, performs signal movements, distributes a part of the brought nectar to them, then stops the signal movements and after the delivery of the load, flies out again. Following her game, the foragers fly out toward the food source.

Taranov also states the behaviour of the scout bees when there is a lack of nectar in the nature. At that time, they are attracted by the buzzing and the scent of nectar coming from the entrance of the neighbouring hives and they try to go in and reach it. Nevertheless, they face the strong resistance of the guards, which, according to him, have the ability of telling a forager from a scout bee. If a scout bee comes into some other hive, it takes the honey and goes back to its colony mobilizing its foragers.

Carefully observing, we can spot black bees. They represent a type of invisible unmanned aerial vehicle informing the bombers about the weaknesses of the enemy, while the bombers (foragers) are strong and capable of carrying lots of load.

The entrance is narrowed, but the fight of bees without killing and "silent" robbery still continues

Earlier, the belief was that the black bees are in fact old bees and that they lose the tomentum due to aging, but later on, it was found that it is not correct (Taranov) and it can be easily determined by marking just emerged bees and observing after 19 days.

Taranov claims that the existence of scout bees is justified, because, if every bee would look for the source of nectar individually, they would unproductively spend food and energy i.e. this would cause an increased food consumption. This means that when there is no nectar flow for a long time, and there is a subsequent increase in the number of scout bees, the increase in the food consumption is increased, as well. The assumption is that, due to the constant minus on the scale, a bigger mobilization of the "black scout bees" is performed because there is more need for those that search. Last year, many people noticed more "black bees" in the apiaries with bad nectar flow conditions.

The assumption is that colonies with bigger food supplies perform the mobilization of scout bees at much lesser intensity. This warns us that without a scale there is no beekeeping. The important thing is that the beekeeper knows that in a very short period, this way, he can lose big quantities of food. In a natural habitat, when the scale is in plus all the time, for a short period, there is a big mobilization of bees receiving nectar. Seeley claims that the number of bees receiving nectar, for one day only, increased from 550 to 2,000 after more than 15 waggle dances. This warns us that, when the flow goes weaker, the number of scout bees can also become increased in this short time. It can happen that in only two to three days the scale goes rapidly into minus and there is the loss of significant food stores, even run out of bees in the hive, which naturally depends on the food stores and on the way our bees rob. It can happen that in a moment we run out of both food (in case the beekeeper does not come to the rescue) and bees.

Komarov and Avetisyan have determined that for one-hour flight a bee spends 100 mg of food or 1.66 mg per minute (determined by measuring with a special scale of high precision). When flying out of the nest at the distance of 4—4.2 km, each bee takes 6.8—7 mg of food as a reserve and based on that they have concluded that if a bee flies 3 km away and does not fill the food reserve, she can not come back. How many times a scout bee needs to do the same if the quest attempt was a failure and if from day to day (in a period without a nectar flow) there are more and more of them? And it can also happen that she never comes back to the hive due to less and less food stores both in the colony and in the honey sac.

Last year, many people found empty hives during the summer, repeating the claims of experts that it is certainly Varroa and that the colonies left their habitats because of it, but here's one reason pointing that it does not necessarily mean that it is always it. And maybe it never has been, at least considering the summer period?

Castes

It has been noticed that during a strong flow bees visit weak honey plants, as well, and this raises the question (and maybe gives the answer) that among bees performing the foraging activity there are castes that even during a strong flow visit various plants, because, in case this would be only bees from one colony, it would have to be noticed that, in the peak of a strong forage, there is at least one colony with extremely poor performance, exactly as when the flow is poor. Since this is not the case, we need to ask ourselves why during a strong flow all the colonies in an apiary collect nectar from poor nectar plants, as well.

During a strong nectar flow, scout bees in time accept the information from other scout bees that perform the navigation which is more dominant for a new, stronger flow. The strength of the nectar smell reduces the ability to recognize bees, that is why it is easiest to put the bees together (and reduce the fight to the minimum) during the bigger processing of nectar. Later on, when the nectar flow is ceasing and there is no bigger nectar processing, the smells are weaker and the mutual recognition of bees by all their scents and pheromones is much easier, therefore the putting together is made more difficult.

It can be dangerous if some scout castes are directed to the honey stores of some other colonies. They probably won't leave it in the beginning of a strong nectar flow, unless they accept the navigation of other scout bees. Furthermore, "silent" robbery is possible even when there is a strong flow, because "black scout bees" probably do not make any difference between the nectar in nature and the "comb nectar".

The existence of castes is spotted also when scout bees are looking for a space for the swarm, as well as in the moving of the swarm. Thomas

D. Seeley states that when a swarm is looking for a new habitat, the scout bees that choose the best place win, while the rest of the scout bees join the "dance" for the new "better" location. He also states that there is some kind of consensus, but the way he describes the behaviour during the moving of the swarm tells something different.

The moving of the swarm itself, which is never in one direction, shows that castes "go each their own way" and the question is whether information about the "better place" is adopted at all, because it is rather a web of circumstances. According to his findings, it is more likely that the first scout bee in quest comes, starts its dance attracting a bigger number of bees to accept her as the guide. If no other scout bee comes during that time, the number of bees accepting the information becomes bigger and bigger. In case some other scout bee comes, it starts its own dance and also allures its "caste" and so on, every next scout bee in the same way. Lindauer (1955) states that the number of potential places for a swarm nesting can range from 13 to 34.

It can happen that there is a scout bee that has not gone to its scouting yet, thus she receives the same information and goes toward that place. When she comes back, she repeats the same information, that way making a caste for the same place. When this swarm goes out, every caste has its own force (*meaning the physics term force in virtual sense – editor's note*) and it goes its own way. The resultant of these forces represents the direction of the swarm moving and it changes by each part of the second depending on the jerk, i.e. the change in direction and current strength of individual forces, sometimes disturbing the compactness of the swarm that way. That is why the swarm makes inarticulate movements when moving.

After all the bees from the swarm fill their honey sacs before going out of the swarm, this kind of moving can last only until the energy (honey) is spent. It can happen (according to Seeley) that the swarm temporary stops on a branch and waits for the final decision. But I would not say that it is because of some kind of consensus. Maybe it rather depends on the queen because she does not have flying predispositions as a bee and cannot endure this kind of jerks and that kind of moving because she is heavy, only few days ago she laid eggs.

In case they do not come to the place chosen by the scout bees attracting the biggest number of bees, and the bees spend the majority of their energy, they won't have the strength to go on and the swarm stays where it is at the moment. Sometimes the swarm divides in two. It is probably the case when two strong forces start to act in different directions.

If the Seeley's claim that the "better" place is chosen is true, and that there is some kind of consensus happening, we would not be the witnesses of some swarms inhabiting very bad places and with a little bit "better", more ideal space nearby, more appropriate for their habitat.

It happens that the swarm is situated on a branch near the apiary. The assumption is that it is the consequence of the queen's inability to fly, regardless the strong force directing to the destination.

Considering the foraging activity, there is also a valid justification that the nature itself is arranged in a way that in the majority of cases it has excludes the monoflora and that the diversity still prevails. This kind of bee urge for diverse food is utterly natural, because it has been noticed that monotonous food can be harmful.

Silent robbery and horizontal transmission of Varroa

In a long nectarless period and with the increase in the number of scout bees, the "horizontal transmission of Varroa" (among various colonies) is accelerated, which becomes very dangerous for already exhausted colonies. The relation between the secreting of nectar and "horizontal transmission of Varroa" is spotted and has a logical explanation in the increase in the number of scout bees and can tell us that the least infection will happen when the flow conditions during the year are favourable, which tells us that the "horizontal" transmission has far more effects than the "vertical" one (transmission to the descendants).

Let's look at the data from M. N. Kosarev. He observed the behaviour and Varroa infection in Burzan woods of Bashkiria and compared the infection in natural and tamed colonies in various periods of a year. He says: "In the beginning of the season, the level of infection in modern apiaries and in the woods with colonies in tree holes was similar (4–6%), in the beginning of June 1–3%, and in August increased to 8–20% averagely. Since the appliance of medication in colonies in natural habitats is hard to perform, these colonies are left without any treatment. In five years, from 1982 to 1986, only

the samples of bees were taken so that the percentage of infection with Varroa could be determined". It is interesting that in June the level of infection decreases, which can tell us that the "vertical" transmission has not played a significant role. On contrary, the level of infection is decreased, although there was a "horizontal" transmission at that time, as well, but much lesser. Carefully observing, I noticed that, in a nectarless period, bees that participate in a silent robbery go freely in and out from one hive to another. A good deal of them certainly wears Varroa mites on themselves.

A black scout bee is waiting to come into the hive, while the guard is trying to send away a predecessor of hers

Without any fuss, the guard recognizes the scout bee and tries to send her away

I have also noticed that the guards are hostile toward certain bees entering the hive, but still let them go in. It is inevitable that in bees, the same as in people, there is solidarity. Thus I have made the difference between the robbery and the silent robbery. Silent robbery can be present all the time. When foraging conditions are favourable, it is relative whether there is a silent robbery or not, but it is certain that the silent robbery is possible at that time, as well. I assume that the big number of scout castes, considering the foraging activity, lead toward more frequent horizontal transmission, especially based on the Lindauer's data on the number of places scout bees find for the swarm settling. It is realistically to say: when the foraging conditions become unstable, it is possible to have the horizontal transmission from about 30 places in the apiary and the surrounding. The number of places, as well as the frequency itself, depends on the concentration of the colonies per area unit.

If the number of bees in a caste is small, than the occurrence is called "the silent robbery", and in case a bigger number of bees respond to the "call" of scout bees, robbery, resistance and fight occur. Its seems as if the nature says: "Moderateness – yes, voracity – no".

Narrowed entrance and alighting-board

Many beekeepers keep the entrances narrowed during the year explaining that there is no robbery or the damage from it is lesser when they are not around. Is it necessary to have a large entrance and of which kind of shape it should be? Is there any damage when the entrance is lesser?

Has anyone ever dared make this kind of experiments, when any reasoning is excluded when you see the "struggle" and crowd of bees at the entrance? After all, it would be expensive to try something illogical with a bigger number of colonies.

Is there any harm from having a crowd at the entrance what so ever? Maybe it is vice versa, maybe there is some harm from the crowd, but generally speaking, it is probably symbolical! Maybe the crop will be somewhat lesser, but something else would not be there, either. Varroa mites!

When will bees, coming back from a forage, be more likely to recognize their colony? When there is a cloud of pheromone in front of the hive (due to the crowd) or when it is not there? Will they be more likely to get lost if they by mistake come across some other's cloud of pheromone? Will they miss at all? Since the "robber bee" is accused of bringing Varroa mites in, does it mean that there will be lesser Varroa mites brought in, as well?

The same question stands for the drifting drones, although, according to the experiments of Livenec (1949) who observed the drone drifting, there are data that the drifting is very rare. True, the Carniolan race was the only one he did

not include in the experiment, but the data are as follows: in Italian drones, drone drifting to other colonies was 1.75%, with Bashkirian 1.47%, with Caucasian 0.85%. Analogue data have been provided also by Gubin and Halifman.

Many people believe that bees waste their time if their entrance is made more difficult. Nevertheless, maybe it is all relative? If a bee waits at the entrance for 5 seconds to go in, and there is a crowd, is this waste relative considering that the same 5 seconds will be wasted if there is less nectar in one flower than in another, therefore she wastes her efforts to use the flower, not knowing about its poor capacity. Since time is relative, this is relative, as well, but worth considering.

Let us ask the first question about the justification of alighting-board in hives. When the man made the alighting-board, did he think why bees needed the alighting-board in the first place? Do you think that a bee is not able to fly up from the spot? Do you think that she needs some kind of running start (like a plane) or her performances are more similar to a helicopter?

There is really no such a thing in nature. And it does not matter, and have you ever wondered do we really need to have the alighting-board? Do you think that, when a tired bee alights to the alighting-board, she will have a better rest in horizontal position? Or you think something else? That she has a lot of trouble with vertical position? Does she put "much more" efforts if she rests in vertical position (on a tree bark where there is not an alighting-board or on the external wall of the hive)?

When a "tired" bee comes back from a forage, she falls in front of the hive or on the alighting-board and rests for a while or immediately starts to crawl through the entrance, climbing up the internal wall of the hive, up to the top bar, and, not sooner than then, goes down to the frame. Those that do not stop and fall in front, directly fly in through the entrance. In this crawling bees do waste some time, but is this time longer than the time when after the rest they directly fly in through the circle entrance, and is it easier at all for them to take a short flight or to take a longer crawl? Who haven't noticed this, please measure, but I assume that there won't be any significant difference in time if there should be any?

But let's ask ourselves whether sometimes this "waste of time" can be useful? Taranov says: "*When there is a lot of stored nectar in the nest, the receiving of nectar is slowing down, 10—12 receiver bees take it over from the foragers, spending a lot of time on taking the food over. At that time, there is a new type of signal movements of the scout bees on the comb and the informative signal to stop the foraging, although there is nectar in the flowers*". Meaning, the number of nectar receivers is increased first.

Does this increasing continue till the moment when all the bees take over the job of receivers, and there are no more of them available, and the scout bees keep looking for them? But, what if Taranov was wrong about this? What if he has drawn a wrong conclusion that bees by their dance request the stopping of the forage?

Maybe it was not the signal about stopping the collecting of nectar, but the signal that more receivers are needed. In one moment, there will be no more bees because they have all been engaged in receiving. But, the signal still continues, until, in one moment, the forage stops because receiving is very slow.

That way maybe the struggle and crowd at the entrance are not harmful due to the uniformity in the nectar delivery, because there is no use if the entrance is large — there will be no one to take over the brought nectar.

With a small entrance on a vertical plane (either circle or some other shape) the defence system is much better. There is a "bee web" and the access of intruders (scouts) is much more difficult there than at the lower entrance. When demonstrators are pushing the police cordon, they will push it away depending on the thickness, but also the width of the cordon. The same number of demonstrators will have much more difficulties to push away the same number of policemen if the street is narrower, because with narrowing of the street, the thickness of the cordon is becoming bigger and the resistance is becoming bigger, as well. We do not compare the man with the bee here, but we compare the resistances.

Findings of Ivan Brndušić

Ivan's several-years findings in nature and claims about the advantages of using the circle entrance are very interesting. Both Seeley and Brndušić have noticed similar sizes of the openings that maybe currently exist the most in the nature. Seeley states that bees like the entrance placed on the southern side and opening that is smaller than 7.5 cm^2, which is about 3.08 cm in diameter, while in Brndušić it is 3.5 cm.

Brndušić states that bees propolize the circle opening reducing it themselves as needed, and we have already found enough reasons why they need to do that. The colonies he monitors in natural habitat resist Varroa. His hives have circle openings and his colonies have been surviving for many years without using any chemicals. It happens that in time some of them die, but he also says that when he once treats with chemicals, according to him, the colonies lose their resistance and die. The intensity of chemical effects on the nervous system of bees is very hard to determine. Do the preparations affect the ability of recognizing and for how long do these effects last? Taranov says: "Guard bees have the ability to discriminate foragers from scout bees".

With people, various forms of chemical medicines have various effects on the nervous system. When a man takes heavy drugs such as heroin, he loses the ability of recognizing his surrounding and people around him.

We still do not now whether fluvalinat, kumafos, amitraz and other chemicals are heavy drugs for our bees, but there are some findings that queens suffer damages with bigger doses of chemicals.

In his monograph "Honey Bee Ecology", Thomas D. Seeley states seven elements bees take into consideration when choosing a new habitat. First of all, it is the volume of the cavity, and secondly, the size of the opening.

What can also be favourable for Varroa mites in colonies in nature are the possibilities for finding appropriate habitat in nature, increasing the possibility of "horizontal" transmission if the choice is lesser, as well as the presence of weak colonies and concentration of colonies per area unit.

In his apiaries, Ivan Brndušić keeps the entrances open, applying the system of vertical defence and his colonies resist Varroa, but does it work for him if the nectar flow conditions become unstable and others surrounding him leave possibilities for more frequent horizontal transmission (common entrances), that his scout bees are going to use with his foragers without any sentimentality?

Is it sufficient that only one colony in his apiary has an inadequate opening (regardless that

all the others have a narrowed one) to have all start going down headfirst, and favourable for Varroa? It's because horizontal transmission is probably reciprocal, i.e. it is possible to bring Varroa mites in, but it is also possible to take them out.

Ivan Brndušić adds to all this: "If you chose circle entrances, you need to do this on all of the hives, because those colonies that remain with the entrance on the bottom board can be damaged and die from robbery.

In case the concentration of colonies per area unit is bigger, the frequency and speed of Varroa transmission becomes bigger and bigger, which gives an explanation why big apiaries can suddenly be destroyed.

And another interesting thing for the end. The massive spreading of Varroa happened just at the moment when modern hives with their construction started to occupy apiaries worldwide. Has this speeded up the horizontal transmission, since beekeepers have been enabled to change the century-old system of defence, to control the narrowing and expanding of the entrance, interfering their own will into the job of bees? Is it possible that Varroa had existed before, as well, and no one had even cared because it was hardly noticeable in a small controlled number?

A big question remains, whether Varroa will go back to the controlled number if we would all have maximally narrowed entrances, if we apply "vertical" system of defence and "bee web", just as it had been for centuries. True, for centuries, bee habitats had been hidden in the woods, and not on meadows exposed to the sunshine.

Lots of things point that silent robbery kills "silently". With beekeeping conditions we have today, without the presence of big food supplies, with today's system of defence, big concentration of colonies per area unit, conditions for this kind of occurrences are realistic. Judge for yourself, but before you judge, go into the nature, i.e. what is left of it. Observe natural habitats, entrances, systems of defence, and many other things. First of all, you will notice that the alighting-board and standard entrance has been invented by someone, because, in nature, you will not find any.

Prof. Jovan Kulinčević, PhD
Belgrade, Apicentre
Tel: +381 11 397 45 40
kulincevic@bigfoot.com

He was born on September 30th, 1928 in the Village of Rađevo near Valjevo. He graduated from the Faculty of Agriculture in Belgrade, with Fruits and Viticulture as his major. He went for his postgraduate studies and won his doctor's degree at the University of Bon in 1965. He was an assistant at the Beekeeping Institute in Bon until 1967. After that, he was at post-graduate studies in the USA (Ohio State University, Columbus). At the same university, he was the scientific consultant and part-time professor for the subject of beekeeping till 1981. He published several dozens of scientific works in the USA that are cited worldwide. From 1982 till 1984 he was a professor at the Faculty of Biology in Belgrade till 1984, when he was elected full time professor at the same faculty. He worked at the Agroekonomik company as a scientific consultant for beekeeping till 1995, when Apicentre was established, which he leads today, as well.

Stress and Bee Colony

Contrary to many other animals that modern man breeds for economic benefits, honey bee is much more related to natural environment. In natural conditions and without a beekeeper, she acts in the same way as in habitats (hives) made especially for them. An absconded swarm in a natural habitat (hollow tree, recess in a rock or similar) will have no problems surviving if there are enough sources of nectar and pollen in the surrounding.

Due to dramatic changes brought by modern civilization regarding the usage of natural resources, it has become common that many negative things that occur in the life of man, animal, even plants, are imputed to stress.

Very often, our people, including beekeepers, are not clear with the term stress. It is correct that it is not quite defined factor or type of disease, but it has definitely been determined that it is a stage weakening the organism of a man or some other living being. In short, various unfavourable conditions of environment are reflected as stress, which can weaken the organism, or, in our case, a bee colony, thus, some other diseases can often become more expressed.

A bee colony should be considered a type of reservoir in which energy flows in the form of nectar, pollen and water in order to be turned into bee products (honey, wax, pollen reserves, brood and bees). Everything unfavourably affecting and reducing the intake of energy in the shape of above mentioned sources can be considered stress.

A beekeeper is mainly interested in the using of that energy material from the hive in the form of bee products, and modern agriculture for cross-pollination through spending the energy of worker bees. It is obvious that the beekeeper himself, with his desire to use the bee colonies to the maximum, becomes one of the stress components.

Weather conditions may be potentially one of the biggest sources of stress for a bee colony. Unfavourable weather conditions reduce or

completely stop the intake of nectar and pollen into hives. In spring, early nursing of a brood requires a big quantity of energy in the form of food. A sudden stop in a foraging (low temperatures, rainy days or closing of the hives because of moving or using insecticides on crops) causes a heavy stress in bees. It is especially manifested if there are not enough honey and pollen reserves in the hives.

In this kind of situation, bees react to stress by stopping the queen's laying and adequate nursing of the brood. In line with this, they throw out previously bred brood. This way, the development of the bee colony stops, which is a type of reducing the "investment" in the strengthening and growth of the bee colony. In this kind of stressing conditions, a good beekeeper provides the source of food by feeding bees. Under certain conditions, water supply for a colony can become critical. It happens in dry parts of the year, when foraging bees need to spend a lot of energy for bringing water (big distances and increased number of forages). Water is necessary for young bees for the secreting of brood food and dilution of honey for feeding the brood. At extremely high temperatures, a young comb can start melting in the hive if there is no water source, regardless the ventilation performed by bees. The beekeeper needs to decrease this type of stress by providing a feeder with clear water. On the other hand, in cold weather, humidity must not remain in the hive, because it would have the effect of stress on the winter cluster trying to maintain certain temperature in the nest. Too dry air possibly caused by the artificial warming of the hive is also a potentially stressing condition. No matter how hard the bees try to maintain the brood temperature at 34 to 35, a fast increase or decrease in the external temperature will reflect as a stress. Everything that has a negative effect on the bee ability to regulate the brood temperature (cold and moist location) causes a bigger usage of energy. Chilled brood is an excellent example of the bee colony stress. There, we have too large brood for the number of bees that need to warm and feed it. The consequence of this kind of conditions is the dying of the brood along the edge of the nest. Therefore, it is necessary to spend more energy in replacing the dead larvae and pupae, especially in removing the dead brood from the comb and from the hive.

Any of the factors having bad effects on the balance in activities inside a bee colony can be considered a stress. Some of these important factors are: power of the bee colony, relation between the adult bees and the quantity of brood and capacity of the queen laying. All this determine the need for energy in order to have the bee colony function normally. Since larvae are fed with small quantities and high frequency, it is necessary to have a bigger population of young bees in the hive. At the same time, it is necessary to have an appropriate number of adult bees for bringing in nectar, pollen and water. Two factors that can radically change the balance are swarming and insecticide poisoning. An artificial swarming a beekeeper performs under unfavourable natural conditions has a similar effect, especially if it is not performed professionally.

Too frequent and often unnecessary manipulation with a bee colony can have the stress effect, especially when performing it under unfavourable nectar flow conditions. The same stands for the usage of smoke from the smoker when examining bee colonies. Many years ago, comparative researches in Germany determined that the smoke has the stressing effect. Bee colonies in which spraying water was used instead of smoke had much less Nosema and bigger honey crop in the five-year period of research.

The best general rule to avoid stress is to maintain the bee colony in full power with

always present food reserves, with a young and good quality queen. Today, considering keeping bees, an especially big problem is the parasite called Varroa destructor. On one hand, it is a dangerous parasite of brood and adult bees that, at certain conditions, causes a disease by acting as a direct parasite, and can also cause stress, which activates the effects of viruses and other micro-organisms, causing the known diseases of honey bees (European Foulbrood, chronic and acute bee paralyses and similar). Varroa can also serve as the vector of causes of these diseases.

Recent researches have shown that a series of other viruses, about which we have not known much, can contribute to the destroying of colonies, the immunity of which has been weakened because of the Varroa parasites. This can be also said for Nosema, caused by Nosema apis.

By removing Varroa, the colony is released from direct parasites, but also from one, maybe the main cause of stress. It is necessary to do this timely, before the complete destruction happens in the colony. Sometimes the number of Varroa mites in the bee colony is not crucial for the full effect of the infection, because other unfavourable factors we mentioned above can additionally contribute to the total unfavourable effect on the colony.

In case there are no viruses in a bee colony, although there is a big number of Varroa mites, the colony will survive. It is obvious that the relations between viruses and Varroa mites in bee colonies are much more complex than they appear to be.

On the other hand, if you use too much chemicals and other means for fighting Varroa, there is a new stress effect that can be reflected through disorientation, shortening of bee life, acute or chronic poisoning of the certain part of bee population in the hive and a permanent loss of immunity.

Although today's society more and more recognizes the role of stress in all the spheres of its being, it is necessary to know much more and put much more efforts in order to remove the stressing factors from the man's environment affecting the life of honey bees. All the beekeepers need to bee aware of the role of stress, regardless whether it comes from the outside, or the beekeepers cause it by their actions and their big desire for profit.

Vlastimir Spasić, engineer, was born on June 5th, 1952 in the village of Đakus, Žitorađe municipality. He lives in Niš. He has been in beekeeping since 1990 with LR hives. He is the president of the Southeast Serbia Regional Association of Beekeeping Organizations. He is also the president of the "Matica" ("Queen Bee") Beekeeping Association of Niš, the member of the SPOS Executive Board and the president of the SPOS Marketing Board. He is the winner of the SPOS Gold Medal. He is a years-long lecturer of SPOS.

Children As Consumers The Right Opportunity

Vlastimir Spasić, Eng.
18000 Niš
98/12 Bulevar Nemanjića St.
Tel: +381 18 531 754
Cell: +381 63 8778 466
maticanis@yahoo.com

Introduction

The basic marketing principle is the awareness of the customers' purchasing behaviour. A beekeeper, the immediate producer of honey and other bee products, in the conditions of unorganized distribution upon updated principles of sale, remains the first and only marketing manager.

Having this role, he/she needs to know his customers, individual consumers, well, in order to identify mutual and specific needs of buyers. Getting to know the buyers is the initial position in the creation of a personal, individual marketing strategy.

The customer purchasing behaviour is the studying of marketing environment of the

purchaser and generally comprises of: political-legal, economic, technological, socio-cultural and environmental surrounding. From analyzing the environment, we come to the findings about needs and wishes, attitudes and beliefs of the consumers and their purchasing motifs.

The examining of the consumer behaviour provides beekeepers with information in the function of keeping the current and obtaining new purchasers, i.e. in the function of the increasing of honey consumption.

A deeper understanding of customer purchasing behaviour can be obtained through analyzing the answers to the questions: how, when and where a customer buys, his/her selection criterions and who is important in the purchasing decision making.

Answers to the question asked can be provided through immediate, personal contacts with customers or through a market research. In our country, there has not been a thorough and systematic honey market research. Truly, a significant attempt in this field has been performed by the Beekeeping Society from Trstenik, but upon a pretty modest sample. In this article, I would like to draw attention to a very important category of purchasers, children.

Attractive packages attract children

Children – great purchasers

The purchase of honey is individual. An impulse for making the decision about the purchase can come from an authoritative individual, friend's recommendation, or a group such as family, household, institution or similar. Economic propaganda, having a significant impact on the purchasing decision making in the world, hardly exists in our country. The first move in this area has already been done in Serbia, by printing the brochure entitled "Honey, miraculous food and medicine" in the record volume of over 650,000 copies.

The brochure aims to illuminate a little bit yellowed picture about honey. Honey, periodically in the shade of seasonal raspberries, sour cherries and water melons, needs to provide its presence on the table throughout the year. Therefore, we need always new actions and ideas.

The initiators of a purchase can be various family members. In our community, children are the rarest initiators of honey purchases, although there are the most important population; they are the present and future purchasers. In the purchase of many food products (crisps, chocolate hazelnut cream, ice-cream, chocolate) children put a strong pressure on their parents who make decisions about the purchase. Therefore, children are our insufficiently used opportunity. It can be used by attracting the attention of children by a free toy, special packages in the shape of a toy or an award when buying.

The most common honey package, the 1 or half-a-kilo jar, is completely uninteresting to children. The imagination of package producers seems to be ended by the designing of the bear-shaped jar. The only purchasing motif is the motif for food, the decision of which is made by parents. The emotional impact of children has been completely neglected. Children know how to start crying, be angry or silent if they do not get the toy or the product they want.

For a bigger consumption of honey in children population, it is not sufficient to have the traditional way of consumption, by spreading it over a slice of bread. Children would love to accept honey if we offer it in many other ways (with hazelnuts, sesame, peanut), which are at the same time great creams. Pastry, pancakes or yoghurt with honey, as well. For our habits, it may be unusual, but fried eggs or hot dog covered with honey have been well accepted (in the

USA, there has been an extremely popular sauce made of a very tasty mixture of garlic and honey for meat specialties). Furthermore, honey is used for pouring over fruit salad and ice-creams. Sour cherries covered with chilled black-locust honey are extremely delicious as a summer desert. Beekeepers should know bee products very well, as well as possible ways of consumption, and recommend them to children and parents in a popular and amiable way. If we want a higher consumption, the honey market needs to be expanded to a variety of food products.

Researches in developed countries have shown that in family purchases, men make more than a half of decisions related to the purchase of food products such as fruit, vegetables, jams, non-alcoholic drinks and similar (D. Jobder: Principles and Practice of Marketing, Megraw-Hill Book Company, London 1995).

Children belong to the category of emotional purchasers, because, generally, they are not very or are rarely interested in their parents' purchasing power, and decide to buy a product upon the influence of the environment (sellers, friends, ambient, trend, TV commercials and similar).

Children as consumers make various markets: primary, when they individually make decisions and do the purchasing; influential, when they directly or indirectly influence their family members; future, when by growing up their influence becomes stronger and stronger and leads toward their independent and more and more active behaviour as consumers (Jams U. McNeal, Kids as Customers, A. Handbook of marketing to children, Lexington Books, New York, 1992).

As consumers, children attract more and more attention of marketing agents, considering the fact that they make a complex, dynamic and challenging market. Children have always had a strong influence on product purchasing, where they often independently make decisions when buying sweets, toys, fast food and similar. Furthermore, children have more and more influence on mutual decisions within the household related to the acquiring of certain types and brands of food products.

According to researches in the USA, (36 million boys and girls between the age of 4 and 12) more than ever before, children make the main market with 24.4 billion dollars of immediate purchasing power and 187.7 billion dollars of direct and indirect influence on purchase. The yearly increase rate in the children expenses in the purchasing of goods is as high as between 10 and 20%. The influence of children on family purchases is estimated to 110 billion dollars for food products, 26 billion dollars for purchasing toys and 22 billion dollars for the purchase of fast food. The estimate is that, by the beginning of the third millennium, children consumers in the USA will yearly spend about 35 billion dollars of "their own" money and 300 billion dollars of their parents' money, for buying food products.

According to the census from 2002, the Serbian market includes 7,594,000 citizens. Regarding the population's sex structure, the participation of male (49.6%) and female (50.4%) population is nearly equal. Children younger than 14 make 1,176,770, i.e. 16% of the population in total (Federal Institute of Statistics, Statistical Yearbook of Serbia, Belgrade, November 2003). If the children of this age would consume approximately 1 kg of honey per year, it would make the consumption of 1,176 tons of honey, which is 19.6% of the total yearly production in Serbia.

Conclusion

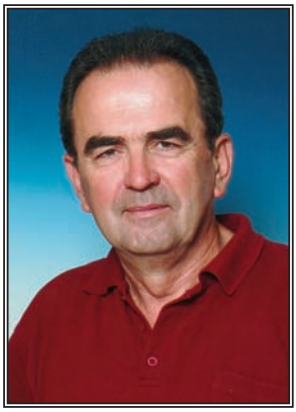
Marketing activities begin and end with consumers. Whether we are ready to create adequate personal marketing strategy depends on how well we know the consumers.

Without information about the needs and motifs of consumers, their behaviour in various purchasing situations and various factors influencing the purchasing process, we can not imagine a success in the distribution of products, in our case honey, on our and foreign market.

The text you have just read draws your attention to children as one of important categories of consumers.

Life Story of the Beekeeper Veroljub Umeljić

Veroljub Umeljić originates from a family with a long beekeeping tradition. According to material and other evidences, his family has not been without bees since the mid 19th century.



He was born in 1949 in the village of Oplanić near Kragujevac. His home was about ten meters away from the apiary. Since early childhood, he assisted his father Miodrag in examining the beehives.

In 1967, after his father's early death, being a graduated high-school student, he took over the care of the apiary himself, therefore considered to do an independent beekeeping as early as then. Thus, there are nearly 40 years of his beekeeping practice.

As a mechanical engineer, he worked at the "Crvena zastava" Institutes, doing the beekeeping in line with it. In 1994, he left the Institutes and since then he has been in professional beekeeping.

He does his beekeeping with about 150 DB hives, moving them during the season to several nectar flows. In line with that, he works intensively on producing colonies, as well on rearing queens for the market.

Since 1992, he has been an official lecturer of the Serbian Federation of Beekeeping Associations. In line with professional beekeeping, he is intensively in art photography about honey plants and the life and work of bees in general. Thus far, he has over 15,000 various photographs on the subjects. He has had 20 individual and several mutual photography exhibitions entitled "In the World of Bees" in various towns of Serbia and Montenegro. Many of his photographs of big format beautify the homes of beekeepers and other fans of nature, as well as the premises of various institutions.

He is the winner of the international competition for the best beekeeping photographs (Virtual Beekeeping Gallery – www.beekeeping.com/goodies/images). He is the collaborator of several domestic and foreign beekeeping

magazines, wherein he has had many professional articles and beekeeping photographs published. His articles are present in many beekeeping symposium proceedings, as well as in similar specific editions.

He is the winner of many domestic and international awards (APISLAVIA's gold medal, APIMONDIA's bronze medal).

In 1997, he published his first book entitled "In the World of Bees". It has found a great interest among beekeepers, therefore four editions in several thousand copies has been issued thus far. The subject of the book is beekeeping technique, and it is illustrated with the author's original photographs and drawings.

In 1999, he published the "Atlas of Honey Plants", part 1, the book containing 333 species of various honey-pollen plants, illustrated with about 1,500 original colour photographs, also taken by himself. Each plant is illustrated with at least 4 photographs, one of which is obligatory the photograph of a bee on the flower, by which the author shows that the plant is a honey plant, i.e. pollen plant. The book, among other things, contains the botanical description of each plant, its richness with nectar and pollen, as well as the features of the honey and pollen produced from it. In addition to Latin and Serbian, the names of the plants are also given in six other languages (Russian, French, English, Hungarian, Macedonian and Slovenian).

In 2003, he published the "Atlas of Honey Plants" part 2, with additional 337 species of honey plants that had not been presented in the part 1, also illustrated with about 1,500 photographs.

This two-volume "Atlas of Honey Plants" edition is a capital work in this field, because, on 1,440 pages, among other things, it contains the presentation of 670 most important world honey plants, illustrated with about 3,000 original colour photographs, then 5,600 names of the plants, given in 8 languages and classified in separate registers. There is also the glossary of botanical terms, as well as the register of the names of diseases in the treatment of which the described plants can help. The author has travelled many areas in order to personally take the photographs of all the plants presented in these books.

The world value of these books was confirmed at the APIMONDIA Congress 2004, held in Ljubljana, where, for the two-volume "Atlas of Honey Plants", the author was awarded the bronze medal. Therewith, these books entered the three most important word works in the area of beekeeping. Considering that the gold medal was awarded to the English book on the bee biology, and the silver one to the New Zealand's book on bee diseases, we can consider the "Atlas of Honey Plants" the most important world work in the area.

These books have attracted the great attention of domestic and world public. They have been translated in Bulgarian and Croatian, and there is a great interest for the translation in other languages, as well.

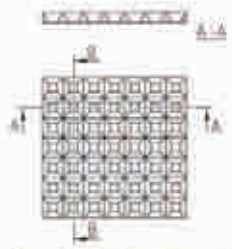
Veroljub Umeljić lives and works in Kragujevac, v u m e l j i c @ p t t . y u , Telephone:
+381 34 362 879

Gallery

SERBIA

Newly Patented in Serbia and EU

I Plastic screen for anti-Varroa bottom board and for collecting propolis



The screen is an even perforated plastic board comprised of three-cornered strings interwoven at right angles

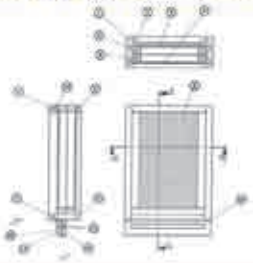
A detail of the screen on the anti-Varroa bottom board

Varroa mites fall through along the sloped surface

A detail of the propolis screen

Propolis (pollen granulated and falls out of the screen easily)

II Hygienic bottom board



The bottom board consists of a wooden frame, anti-Varroa full floor and changeable joint alighting board. Basic features of the bottom board are as follows:

a) the entire area under the bees is free for Varroa mites falling through;
b) floors can exchange places depending on climate conditions
c) it is possible to separate the bees from the floor so that they do not fly out of the hive while the beekeeper changes or cleans the floors;
d) the joint alighting board enables:
- quick closing of the hive with retaining the entrance ventilation
- folding over of the alighting board and leaving the hive without the alighting board but retaining a small opening for the protection from robbery
- expanding of the alighting board for double space for more secure landing of the bees with nectar

Innovator: Savo Ocokoljić, Grad. Eng. Serbia, 31320 Nova Varoš, 23/10 Teslina St.
Tel: +381 33 61 459; Cell: +381 64 2178 664
marijasoc@yahoo.com

QUEENS **QUEENS** **QUEENS**

Apicentar d.o.o. is a specialized enterprise for both breeding and commercial reproduction of honey bee queens. It is licensed by the government of Serbia for this kind of work in agriculture. In our selection program, we are utilizing line breeding of Serbian ecotypes Apis mellifera var. carnica. Since 1982, we have maintained eight selection lines with a period of two years for testing honey productivity, gentleness and disease tolerance in each selected generation. We are the largest producer of selected honey bee queens in Serbia and Montenegro, and our capacity exceeds ten thousand mated honey bee queens destined for domestic beekeeping, as well as export to other countries.

APICENTAR,
Prof. Jovan Kulinčević, PhD

Serbia & Montenegro, 22400 Ruma, 46 Kraljevačka St.
Tel: ++381 22 429 569, Fax: ++381 22 421 675
BiH, 76100 Brčko, 12 Semberska St.
Tel/fax: ++387 49 340 443
Bulgaria, Sofia
Tel/fax: ++359 2 84 031 33
Croatia, Osijek, Api complet
Tel: ++385 31 274 007
evrotom@hotmail.com
www.evro-tom.com, www.evrotom.da.ru

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Business for production, preparing and circulation
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fax : +38115692144
e-mail : agrofrost@verat.net

TÜV CERT

HACCP

Export number - 684

Purchasing, freezing, processing, packing and distribution of fruits

Purchasing, packaging and distribution of honey and wood-honey