

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/306040632>

# Flowering period length and seed quality of medical honey plants.

Conference Paper · September 2014

CITATIONS

0

READS

69

3 authors, including:



Vladimir Filipovic

Institute for Medicinal Plants Research "Dr Josif Pancic" Belgrade, Serbia

176 PUBLICATIONS 567 CITATIONS

[SEE PROFILE](#)



Vera Popovic

Institute of Field and Vegetable Crops

521 PUBLICATIONS 2,364 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Development of innovative methods of organic crop production toward increase of climate neutrality of agriculture. [View project](#)



Revitalization of Small Agricultural Farms through Energy Crops Cultivation and Biomass Production [View project](#)

**XVIII INTERNATIONAL  
ECO-CONFERENCE® 2014  
24<sup>th</sup> - 27<sup>th</sup> SEPTEMBER**

# **SAFE FOOD**



**PROCEEDINGS**

**NOVI SAD, SERBIA**

## *Scientific Committee :*

### *President:*

- **Academician Rudolf Kastori**, Academy of Science and Art of Vojvodina, Novi Sad, Serbia and Hungarian Academy of Sciences, Budapest, Hungary

### *Vice-Presidents:*

- **Prof. dr Pavle Sekeruš**, Vice-Chancellor for science at the University of Novi Sad
- **Prof. dr Evgenij Ivanovich Koshkin**, Vice-Chancellor for International Cooperation at the Russian State Agrarian University – MTAA, Moscow, Russian Federation
- **Dr. Zvonko Nježić**, Research Associate of the Institute for Food Technology in Novi Sad, Serbia
- **Dr Dragana Miladinović**, Assistant Director for Science at the Institute for Field and Vegetable Crops in Novi Sad, Serbia
- **Stefano Ciafani**, Vice-Presidente of Legambiente d' Italy

### *Secretary:*

- **Ana Perenić**, Professor of Ecology and Environment Protection, Vice-Director Ecological movement of Novi Sad, Serbia

### *Members:*

- **Academician Srbislav Denčić**, Institute for Field and Vegetable Srops, Novi Sad, Serbia
- **Academician Vaskrsija Janjić**, University of Belgrade, Resident Professor at the Agricultural Faculty, Serbia
- **Marjan Jošt**, JOST Seed-Research, Križevci, Croatia
- **Academician Branka Lazić**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia
- **Prof. Dr. Desanka Božidarević**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia
- **Prof. Dr. Biserka Dimiskovska**, University "St. Cyril and Methodius", Institute for Earthquake Engineering and Engineering Seismology (IZIIS), Skopje, Republic of Macedonia
- **Prof. Dr. Miodrag Dimitrijević**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia
- **Prof. Dr. Ivana Đujić**, University of Belgrade, Resident Professor aof Food Chemistry and Biological Faculty, Serbia
- **Prof. Dr. Slavko Filipović**, University of Novi Sad, Resident Professor at the Technology Faculty, Serbia
- **Prof. Dr. Vladimir Hadžić**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia

- **Prof. Dr. Vladan Joldžić**, Institute for Criminological and Sociological Research, University of Belgrade, Resident Professor at the Biological and Chemical Faculty, Serbia
- **Prof. Dr. Kadar Imre**, Research Institute for Soil Science and Agricultural Chemistry, Hungarian Academy of Sciences, Budapest, Hungary
- **Prof. Dr. Borivoj Krstić**, University of Novi Sad, Resident Professor at the Faculty of Science, Serbia
- **Prof. Dr. Ivana Maksimović**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia
- **Prof. Dr. Dragutin Mihajlović**, University of Novi Sad, Resident Professor at Agricultural Faculty, Serbia
- **Prof. Dr. Rodoljub Oljača**, University of Banja Luka, Resident Professor at the Faculty of Forestry, Bosnia and Herzegovina
- **Prof. Dr. Mihailo Peruničić**, University of Novi Sad, Resident Professor at the Technology Faculty, Serbia
- **Aleh Rodzkin**, International Sakharov Environmental University, Minsk, R.. Belarus
- **Prof. Dr. Atila Salvai**, University of Novi Sad, Resident Professor at the Agricultural Faculty, Serbia
- **Prof. Dr. Velibor Spalević**, University of Montenegro, Research associate at the Biotechnical Faculty of Podgorica, Montenegro
- **Prof. Dr. Ivan Šimurić**, University of Zagreb, Resident Professor at the Agricultural Faculty, Croatia
- **Prof. Dr. Marija Škrnjar**, University of Novi Sad, Resident Professor at the Technology Faculty, Serbia
- **Prof. Dr. Radmila Šovljanski**, University of Novi Sad, Resident Professor at the Agricultural Faculty
- **Prof. Dr. Ion C. Ungureanu**, Resident Professor at the University of Agricultural Sciences and Veterinary Medicine, Bucharest, Romania
- **Prof. Dr. Ljubo Vračar**, University of Novi Sad, Resident Professor at the Technology Faculty, Serbia
- **Prof. Dr. Momčilo Vukićević**, Faculty of European Legal and Political Studies in Novi Sad, Serbia
- **Prof. Dr. Victor Veniamovič Zakrevskii**, North-Western State Medical University named after I.I. Mechnikov, Resident Professor, Saint-Petersburg, Russian Federation
- **Prof. Dr. Lu Zhongmei**, Resident Professor at the Wu Han Law University, China
- **Mr. Ivan Lulić**, ing. polimer technology

***Organizing Committee :***

*President:*

- **Nikola Aleksić**, Director of the Ecological Movement of Novi Sad

*Vice-president:*

- **Angelo Mancone**, Co-ordinator Legambiente Veneto, Rovigo, Italy

*Secretary:*

- **Ljubica Aleksić**, Organizer of the Ecological Movement of Novi Sad

*Members:*

- **Dr Vera Đekić**, Center for Small Grains, Kragujevac
- **MA Slađana Đuranović**, Professor of English language and literature
- **Zoran Kovačević**, Organizer of the Ecological Movement of Novi Sad
- **Milenko Košutić**, Engineer, Expert Assistant at the Institute for Food Technology (FINS)
- **Slobodan Mišić**, Organizer of the Ecological Movement of Novi Sad
- **Bratimir Nešić**, Translator and Lecturer of the Ecological Movement of Novi Sad
- **Milanko Nešković**, Organizer of the Ecological Movement of Novi Sad
- **Dr. Đorđ Okanović**, Research Associate of the Institute for Food and Technology in Novi Sad
- **Dr. Vera Popović**, Institute for Field and Vegetable Crops, Novi Sad
- **Marina Samsonov**, Translator and Interpreter of the Ecological Movement of Novi Sad
- **Prof. Dr. Milan Stanulović**, Translator
- **Željko Štrbac**, Student of Faculty of Technical Sciences in Novi Sad
- **Luka Vujasinović**, Organizer of the Ecological Movement of Novi Sad
- **Petar Vukić**, Technical Director of the Ecological Movement of Novi Sad

***Official water of the XVIII International Eco-Conference® 2014***

- MINAQUA, NOVI SAD

***Official host of the XVIII International Eco-Conference® 2014***

- Institute for Nature Conservation of Vojvodina Province in Novi Sad

## CONTENT

THE ECOLOGICAL MOVEMENT OF NOVI SAD: AN IMPORTANT DECISION OF ITS PROGRAMME COUNCIL.....	15
---	----

FOREWORD.....	19
---------------	----

### PRELIMINARY PAPERS

<i>Marijan Jošt</i> BIOETHICS OF AGRICULTURE.....	23
<i>Jelena Filipović, Slavko Filipović, Šandor Kormanjoš, Vera Radović, Zvonko Nježić, Đorđe Okanović</i> INFLUENCE OF EXTRUSION PROCESS ON THE NUTRITIVE VALUE OF SOYBEAN.....	35

### CLIMATE AND PRODUCTION OF SAFE FOOD

<i>Arion Turesán, Éva Erdélyi</i> MODELLING THE EFFECTS OF CLIMATE CHANGE ON WINE PRODUCTION FOR KUNSÁG REGION .....	49
<i>Biserka Dimiskovska, Dragi Dojcinovski, Vesela Radović</i> AIR QUALITY IN R. MACEDONIA DEPENDING ON PRESENCE OF SULFUR DIOXIDE WITH REGARDS TO PRODUCING HEALTHY AND SAFE FOODS .....	59

### SOIL AND WATER AS THE BASIS OF AGRICULTURAL PRODUCTION

<i>Antonia Stojanova, Ivan Gospodinov, Svetla Kostadinova, Natalia Petrovska</i> EFFECT OF IRRIGATION AND FERTILIZATION ON MAIZE YIELD AND PROTEIN CONCENTRATION.....	71
<i>Maksimović Ivana, Kastori Rudolf, Putnik-Delić Marina, Svjetlana Zeljković</i> RARE EARTH ELEMENTS IN THE ENVIRONMENT.....	81

<i>Branislav Leleš, Sonja Aćimović</i>	
POSSIBILITY FOR ALKALINITY OF SOIL IRRIGATED WITH DANUBE WATER ON THE BEZDAN PROFILE .....	91
<i>Sanja Mrazovac Kurilić, Vladanka Presburger Ulniković, Violeta Cibulić, Lidija Stamenković</i>	
ASSESSMENT OF POLLUTANT IMPACT ON NITRATE CONCENTRATION IN GROUNDWATER.....	99
<i>Livija Maksimovic, Borivoj Pejic, Stanko Milic, Vladimir Sikora, Milka Brdar-Jokanovic, Vera Popovic</i>	
THE EFFECT OF DROUGHT ON SAFE FOOD PRODUCTION.....	107
<i>Vladimir Miladinović, Vladan Ugrénović, Vladimir Filipović</i>	
METHODS OF PHYTOREMEDIATION OF SOIL .....	117
<i>Miodrag Jelic, Jelena Milivojević, Aleksandar Đikić, Vera Djekic, Goran Dugalić, Svetomir Stamenković</i>	
ALUMINIUM TOXICITY IN ACIDIC SOILS IN SERBIA.....	127
<i>Vera Đekić, Jelena Milivojević, Miodrag Jelić, Snežana Branković, Vera Popović, Vesna Perišić, Vladimir Perišić</i>	
STABILITY OF WHEAT YIELD ON ACID SOIL IN THE PRODUCTION OF SAFE FOOD .....	137
<i>Zoran Dinić, Radmila Pivić, Dragana Jošić, Aleksandar Sebić, Aleksandra Stanojković-Sebić</i>	
METALLURGICAL SLAG USE EFFECTS ON SOIL CHEMICAL, PHYSICAL AND MICROBIOLOGICAL PROPERTIES.....	145
<i>Srdan Šeremešić, Jovica Vasin, Milorad Živanov, Stanko Milić, Dragiša Milošev, Marjana Vasiljević</i>	
BIOCHAR APPLICATION: THE PROSPECTS OF SOIL PROPERTY IMPROVEMENT.....	155

## GENETICS, GENETIC RESOURCES, BREEDING AND GENETIC ENGINEERING IN THE FUNCTION OF PRODUCING SAFE FOOD

<i>Vesna Samobor, Dijana Horvat, Z. Matotan</i>	
PRESERVING AND CONSERVATION OF OLD LOCAL VARIETIES AND VEGETABLE ECO POPULATIONS IN CROATIA .....	165
<i>Kristina Luković, Milivoje Milovanović, Vladimir Perišić, Kamenko Bratković, Mirjana Staletić</i>	
VARIETY PERFEKTA – ANOTHER CONTRIBUTION TO BIODIVERSITY OF WINTER WHEAT IN SERBIA.....	173
<i>Grozi Delchev, Iliyana Petrova</i>	
STABILITY VALUATION OF SOME STIMULATORS FOR THEIR INFLUENCE ON THE GRAIN YIELD OF TWO DURUM WHEAT CULTIVARS.....	181

<i>Kamenko Bratković, Milivoje Milovanović, Vladimir Perišić, Vera Đekić, Kristina Luković</i>	
NEW CULTIVAR WINTER TWO-ROW BARLEY KG ZLATNIK.....	189
<i>Jelena Milivojević, Miodrag Jelić, Vera Đekić, Ljiljana Bošković Rakočević, Vesna Perišić, Zoran Simić</i>	
CULTIVAR-SPECIFIC ACCUMULATION OF IRON, MANGANESE IN WINTER WHEAT GRAIN.....	199

## FERTILIZERS AND FERTILIZATION PRACTICE IN THE FUNCTION OF PRODUCING SAFE FOOD

<i>Aleh Rodzkin, Sasa Orlović, Borivoj Krstić</i>	
THE PERSPECTIVE OF APPLICATION OF ASH FROM WILLOW WOOD AS A MINERAL FERTILIZER.....	211

## INTEGRATED PEST MANAGEMENT AND USE OF BIOLOGICALS

<i>Milan Stojanovic</i>	
REVIEW OF THE MOST IMPORTANT MYCOTOXINS IN FOOD SAFETY.....	221
<i>Marina Lazarević, Violeta Mickovski Stefanović, Đorđe Glamočlija, Vera Popović, Dragana Stanisavljević</i>	
THE PESTICIDES RESIDUE IN VEGETABLES IMPACT ON FOOD SAFETY.....	231
<i>Vesna Perišić, Dušanka Inđić, Vera Đekić, Vladimir Perišić, Jelena Milivojević</i>	
APPLICATION OF PROTECT-IT™ IN PROCESS OF INTEGRATED PEST MANAGEMENT OF STORED GRAINS.....	237;
<i>Stojan Jevremović, Marina Lazarević, Miroslav Kostić</i>	
APPLICATION OF SECONDARY PLANT METABOLITES IN CONTROL OF INSECT PESTS.....	245

## AGRICULTURAL PRODUCTION IN VIEW OF SUSTAINABLE DEVELOPMENT

<i>Tamás Tarján, Sándor Lőrincz, Éva Erdélyi</i>	
DEVELOPMENT IN THE AGRICULTURAL PRODUCTION OF THE BORDERING EUROPEAN COUNTRIES AND REGIONS OF SERBIA DURING THE LAST DECADE.....	255
<i>Imre Molnar</i>	
FUTURE CROPPING SYSTEMS FOR THE PRODUKTION OF SAFE FOOD.....	263



## PRODUCTION OF FIELD AND VEGETABLE CROPS

<i>Bojana Bekić, Vladimir Filipović, Vera Popović</i> FLOWERING PERIOD LENGTH AND SEED QUALITY OF MEDICAL HONEY PLANTS .....	273
<i>Milka Brdar-Jokanović, Dušan Adamović, Livija Maksimović</i> CHAMOMILE AS A TRADITIONAL AND MODERN PLANT IN SUSTAINABLE AGRICULTURE.....	281

## PROCESSING OF AGRICULTURAL PRODUCTS IN THE FRAMEWORK OF SAFE FOOD PRODUCTION

<i>Ostrovskii V.E., Dr., Kadyshovich E.A.</i> OPTIMAL NUTRITION AND CELLULAR LIFE PROLONGATION IN THE LOH-THEORY CONTEXT.....	293
<i>Jelena Kiurski Milosevic, Danijela Jasin Ljiljana Raskov Trifunjagic, Aleksandra Sucurovic, Gordana Ludajic</i> MONITORING AND ENVIRONMENTAL PROTECTION IN THE OIL INDUSTRY „DIJAMANT“ A.D, ZRENJANIN .....	303
<i>V.V. Zakrevskii, S.N. Leleko</i> THE HEALTH RISKS CAUSED BY CONSUMING MEAT PRODUCTS WHICH ARE COTAMINATED BY NITROFURANS .....	313
<i>Dorđe Alavuk, Časlav Kalinić</i> QUALITY OF GASTROLOGICAL PRODUCTS FROM THE ASPECT OF THE TOURISM AND CATERING INDUSTRY .....	323
<i>Vanja G. Mađjoska, Sonja D. Srbinoyska, Sterja M. Sterjovski</i> IMPACT OF SERUM PROTEINS ON THE DEVELOPMENT OF LACTIC ACID MICROORGANISMS IN YOGURT .....	333
<i>Olivera Šimurina, Bojana Filipčev, Marija Bodroža-Solarov, Zvonko Nježić, Rada Jevtić Mučibabić, Jasmina Živković, Jelena Krulj</i> THE APPLICATION OF SELECTED ENZYMESTO IMPROVE THE WHEAT FLOUR QUALITY .....	345
<i>Vid Stanulović, Milan Stanulović</i> BIOTECHNOLOGY IN PHARMACOTHERAPY.....	353

## ECONOMIC ASPECTS AND MARKETING AS SEGMENTS OF THE PRODUCTION OF SAFE FOOD

<i>Qi Liao</i> THE FUTURE OF FOOD PRODUCTION .....	365
<i>Ana Bukilica</i> ECONOMIC ASPECTS OF ORGANIC FOOD PRODUCTION AND MARKETING .....	371

## FOOD STORAGE, TRANSPORTATION AND PACKAGING

*Dragan Đ. Psodorov, Sonja D. Simić*

BIOPOLYMERS AS A CONTEMPORARY PACKAGING MATERIALS IN ACCORDANCE WITH SUSTAINABLE DEVELOPMENT.....	381
---	-----

## NUTRITIONAL FOOD VALUE AND QUALITY NUTRITION

*Veljko Đukić, Đorđe Okanović*

LANDAS A BASEHEALTHY FOOD PRODUCTION IN THE MUNICIPALITY OF PRNJAVOR-REPUBLIC OF SRPSKA.....	393
--	-----

*Karamyan Marietta*

HEALTHY NUTRITION AS COMPONENT OF HEALTH BEHAVIOUR: AN ECOLOGICAL PERSPECTIVE.....	403
--	-----

*Agota Vitkai Kučera*

INFLUENCE OF NUTRITION IN ELITE PROFESSIONAL VOICE USERS.....	411
---	-----

*Djordje Okanović, Dragan Palić*

ROLE OF FAT IN NUTRITION OF ATHLETES.....	417
---	-----

*Bojana Vuković Mirković, Aleksandra Stanković, Maja Nikolić*

CARBOHYDRATES IN COLLECTIVE NUTRITION OF CHILDREN AND YOUTH OF THE CITY OF NIS .....	425
--	-----

*Nikola Vuksanović, Milijanko Portić, Dragan Tešanović,*

*Bojana Kalenjuk, Darko Dragičević*

THE SENSORY QUALITY ASSESSMENT OF ROASTED PIG IN THE RESTAURANTS IN BELGRADE .....	431
--	-----

*Milica Stojnić, MA, Tamara Galonja Coghill*

HEALTHY DIET AND EATING HABITS OF THE STUDENT POPULATION IN NOVI SAD.....	441
---	-----

## LEGAL ASPECTS OF PROTECTING BRAND NAMES OF SAFE FOOD

*Joldzic Vladan*

LAW-LOGICAL AND LEGAL PREROGATIVES FOR SAFE FOOD.....	451
---	-----

*Nenad Bingulac, Jelena Matijašević*

SIGNIFICANCE OF LEGAL REGULATIONS OF FOOD SAFETY IN SERBIA.....	465
---	-----

ECOLOGICAL MODELS AND SOFTWARE IN PRODUCTION  
OF SAFE FOOD

*Milorad Todorović, Milan Ivkov*

"GLOBAL G.A.P" – INTEGRATED FOOD SAFETY

PROGRAMME..... 477

NAME REGISTRY..... 483



ECO-CONFERENCE® 2014

ECOLOGICAL MOVEMENT OF NOVI SAD

Bojana Bekić<sup>1</sup>, Vladimir Filipović<sup>2</sup>, Vera Popović<sup>3</sup>

<sup>1</sup>Institute of agricultural economics, Belgrade, Serbia

<sup>2</sup>Institute of Medicinal Plant Research "Dr Josif Pancic", Belgrade, Serbia

<sup>3</sup>Institute of field and vegetable crops, Novi Sad, Serbia

e-mail: [vf Filipovic@mocbilja.rs](mailto:vf Filipovic@mocbilja.rs)

## FLOWERING PERIOD LENGTH AND SEED QUALITY OF MEDICAL HONEY PLANTS

### Abstract

Flowering period length of medicinal honey plants, which depends on weather conditions, later impacts the seed quality. Research of seven medicinal honey plants, conducted during 2013, showed that the beginning of the flowering time was delayed for several days which, in compare to the possible beginning and length of the flowering, shortened honey bee pasture period. There was only one exception from this case and that was the flowering of marshmallow (earlier beginning and later ending of flowering in compare to the possible beginning and length of the flowering period). For the needs of seed quality determination, authors researched the following: germination energy (GE), total germination (TG) and 1000-seed weight.

**Key words:** *medicinal honey plants, flowering period length, seed quality*

### INTRODUCTION

Honey bee pasture directly depends on weather conditions and the length of plants' flowering period. After flowering period, most plants in the group of medicinal honey plants form their reproductive organ - seed. This group of plants, that is their seed, can be used for production of medicinal raw material utilized in agro-food industry, pharmacology and cosmetics, for decoration purposes, as spices in various dishes, drinks and sweets. Some of the most common medicinal honey plants belong to the family of labiate (fam. *Lamiaceae*), such as: sage (*Salvia officinalis* L.), thyme

(*Thymus vulgaris* L.), lavender (*Lavandula vera* DC.), hyssop (*Hyssopus officinalis* L.), balm (*Melissa officinalis* L.) etc. It is important to notice that all plants stated above are perennial plants and that the economics of their production and utilization is significantly larger in compare to annual and biennial medicinal honey (for example marshmallow (*Althaea officinalis* L., fam. *Malvaceae*) and borage (*Borago officinalis* L., fam. *Boraginaceae*)).

Authors main goal in this research was to determinate the flowering period length impact on the seed quality of medicinal honey plants.

## MATERIAL AND METHODS

Research of flowering period length and seed quality indicators of seven cultivated medicinal plant species was conducted during 2013, at plants collection of the Institute of Medicinal Plant Research "Dr Josif Pancic" in Pančevo. In this research authors used seeds of varieties and domestic populations: „Vojvodanski“ marshmallow (*Althaea officinalis* L., fam. *Malvaceae*), „Citron“ balm (*Melissa officinalis* L., fam. *Lamiaceae*), „Coastal“ sage (*Salvia officinalis* L., fam. *Lamiaceae*), „N-19“ thyme (*Thymus vulgaris* L., fam. *Lamiaceae*), „Coastal“ lavender (*Lavandula vera* DC., fam. *Lamiaceae*), „Domestic purple“ hyssop (*Hyssopus officinalis* L., fam. *Lamiaceae*), „Boraga“ borage (*Borago officinalis* L., fam. *Boraginaceae*). Cultivated perennial plants are balm, sage, thyme, lavender and hyssop while cultivated annual plants are marshmallow and borage.

### Weather indicators

Important differences in the level and distribution of precipitation and average monthly temperatures are given in the table below (Table 1). During month may 2013, precipitation was larger for approximately one third in compare to multiannual average. In the next month, and especially in July and August, amount of precipitation was 7, 4 that is 4, 5 times less, in compare to multiannual average. This impacted, together with the larger average monthly temperatures during month August, the reduction of the flowering length period.

**Table 1.** Precipitation sums (mm) and average monthly temperatures (°C)

Indicator	Month	May	June	July	Avg	Sep	Oct	Σ / A
Precipitation (mm) in 2013		99,7	36,4	7,9	11,1	57,7	47,5	260,3
Precipitation (mm) 2003-2012		64,4	87,9	58,7	50,4	43,7	51,7	356,8
Average monthly temperatures (°C) in 2013		20,9	21,2	23,4	24,6	16,7	14,0	20,1
Average monthly temperatures (°C) 2003-2012		18,6	22,0	24,3	23,6	18,6	12,6	20,0

Source: weather station PSS Institute "Tamiš" Pančevo

### *Monitoring of the flowering period length*

Flowering period length is a time period from the opening of the first flower to the moment of the opening of the last flower. This period was compared to the flowering period length and expected amount of honey per hectare, which was given in domestic and foreign literature. In compare to the expected amount of honey per hectare and in regard to the flowering days, authors calculated theoretical possible amount of honey produced in 2013 (kg).

### *Laboratory research*

Laboratory research of plant seed was conducted in the laboratory for seed in the Institute of Medicinal Plant Research "Dr. Josif Pancic" in Pančevo, in accordance with the Regulation on agricultural plants seed quality ("Official Journal of SFRJ", no. 47/87, 60/87, 55/88 and 81/89, "Official Journal of SRJ", no. 16/92, 8/93, 21/93, 30/94, 43/96, 10/98, 15/2001 and 58/2002 and "Official Gazette of RS", no. 23/2009, 64/2010, 72/2010 and 34/2013). Research included determination of morphological/physiological characteristics (germination energy and total germination) and physical/mechanical characteristics of seed (1000-seed weight). At precise scale researchers measured seed weight and then they put seeds to germinate - 100 seeds in four repetitions, placed in Petri dishes at filter paper with added distilled water at temperature of constant 20°C. Counting of germinated seeds was conducted using binocular magnifier on fifth and fourteenth day, from the day of the experiment setup (ISTA, 2010).

### *Statistical analysis*

Statistical significance of calculated average values was obtained using analysis of variance (ANOVA) with the help of statistical package Statistica 10 for Windows. All results were derived based on F – test and LSD – test with significance level of 5%.

## RESULTS AND DISCUSSION

### *Flowering length*

The flowering period length depends on weather conditions (Table 1), altitude, plant variety (work material), terrain configuration, insolation rate, soil type etc. Beginning of the flowering period of researched plants can vary up to 15 days in the same area, from year to year, which was the case with flowering of some plant species during 2013 (Table 2). Due to mentioned facts, in one season, honey bee societies can use two or even three bee pastures of the same plant species.

Table 2. Flowering period length and approximate quantities of some medicinal plant species in 2013

Common name	Plant species	Flowering time in 2013*	Possible flowering period length	Expected quantity of honey per hectare (kg)	Calculated possible quantity of honey per hectare in 2013 (kg)
Marshmallow	<i>Althaea officinalis</i> L.	20 June-18 October	June - September	50-100 (Sava and Panaitescu, 2007)	46-92
Balm	<i>Melissa officinalis</i> L.	23 May- 15 September	May- September	100-150 (Muntean and Marian, 2005)	80-120
Sage	<i>Salvia officinalis</i> L.	9 May-13 June	May- October	250-500 (BaV, 2014)	27-54
Thyme	<i>Thymus vulgaris</i> L.	4 May-16 June	May-July	45 (Keeping bee, 2014)	21
Lavender	<i>Lavandula vera</i> DC	13 May- 10 August	June- August	250-500 (Umeljić, 2006)	33-66
Hyssop	<i>Hyssopus officinalis</i> L.	5 June- 18 July	June- September	250-500 (BaV, 2014)	21-42
Borage	<i>Borago officinalis</i> L.	15 June-18 July	June- September	200 (Keeping bee, 2014)	21

Source\*: Authors' data

The best results according to calculated possible quantity of honey per hectare in 2013, were achieved with marshmallow and balm. Decrease of the possible quantity of marshmallow and balm honey in 2013, in compare with expected quantity of honey per hectare, was 8% and 20%. In compare with the length of the flowering period of other plant species, these two plant species varied the least. Although marshmallow is cultivated for the medicinal purposes as annual (seldom biennial) plant, in compare with the possible flowering period length (max. 122 days), it had extension of flowering period for 8 days, which could have a positive influence on the possible amount of honey. Due to its positive characteristics, mainly due to the long pasture, marshmallow and balm are increasingly used as bee pasture (Burgett, 1980, Filipović, 2003, Chwil, 2009). In 2013, the following plants had the largest decrease of honey quantity per hectare: borage (decreased for about 9,5 times), hyssop (for 11,9 times) and sage (9,3 times). Sage had the largest reduction of the flowering period and in compare to the possible flowering period length (max. 184 days), in 2013 flowering period length was only 35 days. The diversity of plant species, shrubs and trees whose blossom periods start in march and end in September, covers the entire harvesting season for bees

(Covaliov et al., 2012).

*Seed quality of some medicinal honey plants*

In table 3 are shown average values of germination energy (GE), total germination (TG) and 1000-seed weight. The largest germination is recorded in the case of balm seed (GE=81,0% and TG=89,5%), it is somewhat lesser in the case of sage seed (GE=55,8% and TG=88,0%) and borage (GE=51,0% and TG=82,3%), and the least is in the case of marshmallow (GE=22,0% and TG=57,3%) and lavender (GE=38,8% and TG=54,0%).

**Table 3.** Seed quality of some medicinal honey plants in 2013

Common name	Plant species	Germination energy (%)	Total germination (%)	1000-seed weight (g)
Marshmallow	<i>Althaea officinalis</i> L.	22,0	57,3	1,93
Balm	<i>Melissa officinalis</i> L.	81,0	89,5	0,51
Sage	<i>Salvia officinalis</i> L.	55,8	88,0	7,34
Thyme	<i>Thymus vulgaris</i> L.	68,5	76,8	0,17
Lavender	<i>Lavandula vera</i> DC	38,8	54,0	1,04
Hyssop	<i>Hyssopus officinalis</i> L.	29,3	76,5	0,69
Borage	<i>Borago officinalis</i> L.	51,0	82,3	15,88

Source: Author's data

**Table 4.** Variant analysis of researched seed quality indicators

Sources of variations	Df	Germination energy (%)	Total germination (%)	1000-seed weight (g)
Replications	3	11,6	4,7	0,0
Plant species	6	1.784,3*	795,4*	135,3*
Error	18	14,6	12,2	0,0

Source: Authors' calculation

Annotation: \*  $P \leq 5\%$

Results of medicinal honey plants' seed quality are in accordance with the results of previous domestic and foreign researches (Maletić et al., 2000, Jevđović and Filipovic, 2006, Zutic and Dudai, 2008, Berti et al., 2010, Gorai et al., 2011, Florez et al., 2012). Depending on plant species, size and biochemical composition of analyzed seeds, authors also recorded the impact on germination energy level, total germination and 1000-seed weight (Table 4). The smallest values of germination energy and total germination, recorded in marshmallow, lavender and hyssop, impacted the statistical variation (Lsd 0.05), in compare to other plant species. As expected, seeds with the largest weight (sage and borage) caused statistically important variation (Lsd 0.05).



## CONCLUSION

Weather indicators (rainfalls and average monthly temperatures) significantly impacted the flowering period length and seed quality of seven species in the medicinal honey plants group. The largest number of researched plants had reduction of flowering period length, in compare to the possible flowering period length, which caused lesser honey production up to 12 times. Possible amount of honey in 2013, was in negative correlation with the seed quality indicators. Advantage in cultivation of researched plant species from the family *Lamiaceae* as honey and seed source is in their perennial life, where some species can be used up to 20 years (lavender).

### Acknowledgement

This paper work is a part of research at the project of integral and interdisciplinary studies no. 46006 „Sustainable agriculture and rural development in terms of achieving the strategic goals of the Republic Serbia within Danube region”, financed by the Ministry of education, science and technological development of the Republic of Serbia.

### REFERENCE:

1. Beekeeping association Višegrad (BaV): *Medonosno – ljekovito bilje*, (taken 14<sup>th</sup> May 2014 from: [http://www.medvisegrad.com/medonosno\\_bilje\\_biljke.htm](http://www.medvisegrad.com/medonosno_bilje_biljke.htm)), 2014.
2. Berti, M. T., Fischer, S. U., Wilckens, R. L., Hevia, M. F., Johnson, B. L.: *Borage (Borago officinalis L.) Response to N, P, K, and S Fertilization in South Central Chile*, Chilean J. Agric. Res., 70(2), 228-236, 2010.
3. Burgètt, M.: *The use of lemon balm (Melissa officinalis) for attracting honeybee swarms*, Bee world. 61(2), 44-46. 1980
4. Chwil, M.: *Flowering biology and nectary structure of Melissa officinalis L.* Acta Agrobot, 62(2), 23–30, 2009.
5. Covaliov, S., Doroftei, M., Negrea, B. M.: *Assessment of vegetal resources in Danube Delta, Romania*, Advances in Agriculture & Botany, 4(2), 2012.
6. Filipović, V.: *Uticaj načina zasnivanja useva na morfološke osobine, prinosa i kvalitet korena belog sleza (Althaea officinalis L.)*, Magistarska teza, Poljoprivredni fakultet, Beograd – Zemun, 2003.
7. Florez, M., Martinez, E., Carbonel, M.V.: *Effect of Magnetic Field Treatment on Germination of Medicinal Plants Salvia officinalis L. and Calendula officinalis L.*, Pol. J. Environ. Stud., 21(1), 57-63. 2012.
8. Gorai, M., Gasmi, H., Neffati, M.: *Factors influencing seed germination of medicinal plant Salvia aegyptiaca L. (Lamiaceae)*, Saudi J. Biol. Sci., 18(3), 255–260, 2011.

9. International Seed Testing Association: *ISTA Rules Proposals for the International Rules for Seed Testing 2011 Edition*. Bassersdorf, Switzerland, 2010.
10. Jevđović, R., Filipovic, V.: *Effects of different doses of mineral fertilizers on yield and seed quality of marshmallow*, Counselling "Land and Water", Novi Sad, 24 January 2006, Sub-Proceedings, 67 – 70, 2006.
11. Keeping bee: *Beekeeping*, (taken 14th May 2014 from: <http://keepingbee.org/plants-for-bees/>), 2014.
12. Maletić, R., Jevđović, R., Pavlović, R.: *The investigation of the effect of genotype on the quality traits of lemon balm*. in: *Óvári Tudományos napok az élelmiszergazdaság fejlesztésének lehetőségei (XXVIII)*, Agrárökonómiai szekció, Mosonmagyaróvár, október 5-6, Hungary, 211-216, 2000.
13. Muntean, L. S., Marian, O.: *Melissa officinalis L. an important medicinal and aromatic plant*. *Hameiul si Plantele Medicinale*, 13 (1/2), 207-212, 2005.
14. Sava, D., Panaitescu, L.: *The Apiarian Importance of Certain Ruderal and Segetal Weeds Growing on The Romanian*, *Research Journal of Agricultural Science*, 39(2), 473-476, 2007.
15. Umeljčić, V.: *U svetu cveća i pčela - atlas medonosnog bilja 1*, Kragujevac, 2006.
16. Zutić, I. and Dudai, N.: *Factors Affecting Germination Of Dalmatian Sage (Salvia Officinalis) Seed*. *Acta Hort. (ISHS)* 782, 121-126, 2008.

Bojana Bekić<sup>1</sup>, Vladimir Filipović<sup>2</sup>, Vera Popović<sup>3</sup>

<sup>1</sup>Institut za ekonomiku poljoprivrede, Beograd, Srbija

<sup>2</sup>Institut za proučavanje lekovitog bilja „*dr Josif Pančić*“, Beograd, Srbija

<sup>3</sup>Institut za ratarstvo i povrtarstvo, Novi Sad, Srbija

[vf Filipovic@mobilja.rs](mailto:vf Filipovic@mobilja.rs)

## DUŽINA CVETANJA I KVALITET SEMENA LEKOVITOG MEDONOSNOG BILJA

### Apstrakt

U zavisnosti od vremenskih uslova, zavisi i dužina trajanja perioda cvetanja lekovitog medonosnog bilja, a kasnije i kvalitet semena. U istraživanjima sedam lekovitih medonosnih biljnih vrsta sprovedenim u toku 2013. godine, početak perioda cvetanja kasnio je za nekoliko dana što je, u odnosu na mogući početak i dužinu trajanja perioda cvetanja, skratilo period pčelinje paše. Jedina biljna vrsta koja je pokazala produžetak perioda cvetanja bila je beli slez (raniji početak i kasniji završetak cvetanja u odnosu na mogući početak i dužinu trajanja perioda cvetanja). Za potrebe utvrđivanja kvaliteta semena, istraživane su: energija klijanja (EK), ukupna klijavost (UK) i masa 1.000 semena.

**Ključne reči:** *lekovito medonosno bilje, dužina cvetanja, kvalitet semena*

CIP – Каталогизација у публикацији  
Библиотека Матице српске, Нови Сад

63:502/504(082)  
631.147(082)

INTERNATIONAL Eco-Conference (18 ; 2014 ; Novi Sad)  
Safe food : proceedings / XVIII International  
Eco-Conference, 24-27th September 2014, Novi Sad ;  
[organizer Ecological Movement of Novi Sad ; project editor  
Nikola Aleksić]. - Novi Sad : Ecological Movement of Novi  
Sad, 2014 (Novi Sad : Album). - 486 str. : ilustr. ; 23 cm

Tiraž 500. - Bibliografija uz svaki rad. - Сажети. -  
Registar.

ISBN 978-86-83177-47-9

1. Ecological Movement of Novi Sad. - I. Ekološki pokret  
grada Novog Sada v. Ecological Movement of Novi Sad

а) Здрава храна - Производња - Зборници б) Еколошка  
пољопривреда - Зборници  
COBISS.SR-ID 289561351