XXIII INTERNATIONAL ECO-CONFERENCE® 2019
XIII ENVIRONMENTAL PROTECTION OF URBAN AND SUBURBAN SETTLEMENTS
25th–27th SEPTEMBER 2019
NOVI SAD, SERBIA

XXIII INTERNATIONAL
ECO-CONFERENCE® 2019
25th–27th SEPTEMBER 2019
NOVI SAD, SERBIA

XIII ENVIRONMENTAL PROTECTION OF URBAN AND SUBURBAN SETTLEMENTS

PROCEEDINGS
2019

Publisher
ECOLOGICAL MOVEMENT OF NOVI SAD
21000 Novi Sad, Vojvođanskih brigada 17/I
Phone: (+381 21) 6372 940
(+381 69) 304 73 38
E-mail: ekopokretns@gmail.com
www.ekopokret.org.rs

Project Editor
Nikola Aleksić

Copy Editor
Vesna Karajović

Layout and Formatting
Vesna Karajović

For the Publisher
Nikola Aleksić, Director

Print
SZR Lazukić company, Novi Sad

Cirkulation
300 copies

Publication year: 2019

Organizer:
Ecological Movement of Novi Sad, Serbia

Co-Organizers:
– University of Novi Sad, Serbia
– Russian State Agrarian University – MTAA, Moscow, Russian Federation
– International Independent University of Environmental and Political Sciences, Moscow, Russian Federation
– Institute of Field and Vegetable Crops, Novi Sad, Serbia
– Pasteur Institute of Novi Sad, Serbia
– Legambiente d·Italia (National Environmental Organization), Italia

Patronage:
Matica srpska

Host:
Institute for Nature Conversation of Vojvodina Province, Novi Sad, Serbia

Honorary Committee:

President:
– **Prof. Dr. Dragan Stanić**, President of Matica Srpska, Serbia

Vice-presidents:
– **Prof. Dr. Dejan Jakšić**, Rector of the University of Novi Sad, Serbia
– **Prof. Dr. Vladimir Bautin**, Rector at the Russian State Agrarian University-MTAA, Moscow, Russian Federation
– **Prof. Dr. Stanislav A. Stepanov**, Rector of the International Independent Ecological-Politicology University in Moscow, Russian Federation
– **Dr. Svetlana Balešević Tubić**, Director of the Institute for Field and Vegetable Crops in Novi Sad, Serbia
– **Mr. Nenad Vranješ**, Director of the Pasteur Institute in Novi Sad
– **Dr. Marina Tomić**, Director of the Institute for Nature Protection of Vojvodina Region, Serbia
– **Vittorio Cogliati Dezza**, President of Legambiente d' Italia, Italy

Scientific Committee:

President:
– **Academician Rudolf Kastori**, Academy of Science and Art of Vojvodina, Novi Sad, Serbia, Hungarian Academy of Sciences, Budapest, Hungary, And Russian Academy of Sciences, Moskwa, Russian Federation

Vice-presidents:
– **Prof. Dr. Stevan Stamenkovski**, Vice-Chancellor for Science at the University of Novi Sad, Serbia
– **Prof. Dr. Evgenij Ivanovich Koshkin**, Vice-Chancellor for International Cooperation at the Russian State Agrarian University-MTAA, Moscow, Russian Federation
– **Prof. Dr. Marfenin N.N.**, Russian Federation, Vice-Chancellor for Science at the International Independent Ecological-Politicology University in Moscow, Russian Federation
– **Dr. Ana Marjanović Jeromela**, Assistant Director for Science at the Institute of Field and Vegetable Crops, Novi Sad, Serbia
– **Prof. Dr. Dušan Lalošević**, University of Novi Sad, Faculty of Medicine, Vice-Director of Pasteur Institute, Novi Sad, Serbia
– **Prof. Dr. Baccichet Moreno**, University of Ferrara, Faculty of Philology and Philosophy, Italy

Secretary:
– **Ljubica Aleksić**, Organizer of Ecological Movement of Novi Sad, Serbia

Members:
– **Academician Vaskrsija Janjić**, University of Belgrade, Faculty of Agriculture, Serbia
– **Akademician Vukadin Leovac**, University of Novi Sad, Faculty of Mathematics and Natural Sciences, Serbia
– **Prof. Dr. Ištvan Bikit**, University of Novi Sad, Faculty of Mathematics and Natural Sciences, Department for Physics, Serbia
– **Prof. Dr. Desanka Božidarević**, University of Novi Sad, Faculty of Agriculture, Serbia
– **Prof. Dr. Ilija Ćosić**, Faculty of Technical Sciences, University of Novi Sad, Serbia
– **Prof. Dr. Biserka Dimiskovska**, University of „St. Cyril and Methodius", Institute for Eartquake Engineering and Engineering Seismology (IZIIS), Skopje, Republic of Macedonia
– **Prof. Dr. Ivana Đujić**, University of Belgrade, Food Chemistry at Biological Faculty, Serbia
– **Dr. Aleš Golja**, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia

– **PhD Đordje Okanović**, Principal research fellow of the Institute for Food Technology in Novi Sad (FINS), Serbia
– **Dr Vera Popović**, Institute of Field and Vegetable Crops, Novi Sad, Serbia
– **Dr Ksenija Mačkić**, University of Novi Sad, Faculty of Agriculture, Serbia
– **Dr Jela Ikanović**, University of Belgrade, Faculty of Agriculture, Serbia
– **Dr. Tijana Zeremski**, Institute of Fild and Vegetable Crops Novi Sad, Serbia

Organizing Committee:

President:
– **Nikola Aleksić**, Director of the Ecological Movement of Novi Sad

Vice-president:
– **Angelo Mancone**, Legambiente Veneto, Rovigo, Italy

Secretary:
– **Zoran Kovačević**, Organizer of Ecological Movement of Novi Sad, Serbia

Members:
– **Prof. Dr. Milan Stanulović**, University of Novi Sad, Faculty of Medicine, Serbia
– **Prof. Dr. Dragoslav Stoiljković**, University of Novi Sad, Faculty of Tehnology, Serbia
– **Prof. Dr. Mihailo Peruničić**, University of Novi Sad, Faculty of Technology, Serbia
– **Dr. Željko Mihaljev**, Scientific Institute of Veterinary, Novi Sad, Serbia
– **Dr. Emina Mladenović**, University of Novi Sad, Faculty of Agriculture Serbia
– **Dr. Vera Popović**, Senior Research Associate, Institute of Field and Vegetable Crops, Novi Sad, Serbia
– **Dr. Vera Rajičić**, Senior Research Associate, Center for Small Grains, Kragujevac, Serbia
– **Mr. Milenko Košutić**, Engineer, expert assistant at the Institute for Food Technology in Novi Sad (FINS), Serbia
– **Mr. Bratimir Nešić**, Translator and Interpreter of the Ecological Movement of Novi Sad, Serbia
– **Mr. Slađana Đuranović**,Translator and Interpreter of the Ecological Movement of Novi Sad, Serbia
– **Luka Vujasinović**, Organizer of the Ecological Movement of Novi Sad, Serbia
– **Milan Vurdelja**, Rectors Office, University of Novi Sad, Serbia
– **Martina Čavić Gužvica,** B. Sc. in Environmental Engineering, Organizer of the Ecological Movement of Novi Sad, Serbia

THE ECOLOGICAL MOVEMENT OF THE CITY OF NOVI SAD: AN IMPORTANT DECISION OF ITS PROGRAMME COUNCIL

Since 1995, the Ecological Movement of the City of Novi Sad organizes „Eco-Conference® on Environmental Protection of Urban and Suburban Areas", with international participation.

Twelve biennial conferences have been held so far (in 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015 and 2017). Their programs included the following environmental topics:

Session 1: Environmental spheres: a) air, b) water, c) soil, d) biosphere
Session 2: Technical and technological aspects of environmental protection
Session 3: Sociological, health, cultural, educational and recreational aspects of environmental protection
Session 4: Economic aspects of environmental protection
Session 5: Legal aspects of environmental protection
Session 6: Ecological system projecting (informatics and computer applications in the field of integrated protection)
Session 7: Sustainable development of urban and suburban settlements–ecological aspects

Conference participants have commended the scientific and organizational levels of the conferences. Conference evaluations have indicated that some aspects are missing in the conference program. In addition, since a team of conference organizers was completed, each even year between the conferences started to be viewed as an unnecessary lag in activity.

Eco-Conference® on Safe Food

With the above deliberations in mind, a decision was made that the Ecological Movement of the City of Novi Sad should embark on another project – the organization of Eco-Conferences® on Safe Food. These Conferences were planned to take place in each even year. Preparations for the first Eco-Conferences® on safe food started after the successful completion of the Eco-Conference® '99.

So far ten Eco-Conferences® have been held (in 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016 and 2018.) focusing this general theme.

Theme of the Eco-Conference®

By organizing the Eco-Conference® on Safe Food, the organizer wishes to cover all factors that affect the quality of human living. Exchange of opinions and practical experiences should help in identifying and resolving the various problems associated with the production of safe food.

Since 2007 Eco-Conference gained five times in a row, a sponsorship from UN and their sectorial organizations (UNESCO and UN-FAO) and became purely scientific Conference.

Objectives of the Eco-Conference®

– To acquaint participants with current problems in the production of safe food.

– To make realistic assessments of the causes of ecological imbalance in the conventional agricultural production and the impact of various pollution sources on the current agricultural production.

– Based on an exchange of opinions and available research data, to make long-term strategic programs of developing an industrialized, controlled, integral, alternative and sustainable agriculture capable of supplying sufficient quantities of quality food, free of negative side effects on human health and the environment.

Basic Topics of the Eco-Conference®

Basic topics should cover all relevant aspects of the production of safe food. When defining the basic topics, the intention was itemize the segments of the

production of safe food as well as the related factors that may affect or that already have already been identified as detrimental for food safety and quality.

The topics include ecological factors of safe food production, correct choice of seed (genetic) material, status and preparation of soil as the basic substrate for the production of food and feed, use of fertilizers and pesticides in integrated plant protection, use of biologicals, food processing technology, economic aspects, marketing and packaging of safe food.

To paraphrase, the envisaged topics cover the production of safe food on the whole, individual aspects of the production and their mutual relations, and impact on food quality and safety.

Sessions of the Eco-Conference®

1. Climate and production of safe food.
2. Soil and water as the basis of agricultural production.
3. Genetics, genetic resources, breeding and genetic engineering in the function of producing safe food.

4. Fertilizers and fertilization practice in the function of producing safe food.
5. Integrated pest management and use of biologicals.
6. Agricultural production in view of sustainable development
7. Production of field and vegetable crops.
8. Production of fruits and grapes.
9. Livestock husbandry form the aspect of safe food production.
10. Processing of agricultural products in the framework of safe food production.
11. Economic aspects and marketing as segments of the production of safe food.
12. Food storage, transportation and packaging.
13. Nutritional food value and quality nutrition.
14. Legal aspects of protecting brand names of safe food.
15. Ecological models and software in production of safe food.

Attempts will be made to make the above conference program permanent. In this way will the conference become recognizable in form, topics and quality, which should help it find its place among similar conferences on organized elsewhere in the world.

By alternately organizing conferences on environmental protection of urban and suburban areas in odd years and conferences on safe food in even years, the Ecological Movement of the City of Novi Sad is completing its contribution to a higher quality of living of the population. Already in the 19th century, Novi Sad was a regional centre of social progress and broad-mindedness. Today, owing first of all to its being a university centre, Novi Sad is in the vanguard of ecological thought in this part of Europe.

It is our duty to work on the furtherance of the ecological programs of action and, by doing so, to make our contribution to the protection of the natural environment and spiritual heritage with the ultimate goal of helping the population attain e higher level of consciousness and a higher quality of living.

Director of the Ecological Movement
of Novi Sad
Nikola Aleksic

CONTENT

Biosphere

TECHNICAL-TECHNOLOGICAL ASPECTS OF ENVIRONMENT PROTECTION (ECO-INGEENERING)

SOCIAL ASPECTS OF ENVIRONMENTAL PROTECTION (SOCIOLOGICAL, HEALTH, CULTURAL, EDUCATIONAL, RECREATIONAL)

ECONOMIC ASPECTS OF ENVIROMENT PROTECTION

LEGAL ASPECTS OF ENVIROMENT PROTECTION

ECO-CONFERENCE® 2019
ECOLOGICAL MOVEMENT OF NOVI SAD

Medić-Pap S., Červenski J., Danojević D.
Institute of Field and Vegetable Crops, Maksima Gorkog 30,
Novi Sad, Serbia
sladjana.medicpap@ifvcns.ac.rs

PREVENTIVE MEASURES AS A TOOL FOR ENVIRONMENT-FRIENDLY VEGETABLE PRODUCTION IN SUBURBAN AREAS

Abstract

Increasing market demands for the production of safe foods pose the need for the application of preventive measures in combat against harmful organisms. Another very important demand in food production is environment protection. Most of the vegetable production is situated in the suburban areas. The paper includes the review of preventive cultivation practices in vegetable production which are an important factor for environment-friendly vegetable crop production.

Key words: *vegetable, plant protection, environment*

INTRODUCTION

The amount of vegetable crop production in Serbia has visibly increased in recent years. Thanks to investments in modern equipment and mechanization, use of high-quality raw material and an increase in vegetable crop production under controlled conditions, Serbia has become an important regional vegetable producer. Production of the safe and biologically valuable vegetable crop with familiar composition and quality, under controlled conditions, has caught consumers' attention. This type of vegetable is believed to have a much better flavor and it is produced with awareness for environment protection, and the aim to protect human health (Momirović et al., 2015). Vegetable crop production in Serbia spreads on 130,000 hectares (www.stat.gov.rs), with the annual variation in the production area of several tens of thousands of hectares. The major part of the production is the open-field type (over 95%), whereas a lesser part occurs under controlled conditions (up to 5%). A part of total vegetable

crop production occurs in home gardens and backyards. The total vegetable crop production area consists of 20% of the traditional home garden growing (Gvozdanović-Varga et al., 2016).

About 200 wild and cultivated vegetable species are used for human consumption throughout the world, while in Serbia there are only 50–70 vegetable species in human consumption. Vegetable cultivation is influenced by environmental/economic conditions as well as consumer habits. Vegetable crop cultivation is developed in river valleys and close to big consumer centers (suburban areas). Bio-gardening has also been developed based on vegetable crop production in the same area throughout the whole year. This kind of production leads to intensified crop rotation and crop merging, thus increasing the number of vegetable species and cultivars, different in their maturity, sensitivity to low temperatures and sunlight exposure duration (Lazić et al., 2017). Each vegetable crop production is specific depending on the species, region, and cultivation type. There are several preventive cultivation practices in vegetable crop production which should be applied so as to obtain in the final product a source of high-quality vitamins, minerals, plant fibers, essential amino acids, and other substances important in human nutrition.

Vegetable crop production is the source of high quality and safe foods essential for human development and health. Besides, it enables intensive soil use and achievement of high income per surface unit with higher investment and human labor. To make vegetable crop production more successful and organized, local vegetable producers should be regularly introduced to modern production methods, especially organic and environment-friendly vegetable crop production (Vlahović and Puškarić, 2013). Education of producers sometimes have encouraging effects, yet the financial side should be taken into account before organizing the production (Cameron et al., 2012).

Preventive cultivation practices

Given the intensity of vegetable crop production and short vegetation period of most vegetable species, application of chemical fertilization is limited. Plant protection should begin by a set of available preventive cultivation practices, applied before the establishment of production and during the production process. Application of preventive cultivation practices can significantly cut down the losses incurred by harmful organisms, and reduce the application of chemical preparations.

Local climatic factors are an important factor of vegetable crop production from the aspect of plant development, as well as occurrence and development of diseases, harmful insects and weeds. The plan of production should include regional (average annual temperature and rainfall) and local (frost danger) climatic conditions. Sowing or planting in open production areas should occur when the soil reaches an adequate temperature. This is especially important for vegetable species with high-temperature demands. When it comes to the position, plots should be chosen where fogs do not remain longer, since higher air humidity makes a good basis for the development of diseases such as cucumber and tomato blight, pepper, and dry bean bacterial infections and so on. Under controlled conditions, adequate venting affects microclimatic condi-

tions leading to disease emergence and spread. Soil conditions are also very important for the successful production of a specific vegetable crop. Flat terrains and mild slopes (1–2%) which provide adequate moisture drainage are most desirable, as steep slopes can lead to soil erosion. Soil with high groundwater presence is unfavorable since in some species such as pepper it can lead to increased emergence of root system diseases. Although certain soil types are more favorable for the production of vegetable crops, generally the most suitable is medium light or medium heavy soils. Besides, maintaining the favorable soil structure so that fast and uniform sprouting and rooting is provided, which is surely more important for the condition of the plant itself.

Soil tillage – optimal sowing preparation of soil helps better plant sprouting (important in particular for vegetable species with tiny seeds, such as lettuce, celery, parsley carrot, and so on...) because it cuts the sprouting period short and reduces the emergence of dangerous diseases. Soil tillage at the end of winter destroys larvae and eggs of snails and caterpillars which hibernate in soils.

*On selection of cultivars for cultivation***,** it is important to consider their resistance to dominant diseases. Cultivation of resistant cultivars is environmentally most acceptable and most efficient way of combat against harmful organisms, by reducing the application of chemical fertilizers.

Proper crop rotation is a significant preventive measure leading to decrease in weed abundance and providing control of plant pathogens, increasing soil fertility and yield (Sumner 1982; Brust and Stinner 1991, Medić-Pap et al., 2017). More intense emergence of diseases caused by plant pathogens in soils mostly occurs due to improper crop rotation.

Use of *high-quality, certified and healthy planting material* is what successful vegetable crop production is based on. Treatment of seed with hot water helps reduce the number of pathogens and is recommended in tomato, pepper, cauliflower, cabbage, carrot, celery, and lettuce production, while it does not have a suitable effect or it can even be harmful to vegetable species such as peas, dry beans, cucumbers or sweet corn (Nega et al., 2003, https://www.agric.wa.gov.au). Specific temperature and treatment time interval must be precisely determined and controlled so as to maintain vegetable seed viability and secure treatment efficiency. Seed disinfection can also be applied by immersion of seed into a 2% sodium hydroxide solution. This is applied in pepper production because it destroys seed surface pathogens and some viruses. The use of healthy transplants is essential in transplantation to a fixed spot. Healthy, properly developed, viable plants will overcome transplanting stress faster, root better and thrive.

Planting density significantly affects microclimate within crops. High planting density equals high air humidity and higher intensity of plant disease emergence.

Soil fertility agrochemical analysis is required before *fertilization*. It should include the content of soil macro and microelements, humus content and pH value. Soil pesticide remains can also be determined if needed. Based on soil and crop analysis, a plan of fertilization in the following vegetation should be set up. Optimal fertilization is very important because high nitrogen content e.g. promotes growth and abundance of plants but also higher susceptibility to diseases like grey rot. In later stages of plant growth, adequate fertilization enables balanced and ample supply of nutrients (particularly potassium) leading to fast growth and better disease resistance.

Use of manure is vital in vegetable crop production, by contributing to higher soil humus content, microbial abundance, improved soil structure, and pH value regulation. Soils fertilized with manure successfully regulate both lack and surplus of water.

Irrigation- most vegetable crops have high water requirements. Depending on the type of vegetable species and production, irrigation needs to supply soils with 35–75% plant water requirements. Determining the time of irrigation, i.e. optimal and rational watering regime according to specific soil type and climate conditions, cultivation practice level and biological characteristics of cultivated crops, are among the most important questions in irrigation practice (Pejić, 2008). Artificial rain irrigation is the most common type in our country. Relative moisture is high in crops watered in such a way, so it enables water retention on leaves and contributes to the development of certain fungal and bacterial diseases. Large water drops lead to plant damage (leaf tissue above all) which significantly increases disease sensitivity in plants. Drop by drop irrigation minimizes water loss through vaporization, while at the same time maintaining dry leaves as a cultivation practice against diseases. Irrigation can be applied as a cultivation practice for prevention of phytophagous acarids by increasing air humidity in crops, which negatively affects acarids and mechanically removes them from leaves.

Weed destruction should be carried out not only because weeds compete with cultivated crops for space, nutrients, light, and water, but also because they are a potential source of inoculums for microorganisms. Weeds are suitable spots for sustainment of viral vectors and phytoplasma such as aphids and leafhoppers. Although a number of examples of weed species can be given, field bindweed (*Convolvulus arvensis* L.) is particularly common in vegetable crop production. Frequently observed in the past years, field bindweed is an important host of Stolbur phytoplasma which causes yellow wilting and other significant damages to tomato and pepper (Navratil et al., 2009). Weeds are mostly destroyed mechanically due to the lack of suitable herbicides and vegetable crop sensitivity.

The soil covering with foil can be used as cultivation practice so as to protect the aboveground plant parts from soil-borne fungal infections. It reduces the need for irrigation. Yellow mulch foils act as insect repellents and halt viral spread to cultivated crops.

Besides earlier crop maturation, *use of Agryl fleece* has an important role in warding off insects.

Use of insect nets can be applied in greenhouses and glasshouses. The nets prevent insect access into vegetable crop production objects.

Sanitary cultivation practices are measures to destroy infested crops as potential inoculums (Lucas, 1992). This is of particular importance in transplant production and vegetable crop production in closed spaces, due to suitable conditions for the fast spread of diseases. On performing certain operations such as tomato pruning, hand and equipment sanitation and disinfection in 70% alcohol is mandatory.

Grafting is a significant preventive measure in control soil pathogen in Solanaceae (tomato, pepper, eggplant) and Cucurbitaceae (melon, watermelon) (Louws et al., 2010). Diseases which can be controlled by grafting are different types of wilting due to *Verticillium* and *Fusarium* infections. Besides, grafting can provide successful com-

bat against *Phytophthora* (*P. capsici, P. nicotianae*), bacteria, nematodes, and some viruses. Selection of media can also affect microorganisms which damage plant leaves including plant pathogens and insects. The use of one specific medium in production can lead to "overcoming" of host resistance, which poses the need for a different approach in solving the problem of soil pathogens. A medium selection must correspond to the place of production in terms of number, population structure, and pathogen dynamics, as well as edaphic and environmental conditions.

Crop review – regular crop review and monitoring the emergence of harmful organisms in the regions and if needed, application of chemical prevention cultivation practices.

Chemical combat cultivation practices – If there is a need for applying chemical combat cultivation practices, time of application and amount of preparation should strictly be followed as well as withholding period (timeframe between last chemical treatment and harvest). Pesticide application can be suggested only if all the available cultivation practices have been exhausted. Pesticide application requires caution and application of preventive cultivation practices. Besides the possibility of acute intoxication, long-term and multiple exposures to pesticides can cause cancers in various human organs (Bassil et al., 2007), dermatological and neurological diseases, affect fertility, and lead to different fetal deformities (Sanborn et al., 2007). Negative environmental effects of pesticides i.e. their eco-toxicological properties should be taken into account (Tim priređivača, 2016).

The results of Červenski et al. (2016), state an example of vegetable crop production using the open-field model. By using a well-organized and timely production in optimal terms, authors have incorporated 14 vegetable species in the production: kohlrabi, radish, lettuce, spinach, peas, pepper, cabbage, tomato, kale, beetroot, garlic, cucumber, onion, chard. Intensive crop rotation or rotation of crops in time and space is one of the key requirements of a successful production. Crop rotation requires different crop cultivation in different periods and simultaneously, various crop cultivation in a year, maximum utilization of available sources (soil and labor), as well as high efficiency. The open field can be divided into several parts with the aim to incorporate into production as many vegetable crops as possible and obtain high yields in a short timeframe. Crop rotation between 2–3 vegetable crops is also essential. This kind of organization increases production efficiency. Optimization and better use of resources through dividing plots between several crops and accelerating crop rotation in one year, can secure better productivity of the first vegetables and thus increase profit.

Main cultivated species are pepper, tomato, cucumbers, and cabbage. These vegetable species require intensive cultivation practices. Cultivation of the same vegetable species at the same production area can create optimal conditions for the occurrence of harmful organisms, diseases, pests, and weeds. To prevent it, Medić-Pap, et al (2017) give an open field four-year vegetable crop rotation as an example. Authors state that early potato should be used as cabbage predecessor in the first production year. After harvesting potatoes, late cabbage is transplanted to the same plot, which gives two harvests per year. Pepper and tomato are cultivated in the second production year. Onions are sown or autumn garlic is transplanted in the third production year. Peas or dry beans are sown in the fourth year, and manure or compost is incorporated after

harvest. Organization of vegetable crop production in the four-year crop rotation can reduce the occurrence of potential plant pathogen inoculums.

Vegetable crop production is more and more market-oriented and includes cultivation of only a few vegetable species (pepper, tomato, cucumber, potato, cabbage, onion), often in monoculture (Červenski et al., 2016). Importance of rotating 2–3 vegetable crops in one production year is stated by Ilin et al. (2009). Such crop rotation, with intensive cultivation practice, is the condition for long-term successful vegetable crop production, whether it is open-field or under controlled conditions.

Červenski et al. (2013) state that timely and organized cultivation practices using mandatory irrigation open the possibility of including several vegetable species into vegetable crop production. If vegetable crop production is organized in an open field and under controlled conditions, there is a chance to achieve two to three harvests in one production area/year. Traditional (old) cultivars and vegetable populations are often present in production, depending on consumer habits (Galluzzi et al., 2010). Results of Orsini et al. (2013) emphasize that vegetable crop production using irrigation and fertilization is more profitable than production of other crops. They further point to the importance of vegetable consumption due to the nutritive value of fruits, which can usually be consumed fresh and unprocessed. Also, a significant number of vegetables have a shorter vegetation period, which promotes more intensive crop rotation.

Vegetable crop production is faced with the problem of the use of pesticides and the application of fertilizer. Application of these preparations can easily lead to soil contamination and changes in soil quality. Garden and backyard soils are often more contaminated than soils under open-field vegetable crop production, due to greater use of chemicals at smaller production areas (Ninkov et al., 2015). In the attempt to achieve higher yields with low input per production area unit, producers often apply greater doses of mineral fertilizers compared to open-field vegetable crop production without prior soil chemical analysis. Also, some producers apply the highest dose on a production area much smaller than recommended by the producer. This is common in application of copper-based fungicides, which leads to soil contamination with copper. To prevent this unsustainable practice of soil use, Szolnoki et al. (2013) and Ninkov et al. (2015) suggested preventive cultivation practices soil lab analyses, with immediate evaluation of soil condition and recommendation for the rational application of fertilizers and other protection preparations. Providing education to producers on vegetable crop production is also an important preventive practice.

CONCLUSIONS

Producers usually strive to produce healthy and safe vegetable products. Naturally, well-organized and well-adjusted (timely) vegetable crop production helps create the space for continuous production throughout the whole year. By including more vegetable species into production as well as using crop rotation, we provide production security. In intensive vegetable crop production, it is necessary to perform systematic control of soil fertility and fertilization i.e. monitor soil quality in all production plots and closed spaces. By regular education and specialization, vegetable producers can

monitor, improve and enrich their production led by the principles of vegetable crop production and produce safe, high-quality. The application of environmentally friendly measures in vegetable production could help in environment protection in the suburban areas.

Acknowledgement

The paper is the result of cross-border Interreg-IPA CBC Croatia-Serbia IMPACT-ENVI project (2017HR-RS 182): "Implementation of cross-border joint actions toward environment protection in agriculture", between Croatia and Serbia (2017–2019).

REFERENCES:

– Bassil K.L., Vakil C., Sanborn M., Cole D.C., Kaur J.S., Kerr M.D. (2007): *Cancer health effects of pesticides*. Systematic review. Canadian Family Physician 53:1704–1711.
– Brust E., Stinner R. (1991): *Crop rotation for insect, plant pathogen, and weed control* in D. Pimentel, ed. CRC Handbook of Pest Management in Agriculture I. Second edition. Boca Raton, CRC 217–236.
– Cameron W.F.R., Blanuša T., Taylor E.J., Salisbury A., Halstead J.A., Henricot B., Thompson K. (2012): *The domestic garden–Its contribution to urban green infrastructure*, Urban Forestry & Urban Greening 11, 129–137.
– Christine, E., Nazim G. (2015): *Urban vegetable for food security in cities*. A review, Agronomy for Sustainable Development. 35:483–498.
– Červenski J., Gvozdanović-Varga J., Vasić M., Zekić V., Ferencz Á., Taskovics-Tóthné Z., Szabó T., Kalmár R. (2013): *New farming models in backyards as possible solutions for generating additional income and self-employment in the rural cross-border area*, Institute of Field and vegetable crops, Maxima graf, 96p.
– Červenski J., Gvozdanović-Varga J., Vasić M., Stojanović A., Medić-Pap, S. Danojević, D., Savić, A. (2016): *Home gardens and backyards – suitable area for vegetable production.* Acta Horticulturae 1142, 179–186.
– Galluzzi G., Eyzaguirre P., Negri V. (2010): *Home gardens: neglected hotspots of agrobiodiversity and cultural diversity*. Biodiversity and Conservation, 19: 3635–3654.
– Gvozdanović-Varga J., Vasić M., Gvozdenović Đ., Takač A., Červenski J., Jovićević D. (2016): *Oplemenjivanje povrća na kvalitet u Odeljenju za povrtarstvo Instituta za ratarstvo i povrtarstvo*, Zbornik referata, 50 Savetovanje agronoma i poljoprivrednika Srbije, Zlatibor, 24–30. 01. 2016. 4–12.
– Ilin Ž., Nešić Lj., Maksimović I., Mišković A. (2009): *Značaj plodnosti i kvaliteta zemljišnog supstrata za proizvodnju povrća u zašićenom prostoru*. Zbornik radova, Sveska 46, 141–154.
– Langemeyera J., Camps-Calveta M., Calvet-Mira L., Bartheld S., Gómez-Baggethune E. (2017): *Stewardship of urban ecosystem services: understanding the value(s) of urban gardens in Barcelona, Landscape and Urban Planning*, First online, (http://dx.doi.org/10.1016/j.landurbplan.2017.09.013).
– Lazić B., Vasić M., Anačkov G. (2017): *Genetički resursi gajenog i samoniklog povrća u Srbiji*, Selekcija i semenarstvo. 23(2): 75–90.
– Louwsa F., Rivarda C., Kubota C. (2010): *Grafting fruiting vegetables to manage soilborne pathogens, foliar pathogens, arthropods and weeds*. Scientia Horticulturae 127, 127–146.

– Lucas G.B., Campbell C.L., Lucas L.T. (1992): *Introduction to plant diseases: identification and management*. Kluwer, 369p.
– Medić-Pap S., Červenski J., Danojevi, D. (2017): *Plodored u proizvodnji kupusa kao prevencija pojave štetnih organizama*, Biljni lekar, 45(3): 293–302.
– Momirović N., Moravčević Đ., Poštić D., Dolijanović Ž. (2015): *Unapređenje metoda i tehnika integralne plasteničke proizvodnje paprike*, "XX Savetovanje o biotehnologiji" Zbornik radova, Vol. 20.(22), 123–132.
– Navrátil M., Válová P., Fialová R., Lauterer P., Šafářová D., Starý M. (2009): *The incidence of stolbur disease and associated yield losses in vegetable crops in South Moravia (Czech Republic)*. Crop Protection 28, (10): 898–904.
– Nega E., Roswitha U., Sigrid, W., Marga J. (2003): *Hot water treatment of vegetable seed – an alternative seed treatment method to control seed borne pathogens in organic farming*. Journal of Plant Diseases and Protection, 110 (3): 220–234.
– Ninkov J., Milić S., Vasin J., Sekulić P., Živanov M., Červenski J., Šeremešić S. (2015): *Quality of garden soil in Vojvodina Province, Serbia*. 7th Congress of the European Society for Soil Conservation ESSC "AGROecological assessment and Functional – environmental Optimization of Soils and TERrestrial ecosystems". 18–22. 05. 2015. Moskva, Ruska Federacija, p. 64–66.
– Orsini F., Kahane R., Nono-Womdim R., Gianquinto G. (2013): *Urban agriculture in the developing world: a review*. Agronomy for Sustainable Development 33:695–720.
– Pejić B. (2008): *Specifičnosti proizvodnje ratarskih i povrtarskih biljnih vrsta u uslovima navodnjavanja*. Novi Sad Poljoprivredni fakultet, http://5.189.140.16/~svetodavstvo/sites/default/files/BorivojPejic.pdf.
– Sanborn M., Kerr K., Sanin L., Cole C. Bassil K., Vakil, C. (2007): *Non-cancer health effects of pesticides Systematic review and implications for family doctors*. Canadian Family Physician 53:1712–1720.
– Sumner R. (1982): *Crop rotation and plant productivity*, in M. Rechcigl (ed.), Handbook of Agricultural Productivity. Boca Raton, CRC.Szolnoki, Zs., 273–313.
– Farsang A., Puskás I. (2013): *Cumulative impacts of human activities on urban garden soils*: *Origin and accumulation of metals*. Environmental Pollution 177, 106–115.
– Tim priređivača (2016): *Pesticidi u poljoprivredi i šumarstvu u Srbiji 2016*. XVIII izmenjeno i dopunjeno izdanje. Duštvo za zaštitu bilja Srbije, Beograd 729 str.
– Vlahović B. (2013): *Survey results*. Faculty of Agriculture, Novi Sad, rukopis, 32 str.
– Vlahović B., Puškarić A. (2013): *Organska poljoprivreda-šansa za agrobiznis*, Novi Sad, Gradska uprava za privredu, 164 str.
– www.agric.wa.gov.au
– www.stat.gov.rs

Медић-Пап С., Червенски Ј., Данојевић Д.
Институт за ратарство и повртарство, Максима Горког 30,
Нови Сад, Србија
sladjana.medicpap@ifvcns.ac.rs

ПРЕВЕНТИВНЕ МЕРЕ У ПРОИЗВОДЊИ ПОВРЋА КАО ЈЕДНА ОД МЕРА У ЗАШТИТИ ЖИВОТНЕ СРЕДИНЕ У ПРИГРАДСКИМ НАСЕЉИМА

Апстракт

Све већи захтеви тржишта за производњом здравствено безбедне хране представљају потребу примене превентивних мера у борби против штетних организама. Још један веома важан захтев приликом производње хране је очување животне средине. Највећи део производње поврћа налази се у приградским насељима. У раду је дат преглед превентивних мера које су важан фактор за здравствено безбедну производњу поврћа, као и за очување животне средине у приградским подручјима.

CIP – Каталогизација у публикацији
Библиотеке Матице српске, Нови Сад

502:711.4(082)

INTERNATIONAL Eco-Conference (23 ; 2019 ; Novi Sad)
Environmental protection of urban and suburban settlements : proceedings / XXIII International Eco-Conference, 25–27th September 2019, Novi Sad ; [project editor Nikola Aleksić]. – Novi Sad : Ecological Movement of Novi Sad, 2019 (Novi Sad : Lazukić company). – 342 str. : ilustr. ; 23 cm

Tiraž 300. – Bibliografija uz svaki rad. – Rezime na srp. jeziku uz svaki rad. – Registar.

ISBN 978-86-83177-55-4

a) Животна средина – Заштита – Градови – Зборници

COBISS.SR-ID 330693895