

**XXV INTERNATIONAL
ECO-CONFERENCE® 2021
22th–24th SEPTEMBER**

**XIV ENVIRONMENTAL PROTECTION
OF URBAN AND SUBURBAN
SETTLEMENTS**



PROCEEDINGS

NOVI SAD, SERBIA

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AND SUBURBAN SETTLEMENTS**

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2021

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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 "EcoConference® on Environmental Protection of Urban and Suburban Areas", with international participation. Seven biennial conferences have been held so far (in 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013 and 2015.). 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 four Eco-Conferences® have been held (in 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014.) 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 patronship from UNESCO 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 from 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 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 center of social progress and broad-mindedness. Today, owing first of all to its being a university center, 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 a higher level of consciousness and a higher quality of living.

Director of the Ecological
Movement of Novi Sad
Nikola Aleksic

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Original Scientific paper

PREPARATIONS BASED ON MEDICINAL PLANTS USABLE IN URBAN AGRICULTURE

Abstract

The paper presents the possibilities of using different types of preparations prepared from certain types of medicinal plants, which can be used in plant nutrition and protection, as well as in the composting process for the needs of plant cultivation in urban agriculture. The trend of importance of urban agriculture, both in terms of food safety and innovative practices, is increasingly present in highly developed countries as well as developing countries. This type of agriculture can play an important role in justice and fairness in terms of food distribution, but also in improving air quality, biodiversity and ecosystem services. In this regard, the application of preparations based on medicinal plants introduces innovative methods of urban agriculture that can be considered a tool to ensure future food safety.

Key words: *preparations of medicinal plants for plant production, plant nutrition and plant protection products, compost, urban agriculture.*

INTRODUCTION

It is estimated that 68% of the world's population will live in cities by 2050. For the same year, it is estimated that the world population will reach 9.7 billion (United Nations, 2019). According to the Agenda for Sustainable Development, by the end of 2030, it will be necessary to double agricultural productivity and income of small

food producers, especially women, indigenous people, family farmers, livestock and fishermen, among other things through safe and equal access to land and other productive resources and inputs, knowledge, financial services, markets and opportunities for added value, i.e. for employment outside agriculture (United Nations, 2015). Considering that industrial agriculture is responsible for 11-15% of global carbon emissions, it is concluded that intensive production processes contribute to climate change (Açıksöz et al., 2021). In this regard, one of the possible tools for achieving the above goals is active work on the promotion and faster introduction of urban agriculture in this area.

The aim of the paper derived from the need to present one of the possible bioagrotechnical solutions (preparations based on medicinal plants) that can be used in the cultivation of plants in urban agriculture.

URBAN AGRICULTURE

According to the general definition, urban agriculture is a type of agriculture that develops in cities or very close to them, but can be more precisely defined as a system that serves the needs of the city using urban resources and supporting the cultivation, processing and distribution of agricultural products in cities (Mougeot, 2000). The concept of urban agriculture is developed as a solution to environmental and socioeconomic problems caused by rapid and unplanned urbanization policies due to excessive and unplanned population growth. It is a complex system that encompasses a wide range of interests, from activities related to production, processing, marketing, distribution and consumption of food, to opportunities for recreation and leisure, economic sustainability of the community, and renewal, rehabilitation and beautification of the environment.

Urban agriculture can also be a significant way to reduce unemployment in cities. In Detroit (USA), a large industrial centre that experienced bankruptcy, was offered urban agriculture as one of the solutions to reduce unemployment (Mogk et al., 2010, Colasanti et al., 2012, Walker, 2016), while in Paris (France) in June 2020, the largest roof garden in the world was opened, financed through a crowd funding campaign. In addition, due to the incidence/outbreak of the COVID 19 virus, the transport and delivery of food is greatly hindered, so local food production, whose distribution chains are shorter, can be seen as a new and more suitable production model. The examples from Sarajevo (Bosnia and Herzegovina) and Zagreb (Croatia), where urban agriculture was promoted as a measure to mitigate the effects of the COVID 19 virus pandemic, show that the region also monitors these changes in production, with the aim of providing food in every currently available. Similar initiatives to form urban gardens have been launched in cities in other countries in the region, such as Pula (Cro), Skopje (NM), Ljubljana (Slo), Maribor (Slo) and others.

It is important to distinguish between urban agriculture and other similar activities such as community gardening or growing plants for one's own needs. These other activities are primarily related to meeting different types of individual needs (food, decoration, landscape or ecological aspect), while urban agriculture is usually focused on the production of plant raw materials for sale. The most common

type of crop production in urban agriculture is vegetable production and spice plant production (Frazier, 2018), which most often takes place on unused parts of urban or suburban land, backyards, balconies, roofs, parts of existing parks, walls or parts of interiors. FAO supports the recognition of urban agriculture as a type of urban land use and economic activity integrated into national and local agricultural development strategies, nutrition and nutrition programs, improvement of production, processing and marketing systems, and urban planning, and also helps national and regional administrations optimize their policies and support services for urban agriculture (Umesha, 2018). Another positive phenomenon related to urban agriculture is its "closeness" to organic production. In general, the population is paying more and more attention to environmental issues, health, social and ethical issues and is looking for more value than ever in food, despite increasing urbanization. Consumers are mostly looking for fresh, less processed food from sustainable sources and are very aware of the importance of the quality of the food they consume and are interested in foods that can provide them with safety when it comes to risks related to certain food products, such as pesticides, additives in food, as well as the presence of antibiotics, hormones and steroids in meat (Simić, 2020). The methods of urban agriculture are closest to the methods used in organic and biodynamic production. One of these methods is mulching, which has proven to be environmentally justified in larger cities of the Republic of Serbia, and from the point of view of cost, mulching uses only about 50% of funds per m², compared to the classic model of growing greenery in cities (Popović, 2017). Another method that is used in organic production, and is also used in the cultivation of plants in urban agriculture, is composting (Filipović and Ugrenović, 2013). In urban production, as well as in organic production, the so-called "eco-corridors" or "flower belts" comprising strips 1-2 m wide containing different mixtures of annual and/or perennial cultivated and/or wild flower plant species (Filipović et al., 2011). Some of the flowering medicinal and aromatic species are especially suitable for the establishment of the so-called "isolation belts", which primarily serve as isolation between organic and conventional production or sources of potential contamination, and secondarily as a habitat for many species of pollinators, predators and parasitoids of harmful insects, which is of particular importance in improving ecosystem services and biodiversity in agro ecosystems (Ugrenović et al., 2012, Dainese et al., 2019).

The situation regarding urban agriculture in the Republic of Serbia has been improving in the last few years as evidenced by several projects implemented mostly by non-governmental organizations such as "Urban gardens are important", "Urban gardens from children's imagination", "Do you remember the court gardens?" and others, whose goal is to conduct training on the proper cultivation of various plant species in urban and suburban areas. The National Association for the Development of Organic Production "Serbia Organika", together with the Novak Đoković Foundation, have been implementing the "Alphabet of Good Habits" project since 2018, where children, parents, educators and other employees in preschool institutions in urban areas acquire knowledge about environmental

protection, methods of organic production, collection of seeds in organic gardens, storage and preparation for sowing, interactions between plants in organic gardens and flower belts, composting and compost formed from plant residues from gardens and making preparations that can be used in nutrition and protection of plants in organic gardens and during composting.

PREPARATIONS BASED ON MEDICINAL PLANTS

One of the aspirations of work in urban agriculture is the reuse of different types of natural resources and urban plant waste, giving importance to the biological diversity (biodiversity) of plants and animals on land, water and air quality that contribute to food health and community preservation. One of the segments of such an approach is the use of different types of plants for the purpose of making preparations that are used as plant protection and nutrition and as soil improvers.

In addition to the well-known use of medicinal herbs in traditional (folk) and official medicine, medicinal herbs are increasingly used in the production of herbs. At the beginning of the twentieth century, the introduction of unknown production methods (biodynamic and organic) intensified work in the field of use of this type of plants in various types of plant production (field, vegetable, fruit and vineyard and others), but also in the production of various preparations i.e. natural means for plant nutrition and protection, compost and similar products (Filipović et al., 2021). For the preparation of preparations based on medicinal herbs, the most suitable moment for their picking, for the purpose of making these biological products, is from the beginning to full flowering, because in that period the listed species are richest in their active substances, and micro- and macroelements.

The application of preparations based on medicinal plants, in urban agriculture, satisfies the principles by which it is defined. For this purpose, there are several types of preparations that differ in the method of preparation. The most commonly prepared types of herbal preparations are as follows:

- Tea is made from fresh or dried plant parts over which boiling water is poured and left to stand for about 20 minutes. Then it is filtered and cooled, and depending on the type used, it is used immediately or first diluted with water (the most desirable rainwater or stagnant well water).
- Broth is prepared when cold water is poured over the chopped parts of the appropriate plant and left for 24 hours. After that, it is cooked for 15-30 minutes, then cooled and strained, and the liquid is used for treatment (spraying – usually diluted).
- Macerate is formed by pouring cold water (preferably rainwater) over the chopped parts of the plant and leaving it to stand for 24 hours. The macerate is filtered and liquid is used.
- Fermented extract is formed when cold water is poured over fresh (best) or dry plant parts and left outside until fermentation begins. The mass is stirred occasionally for 7-12 days. The fermentation is completed when the plant parts fall to the bottom of the vessel and the liquid clears. The extract must be diluted with water before treating the plants (usually it is a ratio of one part of the extract and 10 (20, 50) parts of water).

In production practice, mainly preparations made from one plant species are used – monocomponent preparations (Table 1).

Table 1. Different types of herbal preparations for plant protection and nutrition, soil improvement and for use as so-called "compost teas" in the composting process

Common name	Plant species	Part used	Type of preparation	Purpose*
chamomile	<i>Chamomilla recutita</i> L.	flower	Tea	PPP, PPNSI, CT
stinging nettle	<i>Urtica dioica</i> L.	aboveground part; leaves	Macerate, fermented extract	PPP, PPNSI, CT
comfrey	<i>Symphytum officinale</i> Wallwort	leaves	Fermented extract	PPNSI, CT
dandelion	<i>Taraxacum officinalis</i> Weber	aboveground part; root	Tea, macerate, fermented extract	PPP, PPNSI, CT
garlic	<i>Allium sativum</i> L.	aboveground part	Tea, fermented extract	PPP, CT
horsetail	<i>Equisetum arvense</i> L.	aboveground part	Tea, broth, fermented extract	PPP, CT
tansy	<i>Tanacetum vulgare</i> L.	flower	Tea	PPP
yarrow	<i>Achillea millefolium</i> L.	aboveground part	Broth, macerate	PPP, PPNSI, CT
pot marigold	<i>Calendula officinalis</i> L.	flower	Macerate	PPP, CT
valerian	<i>Valeriana officinalis</i> L.	flower, aboveground part	Macerate	PPNSI, CT
marigolds	<i>Tagetes</i> sp.	flower	Tea, macerat	PPP
burdock	<i>Arctium lappa</i> L.	leaves	Macerate	PPP, CT

* Note: PPP – preparation for plant protection, PPNSI – preparation for plant nutrition and soil improvement and CT – "compost tea".

There are examples in practice where preparations are made using parts of multiple species – multicomponent preparations. Most often, nettles and garlic, nettles and common comfrey, nettles and field horsetail, etc., are mixed. In practice, preparations are usually made depending on the purpose (presence of certain diseases and pests, the need for a certain mineral nutrition for certain plants or in the

process of composting). An example of one of the recipes for making herbal preparations that is (can be) used in urban agriculture:

Fermented nettle and common comfrey extract. Chop 1 kg of above-ground mass of nettle and comfrey and immerse them in 10 litres of water (rainwater or stagnant water from the water supply) in PE barrel of 20 to 50 litres volume. When it stops foaming, i.e. in a few days, the preparation is filtered and diluted in a ratio of 1:10 with rainwater or stagnant tap water. During the application, the soil around the plants is watered, once a week, i.e. four times a month. It is used for plant protection and nutrition. In protection against plant lice, and in the nutrition as a preparation rich in nitrogen and potassium (Oljača et al., 2019).

In the previous research work, using different types of preparations based on medicinal plants, significant results have been achieved, both in terms of reducing the presence of economically important diseases and pests, and in terms of mineral nutrition of treated crops, which significantly increased productivity and quality of cultivated plants (Filipović et al., 2014, Filipović et al., 2016, Stoyanova, 2020). In the wheat crop, the highest mortality of aphids was obtained after the application of tobacco extracts (57.9%) and garlic (57.91%) (Iqbal et al, 2011). Preparations based on garlic and burdock, in a group of 24 botanical extracts, have shown satisfactory antifungal properties on the incidence of the fungus *Fusarium oxysporum f.sp. lycopersics* (Rongai et al., 2015). The content of plant-available forms of nutrients in the liquid preparation of nettle is 0.015% K₂O, 0.0019% P₂O₅ and total N 0.005%, while the content of these nutrients in the liquid preparation is similar (0.013% K₂O, 0.0024% P₂O₅ and total N 0.002%) (Garmendia et al., 2018). A significant number of scientific papers have been published with application in plant protection with the so-called botanical pesticides, whose experiences and results can be greatly used in the further development of the application of herbal preparations.

CONCLUSION

The application of preparations based on medicinal plants, in urban agriculture, satisfies the principles by which it is defined. By applying various methods such as flower belts, insulation belts, composting, mulching, by introducing a large number of different plant species in the production conditions of urban agriculture, and by applying such preparations, sustainable food is obtained and the environment in which it is performed is preserved. As urban agriculture is constantly growing, it is necessary to conduct research, i.e. develop but also promote methods such as the use of herbal preparations.

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Оригинални научни рад

ПРИПРАВЦИ НА БАЗИ ЛЕКОВИТОГ БИЉА КОЈИ СЕ МОГУ КОРИСТИТИ У УРБАНОЈ ПОЉОПРИВРЕДИ

Апстракт

У раду се приказују могућности употребе различитих врста припревака припремљених од појединих врста лековитог биља, а који се могу примењивати у исхрани и заштити биља, као и у процесу компостирања за потребе гајења биља у урбаној пољопривреди. Тренд значаја урбане пољопривреде како у погледу безбедности хране, тако и у иновативним праксама је све више присутан како у високоразвијеним, тако и државама у развоју. Ова врста пољопривреде може играти важну улогу у правди и правичности у погледу хране, али и унапређењу квалитета ваздуха, биодиверзитета и еко-системских услуга. С тим у вези, применом припревака на бази лековитог биља уводе се иновативне методе урбане пољопривреде које се могу сматрати алатом за осигуравање будуће сигурности хране.

Кључне речи: *приправци на бази лековитог биља за биљну производњу, средства за исхрану и заштиту биља, компост, урбана пољопривреда*

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