



Agrotechnical Use of Medicinal Plants in Organic and Biodynamic Production

Vladimir FILIPOVIĆ ^{1*}, Vladan UGRENOVIĆ ², Ivana SIMIĆ ³, Vera POPOVIĆ ⁴, Slobodan POPOVIĆ ⁵, Milan UGRINOVIĆ ⁶ and Stojan JEVREMOVIĆ ⁷

¹Institute for Medicinal Plant Research „Dr Josif Pančić“, Tadeuša Koščuška 1, 11000 Belgrade, Serbia; vfilipovic@mocbilja.rs

²Institute of Soil Science Belgrade, Teodora Drajzera 7, 11000 Belgrade, Serbia; vladan.ugrenovic@gmail.com

³National Association for the Development of Organic Production “Serbia organica”, Bojanska 19, 11000 Belgrade, Serbia; ivana.simic@serbiaorganica.org

⁴Institute of Field and Vegetable Crops, Maksima Gorkog 30, 21000 Novi Sad, Serbia; vera.popovic@ifvcns.ns.ac.rs

⁵University of Novi Sad, Faculty of Economy and Management, 21000 Novi Sad, Serbia; slobodan.popovic49@gmail.com

⁶Institute for Vegetable Crops, Karadordeva 71, 11420 Smederevska Palanka, Serbia; milan.ugrinovic@gmail.com

⁷Bayer CropScience, Omladinskih brigada 88b, 11070 Belgrade, Serbia; jevremovic.stojan@gmail.com

ABSTRACT: This paper presents the state of the use of medicinal plants in organic and biodynamic production in the Republic of Serbia. Most of the agrotechnical use of this type of plants is related to the preparations that producers themselves produce on their own farms. The second part of this use relates to commercial preparations to be found on the List of plant nutrition products and soil conditioners and the List of plant protection products that can be used in organic production by the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. The third part of the use refers to preparations that can be found on the market of the Republic of Serbia, but cannot be found on the mentioned lists. This paper will outline the medicinal species most used for preparing the above-mentioned types of preparations. The method of the production of the preparations will also be presented, as well as the method and purpose of using them. The last part of the paper will cover the species used in the process of composting plant waste that remains in the production of different plant species.

Key words: medicinal plants, organic production, biodynamic production, preparations, composting.

INTRODUCTION

We will outline some of the more commonly used MAP species used in plant production, in which, they are primarily used for the preparations for plant protection and nutrition (tea, broth, maceration and fermented extracts) and as plant waste used in composting process. In organic and biodynamic production the most widely used MAP species to this purpose are: stinging nettle (*Urtica dioica* L.), comfrey (*Symphytum officinale* Wallwort), dandelion (*Taraxacum officinalis* Weber), garlic (*Allium sativum* L.), horsetail (*Equisetum arvense* L.), tansy (*Tanacetum vulgare* L.), yarrow (*Achillea millefolium* L.), pot marigold (*Calendula officinalis* L.), valerian (*Valeriana officinalis* L.), marigolds (*Tagetes* sp.) and burdock (*Arctium lappa* L.).

In natural habitats grow the herbs which are very useful in protecting against numerous plant diseases and pests. In addition, there is a large number of plants that, apart from medicinal substances, contain a significant percentage of macro and microelements necessary for their proper growth and development. Natural remedies achieve the desired goals in a less problematic way. Moreover, when we produce them ourselves, they are much cheaper. Take, for example, the use of nettle preparation that is rich in nitrogen, phosphorus, potassium, sulfur, calcium, iron and other nutrients, as well as some synthetic fertilizer. By using nettles, a resource from our own property, we do not contaminate the soil or the plant, and we also do not incur the expense of buying a synthetic fertilizer, which introduces the risk of contaminating the soil with unwanted heavy metals, jeopardizes its biogenicity (biological activity), and in certain amount affects its structure and pH, too.

In addition to industrially produced preparations, herbal preparations made on farms are largely used in organic production. These preparations have insecticidal, bactericidal and fungicidal properties. Apart from the protective role, a large number of these preparations are also used to feed the cultivated plants. Natural preparations are made from medicinal, aromatic, spicy herbs, vegetables, weeds and other plants. They have been known since ancient times. Recently, their use has been increasing due to the negative consequences of synthetically produced chemical substances for plant protection and nutrition. With the appearance of biodynamic and organic production, the interest in natural preparations has increased, and they are used in various plant productions (crop, vegetable, fruit and others). Properly used, they provide a healthy and quality yield, i.e. acceptable and sustainable plant production for humans and the environment.

USE OF MEDICINAL PLANTS IN BIODYNAMIC AND ORGANIC PRODUCTION

In **organic production**, will list the types of bio-preparations that we can make on our own:

Tea is made from fresh or dried plant parts poured over with boiling water, and the tea is left to sit for about 20 minutes. It is then strained and cooled, and depending on the plant species, immediately used or diluted with water (most desirable is rainwater or well water which has previously sat), and then, used. Some of the tea preparations are based on MAP are: dandelion tea, garlic tea, horsetail tea, chamomile tea, tansy tea etc.

Broth is prepared when the shredded parts of the respective plant are covered with cold water and left to sit for 24 hours. After that, the broth is cooked for 15–30 minutes, then cooled, filtrated and the liquid, the broth, is used (usually diluted) for treatments (spraying). Some of the broth preparations are based on MAP are: horsetail broth, yarrow broth etc.

Macerate is made by covering chipped parts of a plant with cold water (preferably rainwater) and allowing them to sit for 24 hours. The macerate is then strained and the liquid is used. Some of the macerate preparations are based on MAP are: stinging nettle macerate, dandelion macerate, yarrow macerate, pot marigold macerate, marigolds macerate, burdock macerate etc.

Fermented extract is formed when preferably fresh or dry plant parts are covered with cold water and left outside until fermentation begins. The mass is stirred occasionally during 7–12 days. The fermentation is complete. when the plant parts sink to the bottom of the container and the liquid clarifies. The extract must be diluted with water before treating the plants; usually, the ratio is: one part extract and 10 (20, 50) parts water. Some of the fermented extract preparations are based on MAP are: fermented stinging nettle and cabbage extract, fermented stinging nettle and common comfrey extract, fermented common comfrey extract, fermented dandelion extract and other MAP, fermented garlic extract, horsetail fermented extract, etc.

In **biodynamic production**, there are seven plant-preparations, which are numbered from BD 500 to BD 508, as follows:

I) spray preparations:

BD 508 – a preparation made from field horsetail (*Equisetum arvense* L.), used for spraying against plant diseases.

II) preparations added to the compost pile for a better and higher quality composting process:

BD 502 – preparation made from common yarrow (*Achillea millefolium* L.),

BD 503 – preparation made from chamomile (*Chamomilla recutita* (L.) Rausch.),

BD 504 – preparation made from stinging nettle (*Urtica dioica* L.),

BD 505 – preparation made from oak bark (*Quercus robur* L.),

BD 506 – preparation made from dandelion (*Taraxacum officinalis* Weber),

BD 507 – preparation made from valerian (*Valeriana officinalis* L.)

CONCLUSION

In addition to their basic use (pharmacy, cosmetics, nutrition, etc.), a large number of MAPs can be used as a starting material for the production of numerous bio-preparations in various types of environmentally sustainable plant production. Their use as fertilizers and soil conditioners, provides ecological and economic benefit, maintains and improves soil fertility and biological activity, creates suitable waste for the composting process, as well as bio-preparations used for activating compost, which is especially developed in biodynamic production. MAP-based agents can also be biopesticides, i.e. they can have a positive effect on reducing the presence of diseases and pests in cultivated crops and plantings. Finally, we would like to turn to the starting assumption of the researcher Rudolf Steiner, who states the following: biodynamic preparations create an environment for the permeation of the major space and earth forces that create this metabolic wonder. With the help of biodynamic preparations, in this case, MAPs, the health and nutrition of plants, animals and humans around the world is regenerated. Remember what it is that makes these preparations.

ACKNOWLEDGEMENTS

Acknowledgement: Research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (agreement number 451-03-68/2020-14/200003 and 451-03-68/202014/200032) and Project: „EcoStack: Stacking of ecosystem services: mechanisms and interactions for optimal crop protection, pollination enhancement, and productivity (H2020, Grant No. 773554, 2018-2023).

