STATE OF THE PRODUCTION AND THE COLLECTING OF MEDICINAL PLANTS IN THE REPUBLIC OF SERBIA[1]

Vladimir Filipović[2], Vesna Popović[3]

Abstract

In relation to the period of 25 or more years ago, the sector of medicinal, aromatic and spice plants (MASP) in Serbia has been on a constant rise, developing new technologies, standards and markets. Nowadays, unfortunately, in spite of the exceptionally rich biofund of this group of plants, production, processing and export of medicinal plants are far below levels of the late 1980s. The cessation of the operation of several major public companies, together with the lack of sufficiently favorable political situation has directed some of the foreign, as well as domestic customers towards the acquisition of raw materials and products in some other markets. Therefore, to restore this sector to the place it deserves, it must act vertically and horizontally. Vertically, towards the institutions that directly or indirectly determine the state of the sector (ministries, chambers, associations, etc.). Horizontally should be acted on the participants in the production and processing.

Key words: *medicinal, aromatic and spice plants (MASP), plantation growing, collecting, quality, product*

Introduction

The interest in natural medicinal raw materials in the world is growing, it is being invested in the research and the promotion of phytoremedies, standards

[1]The paper represents a part of the research results within the Project of Integral and Interdisciplinary Research No. 46006 Sustainable Agriculture and Rural Development in the Function of the Accomplishment of Strategic Objectives of the Republic of Serbia in the Danube Region, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

[2]Vladimir Filipović, PhD, Research Associate; phone: +381 (0)13 377855, e-mail: vfilipovic@mocbilja.rs; Institute for Medicinal Plants Research "Dr Josif Pančić", Tadeuša Košćuška 1, 11000 Belgrade, Serbia

[3]Vesna Popović, PhD, Senior Research Associate; phone: +381 (0)11 2972854, e-mail: vesna_p@iep.bg.ac.rs; Institute of Agricultural Economics, Volgina 15, 11060 Belgrade, Serbia

are being introduced (GAP, GACP, Organic, etc.) and continuous education is being implemented concerning the importance of using these raw materials, which primarily refers to the younger population. The growing needs of the international market and for a foreign exchange indicate the importance of adaptation, i.e. the transformation of the production of medicinal plants. Based on the analysis of this sector of the Republic of Serbia, it can be concluded that there are few manufacturers that offer sufficient amounts of export of quality medicinal plants. Serbia has lost its dominant position in the export of medicinal plants in recent years. According to Ignjatijević (2010), during the year 2008, it was at the 31st position in the world by export value. Although, by the early 1990s, Serbia had been the largest exporter of medicinal and aromatic plants to the countries of today's European Union, in the past twenty years or so, we have been pushed out of the acquired positions by Bulgaria, Poland and Hungary, out of the European countries, as well as China and India, out of the Far East ones. Unfortunately, most commonly, we still sell raw materials to foreign buyers and only in a minority of cases, semi-finished products or products of a higher level of processing – extracts, essential oils and phytoremedies.

In the global market of medicinal and aromatic plants dominate European, especially German companies. The greatest concern that deals with plant raw materials in Europe is "Martin Bauer Group" (a holding company from Germany), positioned as a "natural connection" with the branches in 50 countries on 5 continents, and with an annual turnover of 350 million €. Other leading companies include the German "Madaus Group" and the Italian "Indena", with a turnover of 330 million € and 170 million € respectively (Pavlović and Kostić-Nikolić, 2006).

In Germany, an important role in the trade of medicinal and aromatic plants is held by the company "Dr. Willmar Schwabe Arzneimittel", with an annual turnover of over 400 million €, of which over 300 million € comes from phytopharmaceuticals. In Germany today, there are about twenty major wholesalers and seven representatives for medicinal and aromatic plants and their products (essential oils and plant extracts).

For the past period of time, in addition to international ones, there were a large number of domestic firms that bought medicinal raw materials. Some of them were: "Jaka 80" Radoviš, Macedonia; "Alkaloid", Skopje, Macedonia; "Krka", Novo Mesto, Slovenia; "Droga", Portorož, Slovenia; "Lek", Ljubljana, Slovenia; "Aphrodita" Rogaška Slatina, Slovenia; "Pliva" and "Franck", Zagreb, Croatia; those were just some of the enterprises bought up

raw materials from the territory of Serbia. Unfortunately, most of the above mentioned no longer acquire raw materials in the region, which has affected the engagement in this industry, which has been largely decimated. However, in the Serbian market in the last twenty years, there have emerged several, mostly family, businesses, which increase productivity and competitiveness in the domestic and international markets year in year out (Turudija-Živanović et al., 2010).

In our country, experts say, there are many places where such production could be organized. We have the sort of soil that plants need, water resources and favorable climatic conditions. In the rich genofund of medicinal, aromatic and spice plants, the greatest importance is born by the genetic diversity of economically important species (chamomile, mint, sage, St. John's wort, yarrow, wild marjoram, bearberry, valerian, plantain, primrose, etc.), as well as the types of limited native plants and those which are in decline for various reasons. Not enough attention is paid to the evaluation and monitoring of the state of the population of genetic resources of medicinal and aromatic plants and to the need for their conservation. According to the latest voluminous study on medicinal plants, the total number of medicinal and aromatic plant species in our flora is around 700, of which, 420 are officially registered, and around 280 are in trade, based on data from the "Strategy of medicinal plant protection in the Republic of Serbia" (Amidžić et al., 1999).

But in spite of all of the above mentioned, the production of these plants tends to decrease, whereas the interest in their collecting is gradually increasing. On the other hand, as compared to the collecting of wild plants, plantation growing has several advantages. The basic advantages are that, through the means of plantations, natural resources are preserved and raw materials of a more uniform quality are obtained, and there is a choice of acceptable conditions for the production and control of all its phases through the introduction of various standards.

On the territory of the Republic of Serbia 20,000 hectares of MASP were grown in 2013

The needs of our market for medicinal raw materials are mainly satisfied through collecting; as a matter of fact, 90 percent of plants in trade come from nature. In the last ten to fifteen years, the areas under plantations have been ranging from very important to symbolic ones. According to the data from the Serbian Chamber of Commerce, in 2012, there was 1,337 hectares under grown plants (1,419 hectares in 2011). If we add to it a portion of the areas

under spice plants that are listed as vegetables and a portion of the areas on which it is produced for foreign customers, it makes a total of approximately 20,000 hectares.

According to the areas of growing, the Republic of Serbia can be divided into two production regions: the lowlands (Vojvodina) and the highlands (Central Serbia). In the former region, the most commonly grown ones are: chamomile, peppermint, marigold, lemon balm, coriander, lavender, white and black mustard, valerian, fennel, parsley, basil, cumin, dill, tarragon, marshmallow, celery, thyme, sage and some other less included species. In the hilly and mountainous part of our country, there are plantations of the following: marigold, lemon balm, arnica, lavender, gentian, sage, St. John's wort and others (Table 1).

Table 1. *Some of the more sought for plantation grown medicinal plants*

ordinal number	common name	plant species	grown as
1	chamomile	*Chamomila recutita*	Annual
2	peppermint	*Mentha piperita*	Biennial
3	marshmallow	*Althaea officinalis*	Annual or biennial
4	lemon balm	*Melissa officinalis*	perennial
5	sage	*Salvia officinalis*	Perennial
6	marigold	*Calendula officinalis*	Annual
7	valerian	*Valeriana officinalis*	Annual
8	thyme	*Thymus vulgaris*	Perennial
9	basil	*Ocimum basilicum*	Annual
10	fennel	*Foeniculum vulgare*	Perennial
11	St. John's wort	*Hypericum perforatum*	Biennial
12	yarrow	*Achillea millefolium*	Perennial
13	wild marjoram	*Origanum vulgare*	Perennial
14	nettle	*Urtica dioica*	Perennial
15	parsley	*Petroselinum sativum*	Annual and biennial
16	angelica	*Angelica archangelica*	Annual
17	dill	*Anethum graveolens*	Annual
18	ribwort plantain	*Plantago lanceolata*	Perennial
19	buckwheat	*Fagopyrum esculentum*	Annual
20	white mustard	*Sinapis alba*	Annual

Source: *The presented data have been obtained in touch with suppliers of medicinal raw materials for the needs of production of the Institute for Medicinal Plant Research "Dr Josif Pančić" from Belgrade, located in Pančevo.*

The production and processing of medicinal plants is specific, and is greatly in common with the production of tobacco, vegetables, fruits and flowers. The technological level of production is high in some areas, whereas, in certain other areas, there is a lot of the unknown regarding the growing and collecting of medicinal plants and in those areas, one can encounter inadequate technology of growing and collecting, along with a low level of the training of producers and collectors.

One of the institutions that unify the work in scientific research, practice and production is the Institute for Medicinal Plant Research "Dr Josif Pančić" from Belgrade. This institution is engaged in the studying, producing, processing and trade of medicinal plants and phytoremedies, with a tradition of more than sixty-five years. For the past period of time, the Institute has participated in the design and implementation of the most significant studies, reports and projects in the field of medicinal plants in our country and the countries of former Yugoslavia. Some of the results of the past work can best be noted on the territory of South Banat, for instance, where the attitude towards the technology of growing, the work on the introduction and domestication of medicinal, aromatic and spice plants (Filipović and Ugrenović, 2013). Another scientific research institution that has done a lot in the field of medicinal plants in Vojvodina is the former Department of Hops, Sorghum and Medicinal Plants, which is today's Department of Alternative Plants within the Institute of Field and Vegetable Crops from Novi Sad, with the headquarters in Bački Petrovac. The work of this institution is the most apparent on the territory of Bačka.

Considerably greater opportunities for growing and export

The natural conditions in Serbia and particularly, some of its regions, in terms of climate and soil, are very favorable for the growing of these plants. The technology of their growing has partly been developed and made available to future producers and in other words, it is possible to secure rich raw material bases, both from the standpoint of variety and of quantity. Some construction projects that have previously been built can be adjusted to the needs of this sort of production, the market for final products has been developed, and there is also a possibility of securing funding for such production.

Some of the difficulties are related to crop establishment, the protection from weeds, diseases and pests, determining the moment for harvesting and the method and time of drying. The machinery intended for this production is relatively little used, although there are some good individual solutions. The

buying-up is frequently disorganized, with insufficiently defined quality criteria. Of the existing capacities for plant distillation, only some ten percent are in use, and of those for the extraction, about 30 percent.

To eliminate most of the above mentioned difficulties, it is most important that all those who make the sector of medicinal, aromatic and spice plants work together. That is the only way to make progress in this field. It is particularly important to introduce European and international standards for product quality. It is also necessary to prepare and adopt a law and related acts in connection with these plants and provide the seed-breeding and nursery production of those species, the constant specialization of personnel at home and abroad, and to encourage domestic research more intensively. Financial support is supposed to encourage the purchase of new equipment, particularly for the purpose of increasing processing capacities. The market for these products, including the export, should also be developed.

Growing does not only solving the issue of the supplying domestic pharmaceutical industry with necessary quantities of medicinal raw materials of sustainable quality and pharmacological effect, but also, the export of these raw materials, given that cultivated medicinal, aromatic and spice plants are more wanted and appreciated by most of the importers in the European Union. One of the ways of reducing the pressure on the exploitation of wild plants it is their breeding apparently. Although plantation growing can be used as a good and effective way to provide large quantities of raw materials and products, as well as a larger market, it has also got a number of limitations. Among other things, one should bear in mind that not all species can easily be grown, and that some take several years to reach the maturity when they can be gathered.

How and what to produce and collect?

Due to the limited demand for raw materials of plant origin and consistency of supply and demand, both in this country and in the world, the increasing of the areas must be planned, which means that the production should be based on a familiar customer. The expert services of the Institute "Dr Josif Pančić" recommend beginners that the growing of one or more species should start on smaller areas.

For marigold blossom, for example, the demand has been considerable in the long term, the price of a kilogram of dried blossom ranged from 500 to 700 dinars in 2013. If we take into account that from one hectare, about 500 kilograms of dried blossoms of this plant can be obtained, it can be concluded

that it is exceptionally interesting for growing. The gathering of marigold, however, requires a lot of human labor which, if seasonal workers are hired, can make the production significantly more expensive. If it is a family business, growing medicinal plants is best to be initiated on smaller areas of 10 to 20 acres per plant species, in order to avoid possible losses and increase revenue per unit of production.

Mass production of medicinal plants should be developed in the plains, whereas, in the highlands, there should be the growing and collecting of those species that thrive there. For the purpose of the protection of medicinal, aromatic and spice plants in their natural habitats, endangered species should be introduced in the production, as well as those for which there is an increased demand. In terms of nature protection, the species that should be grown are: *Achillea sp.*, *Aconitum sp. Acoruscalamus* (sweet flag), *Adonis vernalis* (pheasant's eye), *Allium victorialis* (victory onion), *Arctostaphylos Uva Ursi* (bearberry), *Centaurium umbellatum* (centaury), *Cnicus benedictus* (blessed thistle), *Colchicum autumnale* (meadow saffron), *Corylus colurna* (Turkish hazel), *Crocus sp.*, *Gentianalutea* (gentian) *Gentiana punctata* (spotted gentian), *Gypsophila paniculata* (baby's breath), *Helichrysum arenarium* (dwarf everlast) *Menyanthes trifoliata* (bog-bean), *Micromeria sp.*, *Orchis sp.*, *Primula sp.*, *Herniaria sp.*, *Inula helenium* (elecampane), *Ruta graveolens* (rue), *Satureja sp.*, *Sideritis scardica* (ironwort), *Veratrum sp.* and others. By their introduction, first through experiments, and then, in production practices, it should become generally accepted practice. One of the studies of that type was given by Vukomanović and Bojanić (1999), who experimentally researched the economy of growing lemon balm, thyme, valerian and peppermint with the goal of determining the technological and economic parameters of the feasibility of their growing in the region of Kučevo Mountains, in a so-called ecologically clean area in Serbia. The obtained economic results were encouraging for all four medicinal, aromatic and spice plants.

One of the measures that contribute to the protection of endangered medicinal and aromatic plants in nature is their plantation growing. Plantation growing considerably reduces the uncontrolled collection of wild plants and thus prevents their complete destruction. The growing of medicinal plants in our region is linked to the beginning of the 20th century. More intensive plantation growing dates back to the 1950s, and, since 1970s, some medicinal and aromatic species have been fully introduced to culture, such as, for example, *Valeriana officinalis* L. (valerian), *Satureja montana* L. (winter savory), *Helichrysum arenarium* (L.) (dwarfeverlast), Scopolia carniolica Jacq.

(henbane bell), *Borago officinalis* (borage) and others. The salt-marshes of Banat are suitable for the production of chamomile, whereas, for example, the area of Tara is suitable for the production of gentian and arnica, and that of Sokobanja for the growing of wild marjoram and heather.

In order to make a producer and a buyer-up satisfied the resulting raw materials, some of the requirements of production must be met. For instance, meeting the sowing date. The sowing date with chamomile is in late August and in the course of September. The deficiency of this date, that is, the autumn sowing, is a possible drought, which affects the percentage of germinated seeds. If this term is missed, the sowing can also be done with a lot of risk in February or early March. Late winter or early spring sowing is not recommended, primarily because of the achievement of fewer yields, in some cases, even by 50%. On the occasion of this sowing, there is a greater risk in the production – the plants are due for harvesting at a later time, and the possibility of the appearance of weeds is significantly higher. The gathering starts in May, so that the sown plots can also be used for another plant species. Seed is available, and the price of one kilogram of seeds with pulvis was from 2,000 to 11,000 dinars in the course of the year 2013. The yield of dry heads ranges from 400 to 500 kg ha^{-1}, and the yield of pulvis is from 200 to 250 kg ha^{-1}. The purchase price depends on the quality of the very blossom and the content of essential oil in it. In the past two years, the purchase price of dried chamomile were generally uniform in most places of purchase, so 1 kg of dried chamomile blossom cost from 350 to 500 dinars, and a kilogram of pulvis about 200 dinars.

Apart from chamomile, on poorer-quality soils, among other things, the following can be grown: licorice, sage, chicory, lavender and many others. Most grown medicinal plants, however, thrive best in deep, fertile soils, particularly in the conditions of moderately humid climate. Those annual and biennial are grown in rotation, whereas the perennial ones are grown in permanent crops, separately from crop rotations. To ensure a quality sowing and uniform germination of plants, the soil should be ploughed in autumn, and then prepared with the preceding crop. At this stage, the used machinery is mainly the one which is also applied in conventional crop and vegetable production.

Plant nutrition is certainly important. Manure or compost is entered in the basic processing or under the preceding crop and mineral fertilizers – in the primary treatment or during the growth season as supplementary nutrition, depending on soil fertility and the needs of plants. For certain plant species

from this group, depending on the needs, foliar nutrition can be performed just as well. Seeding, inter-row cultivation, fertilizer application and protection also use common machinery. When it comes to the reproduction, the most common and the safest way, especially for those species with small seeds, is transplant production. Successful production also depends on the quality of seeds. It must meet prescribed germination and purity. It is also important to carry out the sowing at a right time and in an appropriate manner, as well as plant nutrition and other care measures. The largest number of specific machinery in this area is required at the time of gathering. The time and method of gathering depend on a plant, i.e. on the parts which are to be collected. The gathering of chamomile blossoms, as well as those of other plant species uses accessory machines – both towing and mounted. The towing ones have their own side wheel and storage space. With the mounted ones, the gathering mass is stored in the trailer over the elevator. There are various models of these machines in the world, with different technical characteristics. They are often confined to own making or making within small series. The average price of this equipment is 10 to 15 thousand euros. With such machinery, considerable savings can be achieved in labor and the length of gathering duration on larger plantations.

Collecting medicinal plants

In many regions of Serbia, there are also good natural resources for the collecting of medicinal plants, but they are not fully utilized. Massive gatheringon a larger scale takes place in the south-east andlately isalso organizedin the east parts of the country. In the regions where berries are grown, buyers-up purchase medicinal fruits as well (blueberry, elderberry and others). The average annual quota for the collecting of certain types of fruit is: up to 2,000 tons of juniper berries, up to 5,000 tons of wild roses, up to 150 tons of wild strawberries, up to 2,000 tons of wild blackberries, up to 2,000 tons of blueberries etc. (Turudija-Živanović et al., 2013). All in all, for this not at all easy work, it takes a lot of collectors. According to estimates by the associates of the Institute "Dr Josif Pančić", there are around 4,000 organizedhouseholds of collectors, which is about 12,000 collectors (Turudija-Živanović, 2010). The active gathering season lasts from April until October. At different times of the year, different plants are collected, that is, their different parts. So, for instance, of nettle, the above-ground part and leaves are collected in April, May and June, whereas the root-rhizome is collected in October–November, and less frequently in the course of February–March.

To successfully collect medicinal and spice plants, it is necessary to master some basic rules and skills. The education of medicinal plant collectors is carried out, especially through the following: collectors are familiarized with the principles that should be followed during the collecting of wild plants and forest fruits, concepts that are encountered in this field, (pharmacognosy, plant-based drugs, the quality of raw materials...), the ways and methods of collecting are indicated, as well as the time of collecting by plant species and organs (the medicinal plants collector's calendar)and the ways and methods of the drying and packing, the basic pieces of information are given on the quality parameters, as well as the guidelines and procedures that should be respected in order to serve organic, i.e. bio-production, etc. (Savić et al., 2008). In order to gain better familiarity with the field of the protection of certain medicinal plants, it is necessary to take into account some of the existing documents relating to the matter. This primarily refers to: the Law on Environmental Protection (the Official Gazette of the Republic of Serbia, 36/2009 and 88/2010); the Regulation on the Transboundary Movement and Trade of Protected Species (the Official Gazette of the Republic of Serbia, 99/2009); the Ordinance on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi (the Official Gazette of the Republic of Serbia, 05/10 and 47/11); the Decree on the Control of the Use and Trade of Wild Flora and Fauna (the Official Gazette of the Republic of Serbia, 31/05, 45/05, 22/07, 38/08, 9/10 and 69/11); the Order of the Prohibition of the Collecting of Certain Protected Species of Wild Flora and Fauna in the Year 2014 (the Official Gazette of the Republic of Serbia, 23/2014); the National Strategy for Sustainable Use of Natural Resources (the Official Gazette of the Republic of Serbia, 33/2012) ; the Strategy for the Biodiversity of the Republic of Serbia for the Period from the Year 2011 until 2018 (the Official Gazette of the Republic of Serbia, 13/2011). The persons who obtain the permission to collect protected species are bound to provide by the prescribed deadline the relevant Ministry and the Institute for Nature Protection of Serbia with the data on collecting (by species and collecting stations), the use and market placement on the prescribed forms. Those persons who deal with the growing of protected species are also bound to provide the Ministry with the prescribed information.The organizations (legal entities and entrepreneurs) which are engaged in the collecting of protected species are obliged to train potential collectors (to train vocationally) for that kind of work, to perform the testing of their knowledge, and to issue appropriate certificates to them (valid for a single season of collecting, a collector has to have it at hand at the time of collecting, and is bound to show it to an authorized person). Also, when purchasing collected protected species, a legal entity or an entrepreneur is obliged to issue a sales/purchase coupon of

purchases and to keep records of every purchase separately: with the data on the collector, the bough-up species and quantity, the price, the collection area (Katić et al., 2006).Bearing in mind that this about is seasonal working engagement, plant collecting cannot provide economic survival for a large number of families. During the summer season, a collector can earn 20 to 50 euros a day, which can be a total of 1,500 to 3,500 euros. According to our experience so far, the most collected species are: yarrow, St. John's wort, wild thyme, nettle, horsetail and many others that can be found in our area. The most wanted wild medicinal plants, apart from the above mentioned, include:centaury, marshmallow, lemon balm, (common) cowslip, hawthorn, gentian, common juniper, lime tree, wild marjoram, winter savory, elderberry, agrimonia, bearberry, bear's garlic, wild rose and dog rose (Table 2).

Table 2. *Some of the more sought for wild–collected medicinal plants*

ordinal number	common name	plant species	collected in the course of
1	bearberry	*Arctostaphylos uva ursi*	April – July
2	horsetail	*Equisetum arvense*	May – October
3	stinging nettle	*Urtica dioica*	April – October
4	(common) yarrow	*Achillea millefolium*	June – August
5	alder buckthorn	*Rhamnus frangula*	March – April
6	Birch	*Betula alba*	July – August
7	rose hips	*Rosa canina*	May – October
8	St. John's wort	*Hypericum perforatum*	June – August
9	(spiny) restharrow	*Ononis spinosa*	October – November
10	wild thyme	*Thymus serpyllum*	July – September
11	coltsfoot	*Tussilago farfara*	April – June
12	wild marjoram	*Origanum vulgare*	July – September
13	cowslip	*Primula officinalis*	March – October
14	common hawthorn	*Crataegus monogyna*	May – October
15	bear's garlic	*Allium ursinum*	April – June
16	lime tree	*Tilia*	May – June
17	common juniper	*Juniperus communis*	August – November
18	centaury	*Centaurium umbellatum*	July – October
19	elderberry	*Sambucus nigra*	April – July
20	winter savory	*Satureja Montana*	July – October

Source: *The presented data have been obtained in touch with suppliers of medicinal raw materials for the needs of production of the Institute for Medicinal Plant Research "Dr Josif Pančić" from Belgrade, located in Pančevo.*

The preservation of the quality of wild medicinal plants directly depends on the primary processing realized in the period from the collectingto the corresponding way of packing and storage. The most common method of primary treatment is dehydration – drying. The blossom and the leaf are naturally driedin a closed and drafty place from three to eight days, and the root in the sun even up to fifteen days. Kiln drying is much faster than natural. They are very practical and easy to work with, and take little labour, so they are recommended to primary producers and plant collectors. In them, temperature, relative humidity and air flow can be adjusted. The drying temperatures also differ depending on the part to be produced or collected. The blossoms and leaves are dried at temperatures from 35 to 40, and the root at 45 to 55 degrees Celsius. Higher drying temperatures are not desirable for the majority of these plants, because their medicinal matter is lost. In addition, plants are also primarily processed by steam distillation and the extraction with solvents. The processing of plant raw materials takes specific equipment.

The dried plant parts are packed in different types of wrapping material: boxes, bags, sacks, and the material that wrapping is made of can be: natron, jute, plastic, wood, glass, metal and more. The packed material is kept in dry, clean, well-ventilated storehouses on wooden shelves or pallets secured from the presence of rodents and insect pests. Plants that have fragrant components must be separated from the others to avoid scent mixing.

Organic medicinal, aromatic and spice plants

One of the possible directions of the development of domestic agriculture is organic production, which has been more and more present in our area year after year. The greatest importance in the practice in our country so far hasbeen shown by organically certified raw materials obtained from the collectors' sector, but also, increasingly, raw materials obtained from production plots. He adds that a considerable share in this sector belongs to medicinal, aromatic and spice plants whose processing and purposes are different.

The benefits of organic certification of plantation and collected plants, in addition to the environmental, communal and social role,the introduction of this production is reflected in the price of organically produced medicinal plants. Compared to conventionally produced plants, the price of organically produced products is higher by about 20-30% on average, although there are large deviationsfrom this frame, depending on supply and demand.

In some cases, when demand exceeds supply, the prices can be up to 100% higher than the conventionally produced raw materials. To illustrate, in Table 3, the wholesale prices were given of a German enterprise that are related to conventional and organic MASP (Stepanović and Radanović, 2011).

Table 3. *Wholesale prices for organic MASP in Germany,*

product	Latin name of drug	conventional product cost (€/kg)	organic product cost (€/kg)	Increase (%)
nettle leaf	*Urticae folium*	3.60	5.20	44
marshmallow root	*Althaeae radix*	9.30	10.00	7
St. John's wort above-ground biomass	*Hyperici herba*	5.20	5.70	10
lime flower	*Tiliae flos*	5.20	11.00	111
yarrow above-ground biomass	*Millefolii herba*	3.90	4.10	5
wild thyme above-ground biomass	*Serpylli herba*	5.20	6.70	29
winter savory above-ground biomass	*Saturejae montanae herba*	4.10	8.00	95
ribwort plantain leaf	*Plantaginis folium*	4.10	6.20	51
absinthium above-ground biomass	*Absinthii herba*	3.10	3.90	26
birch leaf	*Betulae folium*	3.60	4.70	30
valerian root	*Valerianae radix*	5.20	9.00	73
wild rose	*Cynosbati fructus*	1.10	1.60	45

Source: *Alfred Galke GmbH, Germany cited in Stepanović and Radanović, 2011*

The demand for the plants grown and controlled this way in fresh and dry condition has steadily been rising in the past fifteen years. It is particularlyemphasized on the occasion of the demand for fresh organic spice plants, with the highest demand for: garden parsley, basil, coriander, wild thyme and thyme (Filipović et al., 2010). Spain and Italy are the leaders in the European Union when it comes to the organic production of these plants. Spanish experts have suggested that our entire production of this plant should be converted to organic, as well as that the areas should be significantly increased, primarily because of the good quality of our raw materials. On the other hand, Italian experts estimate that in our country organic production could be arrangedon approximately 300,000 hectares, mainly with medicinal plants.

To ensure a proper quality of medicinal plants, that is, of medicinal raw materials, it is necessary that the production and collecting go onin accordance with the Guidelineson Good Agricultural and Collection Practices (GACP). Their further processing, the primary processing, must go on in the most optimal manner, using standardized equipment and procedures as prerequisites for obtaining standard quality plant raw materials, that are prescribed in the methods of organic production.

Generally, the production of these plantsby the principles of organic agriculture, which is current in the whole world, has its future position has in our country, too, especially in the highlands. They are, on the one hand, environmentally acceptable for this type of industry, and, on the other, encompass the native habitats of the majority of medicinal and aromatic species.

Export of medicinal, aromatic and spice plants

According to Dajić (2011), in 2010,the foreign exchange was realized in the amount of $24.3 million, that is, $19.8 million worth of medicinal, aromatic and spice plants was exported, and 5.3$ million worth of plants was imported. In contrast, according to the data by the Chamber of Commerce of Serbia, in the same period in 2011, the foreign exchange was realized in the amount of $25.7 million dollars for a total amount of 6,500 tons. Of that, from Serbia, 5,000 tons of medicinal, aromatic and spice plants were exported, worth $19.8 million. During the same period, 1,500 tons of medicinal, aromatic and spice plants were imported, worth $5.9 million. According to the same source, in the year 2012, the overall foreign trade of medicinal, aromatic and spice plants was achieved, worth $22.9 million, of which the export amounted to $15.2 million, and the importto $7.7 million. As can be seen appears from the above mentioned, in the last year of the processed period, the export of our plant products decreased, and the import increased.

Within the foreign trade in the year 2012, medicinal, aromatic and spice plants achieved a positive balance of $7.5 million dollars. The total export of theseplant products in the year 2012, the largest share has the export to the European Union countries, which is 51% ($7.7 million), followed by the CEFTA countries – 44% ($6.7 million), and 5% ($781,000) to other countries. When it comes to the import of medicinal, aromatic and spice plants, the largest share in the year 2012 was held by the group of spice and aromatic plants – 62% percent of the total import ($4.8 million), followed by medicinal plants – 29% ($2.2 million) and tea plants –9% ($669,300).

In the period from 1991 until 2000, The European Union represented one of the largest markets in the world for the trade in medicinal and aromatic plants, with the import of 120,000 tons, andvalued at US$200 million (based on the wholesale price of dry raw materials). The annual growth rate ranged from 5 to 10 % on average. The EU is also a major producer of medicinal and aromatic plants, which are grown on 62,700 ha. France and Spain are the largest growers with 25,000 haand 19,000 ha of sown area respectively. Within the EU, Germany is the largest importer of medicinal plants, with about 38%, which is over 45,000 tons per year, followed by France, with 17 %, and Italy, with 9 % of the total import (Commonwealth Secretariat, 2001). Germany, with an annual export of 15,000 tons to the USA and other European countries, is Europe's largest exporter of medicinal and aromatic plants at the same time. In order to create the possibilities for a more productive and better quality production, it is necessary to devisea development strategy for this sort of production too (Simić et al., 2003).

Conclusion

Although it has favorable agroecological conditions, as well as certain experience in the field of growing and collecting medicinal, aromatic and spice plants, the Republic of Serbia "has debased itself" from the leading positionin the region as an exporting country to the position of a statewhich symbolically participates in this sector. Tomake a position such as this better, the state unfortunately still does not provide great means to encourage the production and processing of medicinal plant raw materials, so the existing and interested stakeholders in this sector are on their own. Compared to our country that has a large number of plant species (Serbia has about 3,600 plant species), Germany, although with a far smaller number of plant species, uses phytotherapy500 times more than we do. By the extension and increaseof the production of raw materials and finished products, for our country, medicinal plants could represent is a potentially significant development opportunity for the advancement and prosperity of a large number of economic and environmental factors.

References

1. Amidžić, L., Dražić, S., Kostić, M., Maksimović, S., Mandić, R., Menković, N., Panjković, B., Popov, V., Radanović, D., Roki, Đ., Sekulović, D., Stepanović, B., Tasić, S. (1999). Strategija zaštite lekovitog bilja u Srbiji. Ministarstvo zaštite životne sredine Republike Srbije i Institut za proučavanje lekovitog bilja „Dr JosifPančić", Beograd.

2. Dajic Stevanović, Z. (2011). Herbal sector of Serbia: General Overview Serbia, (taken 12th March 2014 from: (http://www.amapseec.org/Herbal%20sector%20of%20Serbia%20overview.pdf)

3. Filipović, V., Glamočlija, Đ., Radivojević, S., Jaćimović, G. (2010): The demand for fresh spice herbs in the world and in Serbia. 6rd Conference on Medicinal and Aromatic Plants of Southeast European Countries, The Association for Medicinal and Aromatic Plants of Southeast European Countries (AMAPSEEC), Antalya, Turkey. 18 – 22 April 2010, Book of Abstracts, 120.

4. Filipović, V., Ugrenović, V. (2013): The Composting Of Plant Residues Originating From The Production Of Medicinal Plants. International Scientific Meeting „Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region - Achieving regional competitiveness. Editors: DragoCvijanović, Jonel Subić, Andrei Jean Vasile. The Institute of Agricultural Economics Belgrade.Topola, Serbia, hotel „Oplenac“, December 5-7th 2013. Economics of agriculture, ISBN 978-86-6269-026-5, UDK 631(4-924.5)(082)(0.034.2), 338.434(082)(0.034.2), 502.131.1(082) (0.034.2), 330.15(082)(0.034.2), 504:33(082)(0.034.2), COBISS.SR-ID 203206156. Thematic proceedings, 1283 – 1301.

5. Ignjatijević, S. (2010). Economic aspects of production and exportation of medicinal and aromatic herbs. Zbornik radova (Fakultet za ekonomiju i inženjerski menadžment), 3(4), 65-79.

6. Katić, B., Savić, M., Mijajlović, N. (2006). Mogućnosti plasmana šumskih plodova, lekovitog i aromatičnog bilja. Ekonomika poljoprivrede, 53(3), 767-783.

7. Savić, M., Mijajlović, N., Bekić, B. (2008). Ambiental, social and economic estimation of gathering and processing of indigenously plants. International Scientific Meeting „State, possibilities and perspectives of rural development on area of huge open-pitminings“, Belgrade–Vrujci, 24-25th April 2008, ISBN 978-86-82121-55-8, Cobiss.SR-ID 148134412, CIP 338.43(082); 502.521:622.271(082). Themetic Proceedings, 350-356,

8. Pavlović, V., Kostić-Nikolić, S. (2006). Uticaj vlasničke structure na efikasnost preduzeća za gajenje i preradu lekovitog i aromatičnog bilja. Ekonomika poljoprivrede, 53(2), 461-475.

9. Simić, J. D., Bogdanović, J., Stevanović, S. V. (2003). Determinants, past results and perspective of medicinal and aromatic plant production and processing.Ekonomika poljoprivrede, 50(2), 117-128.

10. Stepanović, B., Radanović, D. (2011): Tehnologija gajenja lekovitog i aromatičnog bilja u Srbiji, Institut za proučavanje lekovitog bilja ″Dr Josif Pančić″, Beograd.

11. Turudija-Živanović, S. (2010): Trendovi srpskog tržišta lekovitog i aromatičnog bilja. Lekovite sirovine 2010; (30): 3-14.

12. Turudija-Živanović, S., Marković, T., Živanović, T. (2010). Potentials of mountainous region of Serbia for MAP [medicinal and aromatic plants] sector development. International scientific meeting: Multifunctional agriculture and rural development (V) – regional specificities. Editors: Milan Milanović et al. The Institute of Agricultural Economics Belgrade. BanjaVrujci, Serbia, 2-3 December 2010. Economics of agriculture, Special issue – 2. ISBN 0352-34-62, UDK 633.88:631.111 (23.01), Vol. LVII, SI-2 (1-372), 2010. Belgrade, Book of Proceedings, 204 – 210.

13. Turudija-Živanović, S., Vasiljević, Z., Vuković, A. (2013). Legislation in Serbia in the field of collecting medicinal and aromatic plants.Fourth International Scientific Symposium "Agrosym 2013".University of East Sarajevo, Faculty of Agriculture, Republic of Srpska, Bosnia. Book of Proceedings, 760 – 764.

14. Vukomanović, L. M., Bojanić, S. V. (1999). Rearing economics of some market important medical, aromatic and spice plant species in the region of Kučevo. Ekonomika poljoprivrede, 46(1-2), 103-112.