

Medical Crop Production of Ukraine

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The demand for natural healthy food, cosmetics, pharmaceutical and perfume products from natural plant materials is growing worldwide. Such products are more similar to human nature, safe and healthy.

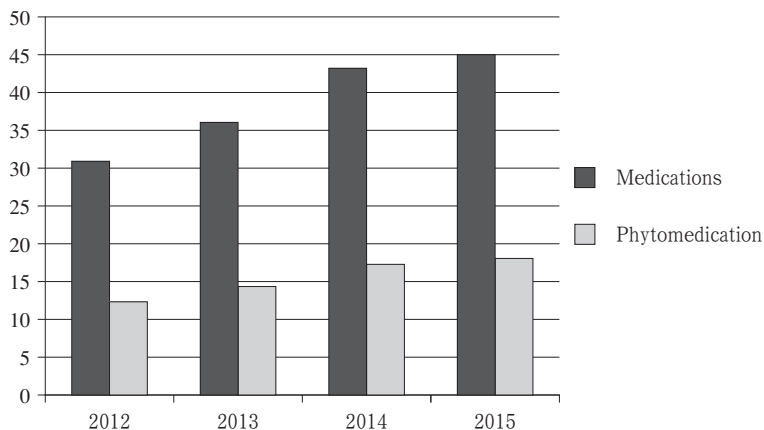
Human needs that are constantly growing, require increase in the volume of raw material for the production of an increasing variety of natural products and herbal remedies. Despite substantial progress of synthetic chemistry and its distribution in industries such as pharmacy, cosmetics and even food industry, we get from plants each third drug, which is used in medicine. The centuries-old history of scientific mastering and medical use of medicinal plants is closely linked to the development of civilization, science, industry, social system and shows that from ancient times till nowadays the interest in medicinal plants and the need for them are constantly growing.

The efficiency of the flora phytodiversity use for human needs and especially for healthcare needs in various countries are not identical, climate and traditions contribute to this.

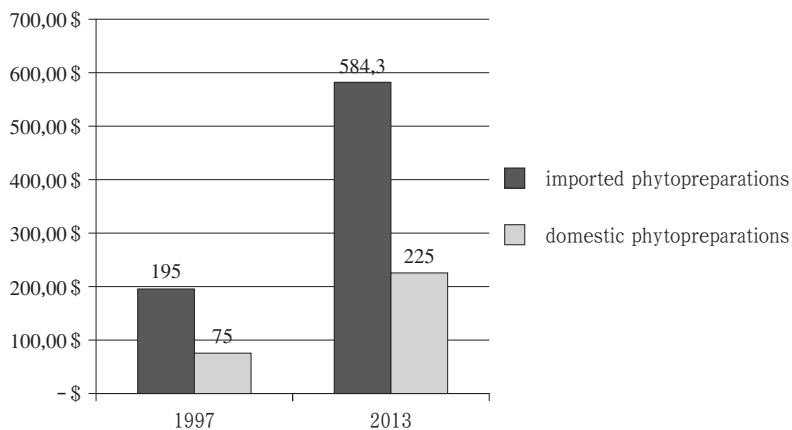
From more than 400,000 species of plants that contain biologically active substances in quantities effective for use with medical purposes is used only about 20

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The volume of the pharmaceutical market of Ukraine, bln. \$



The market potential of herbal remedies of Ukraine

thousand. According to international experts, the effective use of biodiversity can reach 50 or even 70 thousand species, including 15,000 species of plants that are endangered and in need of urgent protection measures (IUCN), can be used as medicinal products.

Efficiency of flora wealth utilization is one of the indicators of sustainable use of

renewable natural resources. Thus in Ukraine from 2,219 species of medicinal plants which are used officially classical and folk medicine and used in a cosmetology and food industries, cultured species make up 244 species, others — wild plants of natural groupings. From 244 species of medicinal plants belonging to the group of introduced and cultivated — 32 species of agricultural crops, 29 are fruit and berries, 150 species of plants are grown for the production of pharmaceutical raw materials, other are introduced and cultivated in gardens, parks and collections. It should be noted that these figures are dynamic and depend on many factors, primarily on market supply and demand, which in turn depends on the morbidity and purchasing power, the effectiveness of herbal remedies, social advertising, etc.

In recent decades, consumption of medicinal products based on biologically active plant compounds are characterized by trend of growth around the world. According to experts, half a century ago, herbs were used mainly in countries where they have been almost the only available way to treat. Currently, the use of natural means, and in particular the use of medicinal plants and products on their basis is typical of all developed countries. The world market of medicinal plants is estimated at 600 thousand tons per year, over 40% of pharmaceutical products in the world are made of medicinal plants. According to the World Health Organization (WHO), about 80% of the world population use herbs and preparations on their basis for treatment and prevention of diseases. According to WHO experts, in the next 10 years the share of herbal medicines will increase and reach 60%. This is due primarily to the fact that about 15% of the world population suffers from allergies, including synthetic medicines.

In terms of today one of the world's largest commercial markets of medicinal plants and medicines made from herbal ingredients is the European market. European countries import and produce a huge range of herbal medicines. In France, Germany, Italy, Sweden, Switzerland, England and Ukraine, medicinal

Volume of the utilization of medicinal plant raw material by industries of the economy in Ukraine

Branch	Number of enterprises	The proportion of use of raw materials, %
Food	50	19,0
Pharmaceutical	20	78,0
Perfumery and cosmetics	4	1,4
Other		1,6

plants are traditionally used as an adjunct to medical treatment.

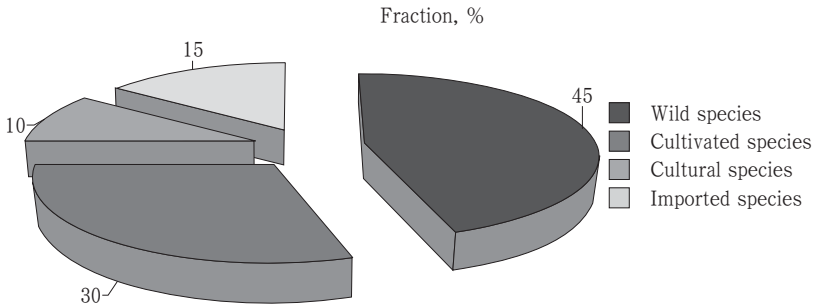
Despite the fact that natural raw material is in great demand on the world market, as “environmentally friendly”, growth in demand for raw materials and reduction of natural resources of medicinal plants, stimulate the development of medicinal plant cultivation as an independent branch of agricultural production.

Preparations of 40 companies from 30 countries are implemented on the pharmaceutical market of Ukraine. About 70% range are products of European manufacturers

Exporting country	Name of Company	Number of preparations
Poland	GEMI	35
Germany	Schwabe	181
Czech Republic	Dr. Muller Pharma	11
Israel	Teva	18
Switzerland	Novartis	17
India	Elegant India	31
Switzerland	Sandoz	17
Pakistan	Herbion Pakistan	13

Branch of medicinal plant cultivation worldwide is highly profitable. The prospects of the industry is obvious, given the significant and growing demand for the products. The profitability of growing majority of medicinal plants significantly exceeds the corresponding figures when growing traditional agricultural crops and

income from the collection of medicinal raw materials in vivo.



The range of medicinal plant raw material, implemented at the market of Ukraine

Medical crop production is traditional for Ukraine agriculture industry, whose products are the raw material for the production of pharmaceuticals, food and perfume and cosmetic industry. In connection with the domestic pharmaceutical production transition to the rules of Good Manufacturing Practice (GMP), the requirements to practice cultivation and quality of medicinal raw material in accordance with international requirements (GACP) are sharply increased.

The introduction of the State Pharmacopoeia of Ukraine, which is harmonized with the European Pharmacopoeia with appropriate quality control, is an important step in quality control of cultivated medicinal plant material. Ideally raw material have to origin from a source that is traceable and reproducible, which in practice is the most complete and performed guaranteed exactly when growing medicinal raw materials when used varieties and adherence to science-based technology.

Variety is the defining element of the technological process of growing medicinal plants. It is important to ensure resource-efficiency and profitability of production. Ukrainian varieties of medicinal plants have a high performance, are characterized by combined resistance to adverse environmental conditions and are the basis for

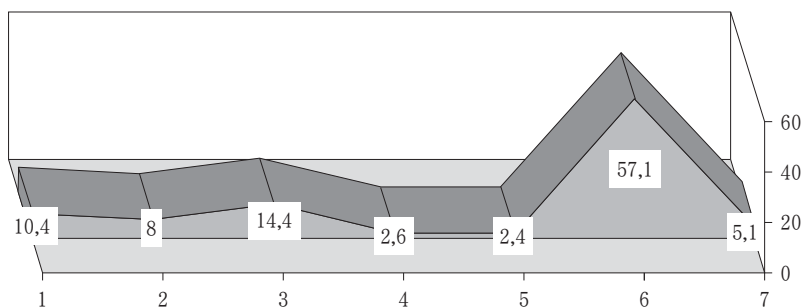
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the operating cost of environmentally friendly technologies. Varieties of plants of both aboriginal flora as well as exotic species are adapted to local soil and climatic conditions, ensure uniformity of raw material in quality which is important in its processing, use of manpower and technology.

Change the nature of plants for human needs is one of the tasks of selection, which is the cheapest, most effective, environmentally sound growth factor for the medicinal plant cultivation production.

Successful development of breeding is impossible without broad involvement of genetic plant resources.

Wild species and forms of medicinal plants is a plentiful genetic and breeding material to create new varieties, cultivated populations and forms. Natural materials are widely used as to select initial pedigree plants of future varieties, as well as in crossings for obtaining hybrids.



The ESMP IANM NAAS composition of medicinal plants collection by categories of samples.

Selection work with the medicinal crops, which contains the original forms, which include a variety of expression and scope of characteristics, is distinguished by productivity. These crops should include first the mint. The first in Ukraine mint plantations were established in 1893 in Poltava province. Selection work with

mint in Ukraine was started in 1921 at the Experimental Station of medicinal plants, and “Poltava peppermint population”, descendant of the black English mint was retained as the object of study in collection of institution, so local populations of mint represent a certain interest as a source of valuable traits. Wild species of mint are also widely used in breeding work with this crop.

10 species of mint grow in vivo in Ukraine. Among the medicinal plants, which selection work is conducted with in experimental stations of medicinal plants of IANM, the mint collection is the largest and includes 263 specimens belonging to 13 species.

Currently, collection of medicinal plants of initial forms for the selection process includes 950 specimens belonging to 384 species of 66 families, 218 families of the world flora, the collection is constantly updated, providing a fruitful breeding work.

To date, breeders have to face the challenge to create a different maturity of productive varieties that would be marked with a long term of preservation of quality characteristics. These varieties allow to create conveyors of raw materials and uniformly use the infrastructure of farms. The issue of expanding the range of cultivated plants, improving the quality by the content of bioactive compounds and environmental safety of medicinal plant cultivation products is quite acute.

Business and economic characteristics of the main medicinal and aromatic crops are given in Table.

Important elements of technological process for medicinal plant cultivation, which significantly affect the profitability is completion - washing, drying, milling and packaging. Therefore, despite the high yield, the formation of production infrastructure takes time and requires investment, as a consequence, newly established economies slowly master growing of medicinal plants as the commercial impact of production should be expected for longer than when growing grain or vegetable

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crops.

One of the important issues in development of the industry is that agricultural equipment in Ukraine in terms of 1 ha is used in an average in 4, and in some crops in 6 times less than in EU countries, specialized machinery and equipment for completion is missing in farms. Portable devices for determining the quality of raw materials, special packaging materials and containers are necessary for development of the industry. The organization of wholesale markets and manufacturers communication with foreign customers is important for the realization of medicinal plant raw material.

Conclusions:

1. Medical crop production is one of the most promising crop industries, both in the world and in Ukraine;
2. Demand for industry products demonstrates a growing tendency and has request to the expansion of assortment;
3. Growing demand for medicinal plants raw materials of natural communities reduces their resources and depletes natural populations;
4. To meet the demand for raw materials it is necessary to expand the cultivation of medicinal plants in different countries;
5. Ukraine has long traditions and the necessary conditions for the development of medicinal plant cultivation - favorable soil and climatic conditions, varietal resources, advanced technology and experience.

Manufacturing profitability of medicinal plant raw material in the conditions of Ukraine.

Crops	Productivity, quintal/ha	Expenses ths. USD./ha	Profit, ths. USD./ha	Manufacturing profitability, %
Common marshmallow <i>Althaea officinalis</i> L.	1 year grass 18-20 roots 10-20	4,08	3,48	85
Valerian <i>Valeriana officinalis</i>	1 year on irrigation roots 30	6,20	5,14	83
<i>Ononis arvensis</i> L.	roots 12-20	3,55	3,25	91
Wild carrot <i>Daucus carota</i>	seed 5-7	0,79	0,72	90
Eastern purple coneflower <i>Echinacea purpurea</i> L. <i>Moench</i>	1 year of grass irrigation 50; roots 15	5,55	2,38	43
St. John's-wort <i>Hypericum perforatum</i> L.	by 2 year 15-20 by 3 year 30-40	1,89	1,51	80
Galega <i>Galega officinalis</i> L.	one slope 17-32 two slopes 30-46	1,81	0,94	52
Greater burdock <i>Arctium lappa</i> L.	1 year roots 30-35	2,12	1,28	61
Blue giant hyssop <i>Lophanthus amissatus</i> Benth	grass 1 year 25-30 2 year 35-40	1,62	1,40	86
<i>Oregano Origano vulgare</i> L.	grass 22	2,53	2,00	79
Lemon balm <i>Melissa officinalis</i>	grass 1,2-1,5 foliage 0,5-0,6	1,96	1,06	54
Peppermint <i>Mentha piperita</i> L.	grass 19,0-27,4	4,65	2,15	46
Pot marigold <i>Calendula officinalis</i> L.	inflorescence 10-15	2,27	0,76	33
Elecampane <i>Inula helenium</i> L.	roots 30-33	3,70	2,34	63
Broadleaf plantain <i>Plantago major</i> L.	leaf 9-12	1,59	0,49	31
Milk thistle <i>Silybum marianum</i>	seed 6-8	0,45	0,30	67
Chamomile <i>Matricaria recutita</i> L.	inflorescence 4-6	1,02	0,79	78
<i>Leonurus Leonurus</i>	grass 1 year 10-15; 2 year 20-30	1,40	1,06	76
Dwarf everlast <i>Helichrysum arenarium</i>	inflorescence 2-3 year 12-18	1,70	1,32	78
Breckland thyme <i>Thymus serpyllum</i> L.	grass 1 year 5-6; 2 year 10-25	1,74	0,53	30
Three-lobed beggaricks <i>Bidens tripartite</i> L.	grass 40-50	1,59	2,19	138
Love-in-a-mist <i>Nigella damascene</i> L.	seed 5-7	0,94	0,57	60
Garden sage <i>Salvia officinalis</i> L.	grass 20-30	1,85	1,55	84
Baikal skullcap <i>Scutellaria baicalensis</i> Georgi	roots: 2 year 10-16; 3 year 16-21 grass: 2 year 34	2,53	3,14	124