

Aromatic plants for food industry in the collections of National Botanical Garden of NAS of Ukraine

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ABSTRACT

The comprehensive study of introduced aromatic plants has been conducted. Our studies identified a number of aromatic plants from Mediterranean and other regions that may have means for their commercial growing in Ukraine. About 150 kinds promising species of aromatic plants have been selected to enrichment of the cultivated flora of Ukraine with new species, cultivars and hybrids of aromatic plants which can be used so fresh, as dried in fruit-vegetable marinades, meat and confectionery products, liqueurs and vodkas, dry spice mixtures.

Have been selected a few forms promising species of aromatic plants, providing a variety of growth habits and colours. From our gene fund were created 9 high-efficiency grades of the alternative aromatic cultures, adapted for ecological conditions of Ukraine and incorporated in the State Registry of grades of the plants of Ukraine.

Keywords: aromatic plants, introduction, growing, essential oils, processing

INTRODUCTION

The National Botanical Garden of Academy of the Sciences of Ukraine takes the one of the leading position among the botanical gardens of Europe and the whole world for its size, richness and variety of collections, refined location and the level of research. The history of the Garden began in the 1935, but the main work on laying out territory, collecting the plants and landscaping was done after the Second World War. Nowadays Garden on the area of 130.2 hectares, including greenhouses, more than 12.000 species, form and varieties of plants have found their home. The initial goal of the Botanical Garden concluded in the introduction and distribution of economically important and ornamental plants to the region.

Aromatic plants are highly diverse in species, varieties and agro-ecological requirements. This species is originated mainly from the Mediterranean region or North America, but today, due to its medicinal, aromatic, culinary properties and economic importance, they are cultivated in temperate regions above all over the world. A number of researches mark preservative, antiseptic and bactericidal quality of plants. Essential oils effect destructively on life activity of some microorganisms, these allow using them to make longer the term of storage juicy fruits and vegetables.

Fruit and vegetable processing industry is very important for Ukraine regarding both the internal and the external market. Aromatic plants are offered in a wide variety of products on the market. At least every fourth flowering plant is used. Wide use of aromatic plants in national economy of Ukraine is possible only when we have such forms and species, which are adapted to certain conditions of growing and give stable crops of high quality.

The use of herbs in the food industry recently has significantly increased because they have antioxidant action on lipid degradation, besides their traditional role in food aroma. Essential oils of aromatic plants make better culinary quality of products and stimulate organs of taste and digestion, increase appetite and food assimilation, facilitate metabolism, help activity of nervous and cardiovascular systems, and health condition of man.

The goals of the researches are development of theoretical basics for introduction and

selection of species, populations, and cultivars promising by productivity, content of biologically active substances, and resistance. The tasks include search of aromatic plants, creation of the collection stock and gene bank of introduced plants, study of plant variation in the wild and under cultivation, as well as in remote and intraspecific hybridization, and elaboration of the methods of development and propagation of new cultivars, investigation possibility use of them in processing industry of Ukraine.

MATERIAL AND METHODS

The aerial parts of aromatic plants were collected in NBG under the conditions of introduction in Polissya and Forest-Steppe regions of Ukraine. The percent dry weight at the time of harvest, and growth stage (vegetative, flowering, seed) is also recorded. It is known, that extracts of aromatic plants have biological activities and can be used for a variety of medicinal purposes. In this connection we have investigated its essential oil composition. The plants were harvested during the blooming stage. Essential oil was obtained by hydrodistillation procedure and examine by GH.

Under conditions of the introduction experiment the ecological-biological potential and capacity for adaptation are estimated, age and genetic population structures, peculiarities of growth and ontogenesis, inter- and intrapopulation variations in morphological characteristics and productivity are studied. Types of resistance and adaptability of natural and cultivated populations of different life forms have been determined.

Most of the investigations were focused on the adaptability of the crop to local conditions. Significant effects of variety, location, year climatic condition and harvest date on the sensory impression and the aroma compounds was found.

RESULTS AND DISCUSSION

Intensive research with herbaceous aromatic plants in NBG was began in the second part of XXc., the object was to substitute imported spices. High price of exotic spice in northern countries cause necessity to find spice plants in aboriginal flora of Ukraine or to introduce some of them from the South. Considerable attention is given to the study of the gene pool of perspective species in the wild. Selected populations, ecotypes, and forms are compared experimentally. The comprehensive study of plants has been conducted, as a result of which about 150 kinds promising species of aromatic plants have been selected to enrichment of the cultivated flora of Ukraine with new species, varieties, cultivars and hybrids of food plants.

Study of the phytochemical properties of aromatic plants was given opportunity to justify to select 16 plants for a canning industry and to receive sanction of Ministry of protection health on use them in products of feed. Most of them belong to *Mint (Lamiaceae) Family*, are annual or perennial herbs from tropics and sub-tropics.

We distinguish edible plants *Majorana hortensis* Moench., *Ocimum basilicum* L. and *O. gratissimum* L., *Satureja hortensis* L., *Lophanthus anisatus* Adans., *Nepeta cataria* var. *citriodora* L., *Melissa officinalis* L., *Monarda didyma* L., *Salvia sclarea* L., *Dracocephalum moldavicum* L., *Hyssopus officinalis* L. and *Vitex agnus-castus* L. and *V. canabifolia* L. from *Verbenaceae* family. The foliage these plants have a pleasant scent.

We examine in detail herbal aromatic plants to substitute partially or completely very expensive classic spice plants in the products of processing industry. Above ground parts of plants with taste and aroma necessary for food and processing industry used predominantly, but roots and rhizomes of some species only. In addition, studies on agronomic practices and quality of the essential oil extracted were conducted, to help evaluate the commercial potential of the crop to our region. Essential oils of aromatic plants are used in a wide variety

of applications in many major industries which include flavour, beverage, food, cosmetics and soap, pharmaceutical, chemical and insecticides, too.

Herbs are collected in phase of budding or flowering. That time a content of essential oils and other valuable components reach maximum. So as essential oils in foodstuffs are used in small dozes, very important is exact to know their chemical compound at drawing up of compounding, for scheduling of the harvesting of the aromatic plants. The structure of components of the essential oils of the aromatic plants depends on many factors - climatic conditions, area of growth, technological aspects and conditions of processing of raw material.

Adaptive biomorphological and anatomical structures of a leaf and seed were determined at intra- and inter-population levels, phenorhythms, seeds productivity and length of preservation of seeds viability in long-term storage were investigated. The method of the ecological range of a species in introduction of the plants natural flora, method of vegetative propagation and by seeds, accelerated method of development of cultivars with higher resistance to environment, productivity, essential oil content, and improved qualities have been developed.

CONCLUSIONS

Bioecological features of adaptive and productive potential of perspective aromatic introduced plants were established. Our comprehensive studies identified a number of aromatic plants from Mediterranean and other regions that may have means for their commercial growing in Ukraine. As a result have been selected a few forms promising species of spicy and aromatic plants, providing a variety of growth habits and colours and created 9 high-efficiency grades of the alternative aromatic cultures, adapted for ecological conditions of Ukraine. These grades are incorporated in the State Registry of grades of the plants of Ukraine. So, our researches helped to enrichment of the cultivated flora of Ukraine with new species, cultivars and hybrids of aromatic food plants. People well know many of our varieties, such as 'Leleka', 'Synij veleten' – *Lophanthus anisatus*, 'Atlant', 'Markiz' – *Hyssopus*, 'Dzvinochok' – *Majorana*, 'Melodia' – *Nepeta cataria* etc. In the several last years we have identified plants from genera *Monarda* that have high level linalool and thymol. Perhaps plants with these types of essential oil composition may find a market and with a price that will be economically attractive to produce commercially. The oil of these has been an ingredient in perfumery, medicine, culinary and food industry. Some of plants can be used as ornamental in the garden.

All plants undergo full cycle of development and can be grown in Ukrainian Polissya and Forest-Steppe. They can be propagated by seeds and by root cuttings. Thanks to strong aroma over ground mass of aromatic plants can be used so fresh, as dried in vegetable and fruit marinades, meat and confectionery products, liqueurs and vodkas, in dry spice mix.

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