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FEATURES OF COLLECTION OF SPICY-AROMATIC PLANTS IN THE BOTANICAL GARDEN

The article presents the results of studying the collection material of spice and aromatic plants in the Botanical Garden of Belarusian State Agricultural Academy based on morphological, morphometrical and phenological characteristics. It also presents data on yield in a phase of technological maturity, seed productivity as well as specifies basic quality indicators.

Collection of spicy-aromatic plants in the Botanical Garden of BSAA is represented by 58 species that belong to 14 tribes and 40 genera. Collection of spicy-aromatic plants is divided into three sections: the most common, rarely used and advanced culture.

Research new varieties of spicy-aromatic plants (*Ocimum basilicum* L. (Volodar, Nastena, Magiya), *Ocimum tenuiflorum* L. (Istochnik), *Allium* × *proliferum* (*Allium cepa* × *Allium fistulosum*) (Uzgorak), *Allium odorum* L. (Vodar), *Borago officinalis* L. (Blakit), *Geranium macrorrhizum* L. (Tanyusha)) that are included in the State Register of varieties of the Republic of Belarus. Varieties has a complex of economically valuable sings and are used as a vegetable and decor plants.

Key words: spicy-aromatic plants, collection, varieties, Botanical Garden.

Introduction. Spicy-aromatic plants are known to men since ancient times. They are widely used in the food industry, traditional and alternative medicine, in perfumery and landscape gardening [1, 3]. The demand for spicy-aromatic plants increases with each passing year. New types of foods appear with spices used in their recepies. The special importance of spicy-aromatic plants is due to the high content of vitamins, carotin and biologically active substances, as well as the ability to clear the body from radionuclides and heavy metals, which is especially important in the conditions of the Republic of Belarus. Essential oils, glycosides, and flavorings contained in spicy-aromatic plants improve the organoleptic quality of the products.

They diversify food and give special flavor to ordinary food, stimulate appetite and intensify the activity of the digestive organs, increase the digestibility of nutrients. Our body needs up to 85 elements in micro- and macro quantities to regulate live processes and generate energy, the majority of these elements are contained in spices.

Many of spicy plants are used in perfumery and pharmaceutical industries, because they contain essential oils and other biologically active substances. All the entire aboveground part of s plant collected in the flowering stage can be considered as medicinal raw material.

Spicy-Aromatic plants have positive effect on the gastrointestinal tract, circulatory system, central nervous system, as well as on the overall psychological and physical condition of the person. In modern medicine this kind of plants are used for the preparation of aromatic baths in many countries (aromatherapy).

Spicy-aromatic plants have the ability to limit or stop the growth of many bacteria. It is recommended to add fresh or dried spice and aromatic herbs to various dishes, not only to give them a wonderful flavor, but also to secure additional protection against pathogens. Many aromatic plants belong to a group of honey plants. The scent of flowers and pollen of these plants attract garden and orchard bees and other beneficial insects. At the same time spices have properties of repellent, i. e. scare many insect pests. Spices can be used as ornamental plants both indoors and outdoors. They grow well throughout the summer season in the open field, in the winter they can be transplanted into the flower pots and taken inside. The purpose of the work is to create of new varieties of spicy-aromatic crops possessing economically useful characteristics. Research was carried out in 2010–2015 on experimental plots of BSAA.

Main part. Botanical garden of Belarusian state agricultural academy was created in 1840. The total collection of the Botanical Garden is represented by 3,335 taxon belonging to 840 genera, 1,476 species and 1,019 varieties. It is subdivided into eight distinct collections, including that of aromatic plants [1, 3]. The need to expand the range of spicy-aromatic crops having high productivity and resistance to biotic and abiotic factors of the environment makes it necessary to study and selection of the most promising types and forms. Planted collection of spicy-aromatic plants in the Botanical Garden of BSAA comprises 58 species which belong to 14 families and 40 genera. The first section of the collection consists of common spicy-aromatic plants (onion – *Allium*, basil – *Ocimum*, mint – *Mentha*, balm – *Melissa*, marjoram –*Majorana*, sage – *Salvia*, rosemary – *Rosmarinus*, hyssop – *Hyssopus*, marjoram – *Origanum*, savory – *Satureja*, thyme – *Thymus*, fennel – *Foeniculum*,

dill – *Anethum*, celery – *Apium*, lovage – *Levisticum*, mustard – *Sinapis*, horseradish – *Armoracia*, estragon – *Artemisia*, purslane – *Portulaca*, nasturtium – *Tropaeolum*, coriander – *Coriandrum*, cumin – *Corum*, parsley – *Petroselinum*); the second section includes rarely used spicy-aromatic plants (monarda – *Monarda*, lavender – *Lavandula*, burnet – *Pimpinella*, avens – *Geum*, potentilla – *Potentilla*, St. John's wort – *Hypericum*, ruta – *Ruta*, marigolds – *Tagetes*, borage – *Borago*, pozhitnik – *Trigonella*, giant hyssop – *Agastache*); the third section consists of perspective spicy-aromatic plants (catnip – *Nepeta*, marigold – *Calendula*, tansy – *Tanacetum*, black cumin – *Nigella*, geranium – *Geranium*, *camomile – Matricaria*).

The study of collection material of spicy-aromatic plants is conducted according to morphological and morphometrical characteristics: plant height, the size of the leaf blade, the number of shoots, the shape and density of the plants, the shape and color of leaves, their glossiness, leaf blister, waviness, cross-section shape, jagged edges; number of inflorescences and their length, number of internodes on the inflorescence, color of the corolla, and other features.

There being also conducted phonological observations (sprouting, budding, flowering, seed maturation); account yield, seed productivity; definition of quality indicators.

The research results in the individuation of some particular species from the collection of aromatic plants. These varieties possess economically valuable features and they are transferred to CIO as well as registered and included in the State Register of varieties. These are *Ocimum basilicum* L. (Volodar, Nastena, Magiya), *Ocimum tenuiflorum* L. (Istochnik), *Allium* × *proliferum* (*Allium cepa* × *Allium fistulosum*) (Uzgorak), *Allium odorum* L. (Vodar), *Borago officinalis* L. (Blakit), *Geranium macrorrhizum* L. (Tanyusha)) [2, 4].

Sweet Basil Volodar. Mid-ripening variety. The period from full germination to harvest on the greens (budding phase) is 50–56 days, that of to spices – 86–95 days. This is a medium growth plant. The height is 46–57 cm, having medium density and good foliage. Leaves are o medium sizes, green, smooth, ovoid, 8.2 cm long, 4.5 cm wide, convex, from medium to strong glossiness, from finely or medium toothed on the edge. Leaf blister is absent or very weak. Elevated inflorescens. The stem is green, the corolla is white. Fetal tissue is tender, juicy. Plant weight – 160–220, yield – 13.0–17.5 t/ha at planting scheme 50×25 cm. The plant has gentle aroma of pepper and anise flavor. It is recommended to use in fresh or dried form as spicy flavor in home cooking and conservation.

Sweet basil Nastena. Late-ripening variety. The period from full germination to harvest on the greens is 65–75 days, that one for harvest to spices – 97–105 days. The plant is tall – 80–87 cm, upright plant, loose with good foliage. Leaves are large, 7.5 cm long h, 4.0 cm wide, green, smooth, egg-shaped. Leaf blade is concave, light green without (with poor) leaves gloss and blistering, average depth of dentation is medium. The inflorescence is elevated. Flowers are white, without anthocyanin coloration. Mass of a plant in flowering phase is 360–390 g, the yield – 28.0–31.5 t/ha at planting scheme 50×25 cm.

The leaves have a strong, persistent lemon flavor that is well preserved by drying. Recommended for use in fresh or dried as spice and flavor to your home cooking and conservation.

Sweet basil Magiya. Mid-ripening variety. The period from full germination to harvest on the greens (budding phase) is 49–67 days, that one for harvest to spices – 67–85 days. Plant height is 48–68 cm, average density. The leaves are medium to large, 7.5–8.2 cm long, 3.2–4.6 cm wide, egg-shaped, purple, smooth, medium gloss with deep dentation. The inflorescence is red-violet. Corolla is pink. The weight of plants is 250–412 g with a specific aroma of anise. It is recommended to use as a spicy flavor additive in home cooking, for spicy mixtures (in pickles) for conservation of vegetables and meat dishes.

Basil Istochnik. Early-ripening. The period from full germination to harvest on the greens is 37–55 days that one for harvest to spices – 52–72 days. Average height – 44–62 cm, with an intermediate form of a bush, dense, thick foliage. The leaves are medium length of 6.5 cm, width – 3.8 cm. Sheet plate from flat to concave, dark green, without gloss and blistering of leaves, dentation is deep. The color of flowers is pink. Mass of plants in flowering phase is 260, the yield – 20.8 t/ha at planting scheme 50×25 cm. It has a rich aroma of anise. It is recommended for using in spice mixtures in alcoholic beverage industry.

Egyptian onion Uzgorak. Early-ripening variety with extensive tubular leaves, height is from 40 to 80 cm, 1.5–2 cm wide, c with wax coating which gives them a bluish tint. On the arrow there are several layers (usually 2–4) of air brood buds over ground bulbs. The largest ones, with a diameter up to 3 cm are located on the lower layer, on the top one – the small size bulbs but of greater number. Arrow reaches the height of 80–100 cm. Air bulbs have a weight of about 1.5 g, at each truss is formed from 3 to 20 bulblets. Yield – 1.5 to 2 kg/m^2.

In spring and early summer, young green leaves are used in fresh. They will stiffen significantly later than bow-welsh onion leaves, the taste is sharper than the leaves of onion bulb. Landing for greenery is done in rows with a distance of 20 cm between rows and 20–25 cm between

plants. The first cutting of leaves is carried out in 24–27 days. It propagated vegetatively only basal and aerial bulbils-the bulb. Leaves are used fresh in salads and as a seasoning for soups and side dishes. Bulbs are used for pickling.

Garlic chives Vodar. It combines the taste quality of onions and garlic, as well as decorative and honey plant. It has half hot and light garlic taste. Leaves are flat, up to 40 cm long and 1.2 cm wide, fleshy, light green, with a waxy bloom. The floral stalk-arrow appears in the second year. Arrow reaches a height of 35–45 cm and ends with an umbrella inflorescence. The inflorescence consists of many (up to 150 pcs.), purple, star-shaped flowers, exuding a strong pleasant aroma.

The leaves are tender and juicy throughout the growing season. Cutting is carried out 2–3 times per season when leaves grow up to 25–30 cm. After each mass harvesting of greenery plants should be well fed and watered abundantly. In mid-August, the cut-off stops. Seeds are sown in April in furrows in rows, with the distance between 25–30 cm. Seeding depth is 1–1.5 cm. In the year of planting greenery is not cut. Since the second year of life, garlic chives are propagated by dividing the bush. The distance between the bushes is 25–30 cm.

Greenery of garlic chives is used fresh and salted in salads, side dishes, meat dishes, as a filling for pies, dumplings, omelets. Young flowering stems (arrows) can be salted and marinated the same as wild leek (onion bearish). Yield – from 2 to 3 kg/m^2. Garlic chives are very decorative and can be used in the design of flower gardens and rockworks.

Borage (common borage) Blakit. Annual plant, quite bent, height of 60–100 cm. Taproot. Stem is upright or ascending, thick, ribbed, hollow, branched at the top. Radical and lower stem leaves are elliptical or oval, obtuse, narrowed in the base to short petiole; stem leaves are egg-shaped, sessile, amplexicaul and covered with stiff whitish hairs like a stem. Flowers on long stalks gathered in curls; calyx is densely bent almost to the base and divided into linear-lanceolate segments, corolla is longer than calyx, dark-blue, rarely whitish, with a short tube. Five stamens. Fruit is egg-shaped, torulose nut; mass of 1,000 pcs is 13–18 g. It blooms in June–August. The fruits ripen in July – September. Growing season lasts 80–90 days, the yield of green mass – 60–80 kg/ha.

Young leaves smell like fresh cucumber, having refreshing taste. In the food we use the leaves in fresh, flowers – fresh and candied. They are good substitutes for cucumbers, they are added to vinaigrettes, salads, sauces (mustard, tomato, sour cream), side dishes, okroshka, cold vegetable soups and borscht. Roots are collected in autumn, when used for preparation of green oil, added to cheese, cottage cheese, sour cream, for flavoring liqueurs, wine, punch, vinegar, syrups, beer, essences and cold drinks. Borage gives a spicy taste to chopped meat, minced meat and fish fried in vegetable oil. Borage flowers in fresh and dried form are used in the liquor and confectionery industry.

Big root crane (Geranium Macrorrhizum) Tanusha. Perennial plant. It differs from other geraniums by long, thick root with a diameter of 1.5 cm, branching out over the surface of the soil. Due to the fast growing of roots Geranium Macrorrhizum forms dense, interlocking thicket. The root forms rosettes of basal leaves on 20 cm stalks. The leaves are oblong-rounded, 6–10 cm wide, divided into 5–7 segments, coarsely toothed on the edge, a brilliant green. The stems rise 5–10 cm above the thickets leaves. Umbrella-shaped stalks have numerous purple flowers with a diameter up to 3 cm. In June geranium blossoms and blooms 20–30 days. Seeds ripen in late July – August. The whole plant is pubescent and very fragrant.

In October – November, the leaves turn red or golden color, which is very nice. Geranium Macrorrhizum can be used in rockeries where it grows around the rocks, highlighting their beauty. In mixed flower gardens it is planted in the foreground.

Geranium Macrorrhizum tolerates replanting and division throughout the season. But it is more practical to divide it in early spring or in August, so as not to ruin the landing when most decorative. The plant grows quickly and one or double or triple bush can give up to ten parts of plant that are enough to decorate a border of 2 m length. A pair of such bushes are enough to plant 2 m^2 of geraniums groundcover.

Aboveground part of Geranium Macrorrhizum has a strong fruity flavor with strawberry-pineapple nuances. This is a wonderful flavoring for various dishes (pastries, fruit salads, drinks). Fresh leaves and roots of geranium improve cardiac function and stabilize the nervous system having stringent and wound-healing effect.

Conclusion. Spicy-aromatic plants are widely used in food industry, traditional and alternative medicine, in perfumery and landscape gardening.

Collection of spicy-aromatic plants of Botanical garden of BSAA comprises 58 species (14 families and 40 genera) and is divided into three sections: the most common, rarely used and advanced cultures.

The research results in the individuation of some particular species from the collection of aromatic plants. These varieties possess economically valuable features and they are transferred to CIO as well as registered and included in the State Register of varieties. These are three varieties of Sweet basil, one variety of Basil, Egyptian onion, garlic chives, Borage and big root crane.

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