ADVANCED R&D AND TECHNOLOGIES

THE NAS OF UKRAINE

INDUSTRIAL AGRICULTURE AND LANDSCAPE GARDENING

ADVANCED R&D AND TECHNOLOGIES

THE NAS OF UKRAINE

SPECIAL ISSUES

ENVIRONMENT
AND NATURE PROTECTION

FOOD INDUSTRY

FUEL, LUBRICANTS,
AND TECHNOLOGIES

INDUSTRIAL AGRICULTURE AND LANDSCAPE GARDENING

INFORMATION AND SENSOR SYSTEMS
AND DEVICES

INFORMATION TECHNOLOGY

MACHINE-BUILDING
AND INSTRUMENT ENGINEERING

MEDICAL PRODUCTS
AND MEDICAL DEVICE ENGINEERING

POWER ENGINEERING
AND ENERGY EFFICIENCY

TECHNOLOGIES AND EQUIPMENT
FOR EXPLORING, ESTIMATING,
AND EXTRACTING MINERAL RESOURCES

TECHNOLOGIES FOR CONSTRUCTION
AND FUNCTIONAL MATERIALS

ACTINIDIA CULTIVARS

Katrusia (left) and *Smaragdova* (right) kiwifruit cultivars

Yuvileina kiwifruit cultivar

Areas of Application

The cultivars are used in gardening, food industry, canning, confectionery, and pharmacognosy. The fruits that have a string flavor taste and a high content of biologically active substances are suitable for use both fresh and processed by various methods. All parts of the plant are used in medicine

Advantages

The cultivars are high-yield, frost resistant, and early-ripening. They are suitable for commercial planting at farms and for household gardens. The kiwifruit cultivars enrich an assortment of plants yielding fruits with high content of vitamins

IPR Protection

IPR2, IPR3

Specification

The cultivar fruits are round- and oval-shaped, green, red-brown or pink colored. The plants are resistant to pests and diseases. The kiwifruits are especially valuable for containing a specific enzyme, actinidain. The *Smaragdova, Yuvileina, Katrusia* and other cultivars (totally 17 items) have been recorded in the State Register of Plant Varieties of Ukraine.

Average weight depending on variety, g	6—10
Maximum weight, g	12—17
Yield per plant, kg	50
Fruit biochemical parameters:	
carbohydrates, %	10.5—17.2
ascorbic acid content, mg%	70—110
total acidity, %	0.5

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant growing are provided. Plant and propagation materials are available

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ACYL-HOMOSERINE-LACTONE AS NEW ENVIRONMENT FRIENDLY EFFECTIVE PREPARATION FOR RAISING THE CROP YIELD RATE AND STRESS RESISTANCE

Effect of priming on wintering of *Triticum aestivum* L. *Yatran* 60 variety: the plants grown from unprimed seeds

Effect of priming on wintering of *Triticum aestivum* L. *Yatran* 60 variety: the plants grown from seeds treated by priming method with the use of AHL

Areas of Application

Agricultural production, pre-sowing treatment for raising the crop yield rate and stress resistance

Specification

New class of mediator molecules of bacterial origin; the preparation based on them is a powder; for priming the seeds it is used in the form of aqueous solution

Advantages

The preparation has no counterparts in the national and world agriculture. Its constituents have a natural origin. The preparation is environment friendly and safe for human health. The use of AHL for pre-sowing treatment of seeds based on priming method is much more effective than the treatment with chemicals

Stage of Development. Suggestions for Commercialization

IRL4, TRL3
Chemical synthesis of preparation and seeds priming are provided upon customer's request

IPR Protection

IPR2

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AGROCHEMICAL PREPARATIONS TO ENHANCE CROP RESISTANCE TO ADVERSE ENVIRONMENTAL FACTORS

Areas of Application

DORSAY, *KRIAHR*, and *JUPITER* preparations are characterized by unique multifunctional range of activity and used to improve freeze- and winter resistance, to protect plants against infections, to raise the agricultural crop yield and quality

Specification

Dosage for treatment per 1 ton seeds is: *DORSAY* from 250 to 400 g; *JUPITER* or *KRIAHR* from 150 to 350 g. Dosage for the foliar treatment of plants per 1 ha is: *DORSAY* 350 g, *JUPITER* or *KRIAHR* from 150 to 250 g. The preparations are produced in a liquid form

Advantages

These preparations enhance the plant survivability after low temperature effect by 10—20%, increase the yield by 20—35% on average, depending on the plant type. The advantages of preparations (as compared with the existing ones) are their combined multifunctional action, much higher efficiency, low cost, and nontoxicity. They are ecologically safe (safety class IV): environment friendly and safe for human, animals, soil, and water reservoirs. The preparation components are used in medicine and pharmaceutical industry

Stage of Development. Suggestions for Commercialization

IRL6, TRL8
The production and delivery of preparations, as well as staff training on their application are available as options

IPR Protection

IPR1, IPR3

Contact Information

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APRICOT VARIETIES

Botsadivskyi variety

Pamiat Kaschenka variety

Areas of Application

Can be used in fruit-gardening, food industry, canning, confectionery, pharmacology, and cosmetology; Delicious and fragrant fruits have a balanced content of sugars and acids; can be used both fresh and canned. Due to a high content of bioactive substances the fruits and seeds can be used for curing purpose

Advantages

The varieties are promising for planting in northern regions. They are winter-hardy, have different terms of ripening, which enables to gather fruits throughout the summer. These apricot varieties enrich an assortment of fruit plants

Specification

The fruits are round- or oval-shaped, orange or yellow colored with a blush. The plants are rather resistant to pests and diseases. The *Botsadivskyi* and *Pamiat Kaschenka* varieties have been recorded in the State Register of Plant Varieties of Ukraine.

Fruit weight for different varieties:

average weight, g	50—65
maximum weight, g	90
yield per tree, kg	50—70
yielding period, years	30—80

Fruit biochemical parameters:

sugars, %	7.8—10.5
vitamin C, %	3.0—4.6
total acidity, %	1.1—1.6
dry matter, %	11.2—14.9
pectin, g/100 g	0.45—0.6

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant growing are provided. Plant and propagation materials are available

IPR Protection

IPR2, IPR3

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AQUEOUS POLYURETHANE DISPERSIONS

Areas of Application

Film forming aqueous polyurethane dispersions and polymer materials may be us as:
protective immunostimulatory coating for seeds and plants in agriculture;
antitranspirantes for reducing water scarcity and optimization of the production process of crops in drought conditions;
binders for biologically active substances granulation

Protective coating of wheat seeds

Specification

The dispersions are stable during long-term storage and water dilution (1:100);
form transparent strong elastic film.

Tensile strength, MPa	10—50
Relative elongation, %	150—1400

Advantages

As compared with counterparts, the proposed dispersions are cheaper due to replacement of raw materials from petroleum derivatives by natural renewable ones.
Use variances can reduce water consumption under irrigated agriculture, improve the environmental quality of agricultural products and reduce the environmental burden on the environment

Humus granules

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Small batches of film-forming aqueous dispersions can be manufactured and delivered upon request

IPR Protection

IPR2, IPR3

Contact Information

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AVERCOM COMPLEX BIOPREPARATION FOR PLANT GROWING

Greenhouse planting of cucumbers by common method (control, to the left) and with the use of *AVERCOM*

Areas of Application

AVERCOM is biopreparation with insecticidal, acaricidal, and nematicidal contact action for plant protection against pests.
It has shown plant protective, growth-stimulating, adaptogenic, and anti-stress properties. *AVERCOM* is recommended for obtaining environmentally safe and organic products. There is an option of soil sanitation by treatment with *AVERCOM*

Specification

The biopreparation is based on biologically active substances synthesized by soil streptomycete *Streptomyces avermitilis*.
The product includes avermectin complex, amino acids, B vitamins, lipids, phytohormones, and a polysaccharide of biological origin as elicitor, which enhances its phytostimulating and immunomodulatory effects.
AVERCOM is compatible with agricultural chemicals and microbial biopreparations.
The product shelf life is 2—3 years at a temperature ranging from –10 °C to +30 °C.
The product meets health and safety standards and has no sensitizing or mutagenic effects.
It is rapidly decomposable, which prevents the accumulation of avermectin in seeds, fruits, and soil

Advantages

The biopreparation differs from the known counterparts by content of avermectins with antiparasitic, acaricidal, and nematicidal action and biologically active substances of phytoprotective, adaptogenic, and growth-stimulating action of natural origin.
The absence of chemical modifications in the biopreparation enables to avoid appearance of resistance in pests

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Microorganism strains and specifications can be provided under the terms of license agreement

IPR Protection

IPR3

Contact Information

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AZOGRAN BIOPREPARATION FOR PLANT GROWING

Areas of Application

AZOGRAN complex bacterial biopreparation can considerably raise seed germination power, stimulate sprouts formation, plant growth and development. It protects the plants from phytopathogens and some kinds of phytophages and raises the crop yield essentially

Specification

The biopreparation is based on highly active strains of *Azotobacter vinelandii* and *Bacillus subtilis* bacteria. It contains bacterial cells and a complex of biologically active substances produced by these bacteria. *AZOGRAN* is manufactured as liquid, bulk or granular material. It is compatible with chemical products for agriculture and biopreparations. The shelf life is 1 year. Keep at a temperature from –10 °C to +30 °C. *AZOGRAN* is human, bee, animal, and environment friendly

Advantages

AZOGRAN differs from analogs by the wild spectrum of the action. Thus *AZOGRAN* is peculiar to pronounced antibacterial, antiviral, antifungal effect as well as the growth stimulating besides nitrogen fixation and phosphate-mobilization ones. *AZOGRAN* increases plants productivity on 18—37% and improves the quality of agricultural production

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Microorganism strains and specifications are supplied under the terms of license agreement. Recommendations can be provided

IPR Protection

IPR3

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AZOLEC BACTERIAL FERTILIZER

МІНІСТЕРСТВО ЕКОЛОГІЇ ТА ПРИРОДНИХ РЕСУРСІВ УКРАЇНИ

ПОСВІДЧЕННЯ

про державну реєстрацію

Серія А № 03582

Видане Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

про те, що відповідно до Закону України «Про пестициди та агрохімікати»

препарат БАКТЕРІАЛЬНЕ ДОБРИВО «АЗОЛЕК», суспензія, біопрепарат

діюча речовина суспензія мікроорганізмів, модифікована аглютиніном зародків пшениці

виробник препаративної форми Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

виробник діючої речовини Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

сфера та умови застосування Пшениця

Тара: герметично закриті стерильні пластикові пляшки об'ємом 0,1-2 л

Зареєстрований в Україні терміном до "31" грудня 2022 р.

Запис у державному реєстрі за № 7138 від "01" лютого 2013 р.

Заступник Міністра – керівник апарату М.П. Д.Л. Мормуль

Areas of Application

Agriculture. The treatment of wheat seeds to improve yield and quality of agricultural products, accumulation of biological nitrogen in soil, improve the technology for crop cultivation involving biological components to raise plant productivity and functional activity of useful nitrogen-fixing microorganisms

Specification

Suspension, biopreparation.
Fertilizer is a culture of soil nitrogen-fixing microorganism Azotobacter chroococcum T79 modified by wheat lectin (wheat germ agglutinin).
AZOLEC TU U 24.1-05417242-002:2012

Advantages

In addition to nitrogen-fixing microorganisms, this complex fertilizer contains wheat lectin, an additional protein component that possesses a broad spectrum of biological activity (growth regulatory, effector, adaptogenic, and phyto-protective) thereby widening the range of physiological biopreparation effect on plants and rhizospheric microorganisms

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
The preparation is manufactured upon buyer's request. Recommendations on the product application are provided upon request

IPR Protection

IPR3

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BIONANOMATERIALS FOR PLANT PROTECTION

Areas of Application

The bionanomaterials can be used in agriculture and organic farming to ensure plants resistance at the early stages of their development, o control the number of harmful phytophagous insects, and to enhance plant resistance to biotic and abiotic stress factors

Specification

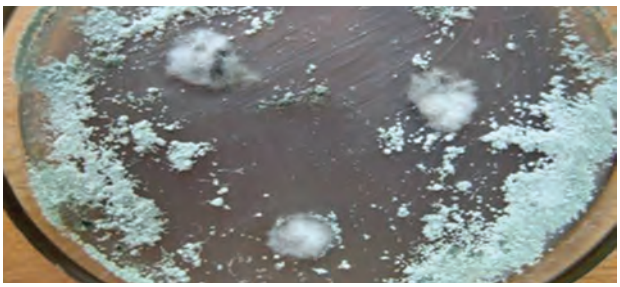
The fungicidal composition of the materials based on the *Penicillium roseopurpureum* strain and analtcinite nanoscale particles is characterized by a wide range of prolonged activity. The bionanomaterial dosage is 50 l/ha, depending on the biological characteristics of plants and climatic conditions

Advantages

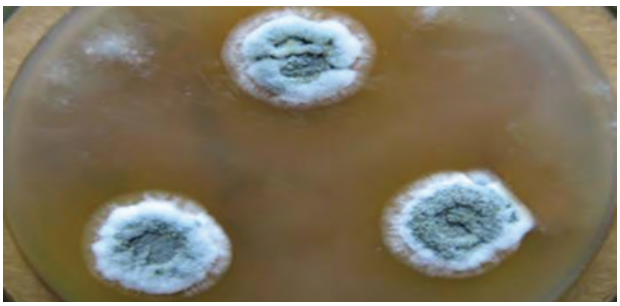
The bionanomaterial has no matches in the world. The number of fungicides used in crop growing increases, mainly because of developing pathogens resistance to their compounds. The use of bionanomaterials will ensure obtaining high quality products and preventing contamination of agrobiocenosis soils with toxic compounds. The process flowchart of manufacturing line for production of bionanomaterials has been designed. The bionanomaterials based on *P. roseopurpureum* strain that is a Curvularin producer and analtcinite are promising in terms of their use both in agriculture and in medicine

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Mix prepared upon request



Growth inhibition. *Alternaria alternate Trichoderma hamatum*



Growth inhibition. *Botrydis cinerea Penicillium rubrum* Stoll. 33P-39.0 mm

Growth inhibition. *Fusarium colmorum Aspergillus niger*. 33P-21 mm

Growth inhibition. *Aspergillus clavatus Pennicillium implicatun*

IPR Protection

IPR3

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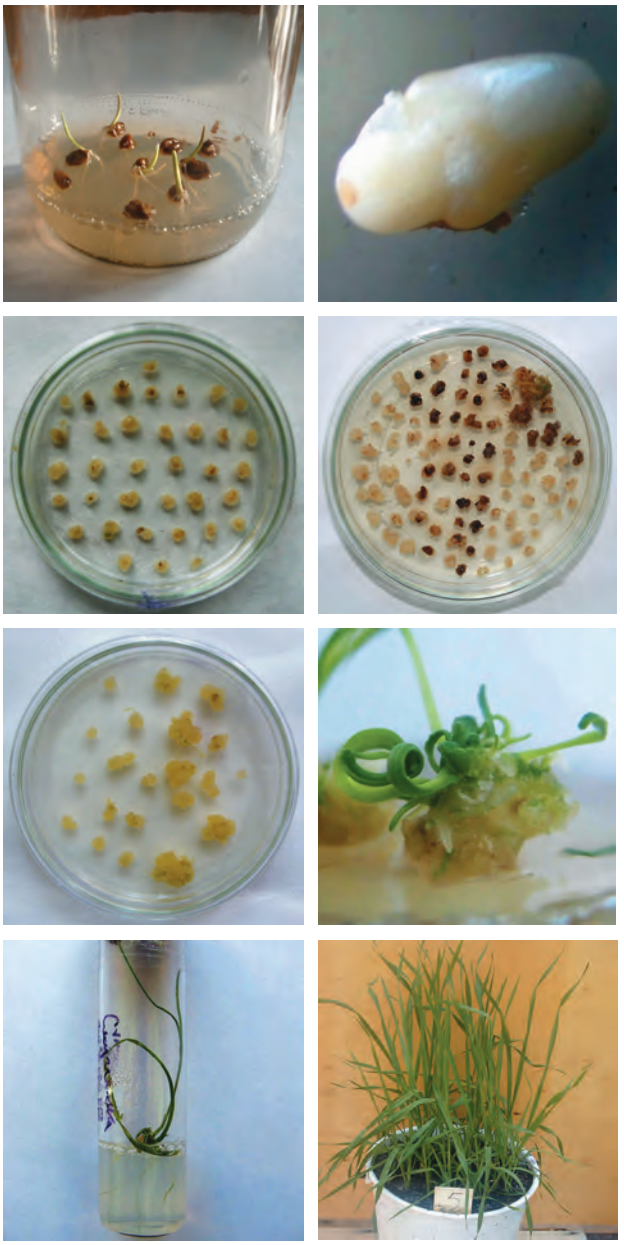
BIOTECHNOLOGY FOR ACCELERATED GROWTH OF NEW VARIETIES OF BREAD WHEAT WITH IMPROVED RESISTANCE TO OPHIOBOLUS ROOT ROT AND WATER DEFICIT



Obtainment of wheat plants resistant
to complex stress factors by cell selection

Areas of Application

This biotechnology can be used
to create new and to improve existing
varieties of bread wheat

Specification

The biotechnology includes the following main elements: obtaining of callus cultures from explants shoot apical meristems of seedlings; use of ophiobolus root rot culture filtrate and mannitol as selective factors, use of original culture media for callus induction and regeneration; in vitro selection according to certain schemes; laboratory tests and vegetation conditions for complex resistance to stress factors

Advantages

The biotechnology increases the breeding ratio and the number of plant-regenerants, reduces time to obtain premium varieties, and facilitates obtaining of initial breeding material of wheat resistant to complex abiotic and biotic stress factors

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL5, TRL5
Support is available upon request

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BIOTECHNOLOGY FOR COMMERCIAL CULTIVATION OF EDIBLE AND MEDICAL MUSHROOMS IN UKRAINE'S CONDITIONS

Areas of Application

Cultivation of fruiting bodies of edible and medical mushrooms as high-quality foodstuff and base for biologically active additives (BAA), cosmetic products, etc.

Specification

The process includes spawn cultivation of selected highly productive strains, formation of composition and preparation of selective substrate from agricultural and forestry waste, inoculation, cultivation of spawns and fruiting bodies in substrate blocks under controlled microclimate conditions, as well as conditions for drying, grinding, and extracting biologically active substances to be used in manufacture of BAA and cosmetic products

Advantages

The technology has no counterparts in Ukraine. New mushroom varieties for commercial cultivation; high productivity, environment safety, and purity of products, efficient utilization of agricultural and forestry waste

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Specifications, staff training, and supervision over compliance with technology regulations are available upon request

IPR Protection

IPR1

Fruiting bodies of *Agrocybe aegerita*

Fruiting bodies of *Hericium erinaceus*

Fruiting bodies of *Pleurotus eryngii*

Contact Information

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CHAROITA SIBERIAN CATMINT CULTIVAR

Spring regrowth of *Charoita* Siberian Catmint plants

Flowering of *Charoita* Siberian Catmint cultivar (left)
A generative shoot of *Charoita* Siberian Catmint plant (right)

Areas of Application

The cultivar can be used as aromatic, medicinal, and ornamental plant

Specification

The cultivar is created by multiple individual selection. The source material is seeds of wild plants from the Republic of Khakassia. The *Charoita* cultivar has been recorded in the State Register of Plant Varieties of Ukraine.

Plant height, cm	85
Average duration of flowering, days	54
Yield of tops, t/ha	26
Content of essential oil (flowering), %	1.1
Vitamin C content, mg%	228
Carotene content, mg%	0.85
Antioxidant activity (in methanol, DPPH), %	92.2

Advantages

This cultivar is the first national Siberian catmint variety. As compared with cultivars of foreign selection, in particular, Souvenir d'Andre Chaudron, it differs by morphological properties, duration and abundance of flowering, and higher content of biologically active compounds

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
License agreement for commercial use of varieties; seeds and recommendations on cultivation and use are provided. The planting material is available

IPR Protection

IPR3

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CHINA ASTER FUSARIUM-RESISTANT VARIETY

Areas of Application

The variety can be planted in recreation areas, near the buildings, in various gardens (including the aster gardens) as a component of flower beds, borders, mixborders, modular flower beds, as well as can be used for floral arrangements, for seeds, and as pot plant

Specification

The original material was obtained from free pollination using individual repeated selection on strong infectious background. The variety is resistant to fusarium; late-flowering; the plants have a columnar shape, 40—45 cm tall. The flowers are full-blossom, of garnet-red color. The Eva variety has been recorded in the State Register of Plant Varieties of Ukraine

Inflorescence of *Callistephus chinensis* (L) Nees., *Eva* variety

Advantages

The properties (such as abundant blossom, purr color of inflorescence, and high seed yield) meet the modern plant breeding standards. In addition to a high decorative value due to a unique color of flowers the variety is resistant to fusarium and suitable for widespread introduction for various purposes

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Seeds for commercial use are available

IPR Protection

IPR2, IPR3

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CHRYSANTHEMUM HORTORUM CULTIVARS FOR MONOCULTURE GARDENS

Vechirnia Simfonia variety

Zagadka Oseni variety

Charivniy Son variety

Areas of Application

The cultivars can be used for ornamental horticulture and landscape gardening (autumn flowering gardens) and floristry

Specification

The varieties have been bred by analytical selection. The plants are of compact, spherical, columnar shape, from 15 to 130 cm high; the flowering period: early, middle, and late autumn. The inflorescences are yellow, pink, terracotta, red, or purple colored; full, radiant, anemone-like shaped. The ray floret edges have a sharp, round, toothed or spurred shape. The *Vechirnia Simfonia, Zagadka Oseni, Charivniy Son, Yablunevyi Tsvit, Kyivska Krasunia, Videnskyi Bal, Bilochka, Pisnia Polonyny*, and *Roksel* varieties have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Planting material and recommendations on plant cultivation are provided

IPR Protection

IPR2, IPR3

Advantages

The varieties are diversified in terms of flowering time, plant height, and inflorescence color. The plants start flowering before frosts and are notable for a high productivity and an abundant blossom. The varieties are winter-hardy and resistant to diseases and pests

Contact Information

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CORNELIAN CHERRY CULTIVARS

Lukianivskyi variety

Koralovyi Marka variety

Nizhnyi variety»

Specification

Fruits are oval, round, pear-shaped, bottle-shaped; red, cherry, yellow or pink colored. Fourteen cultivars (early, middle, and late ripening within the period from August to November) have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine.

Average weight, g	5.0—8.0
Maximum weight, g	9.0—10.0
Biochemical parameters, %:	
carbohydrates	9.7—15.0
glucose	4.0—4.5
fructose	4.0—4.6
pectin	0.73—1.4
total acidity	2.2—3.2
ascorbic acid, mg%	85.0—153.0
anthocyanins content:	
in the pulp, mg%	114.0—198.0
in the skin, mg%	710.0—875.0

IPR Protection

IPR2, IPR3

Areas of Application

The cultivars are used in gardening, food industry, canning, and confectionery. The fruits are used fresh. Fresh fruits, juice, bark, shoots, leaves, and roots are used as astringent, tonic, antiscorbutic, antidiabetic, and appetite-stimulating agent in pharmacognosy

Advantages

These Cornelian cherry cultivars have no counterparts in the world in terms of varietal diversity, quality and yield of fruits, and winter hardiness

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant cultivation are provided.
Plant and propagation materials are available

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CULTIVARS OF *GALEGA ORIENTALIS* LAM. AS FODDER AND RAW MATERIAL FOR BIOFUEL PRODUCTION

Kavkazkyi branets variety

Saliut variety

Riabchik variety

Areas of Application

The cultivars can be used in agricultural production and energy industry as fodder, raw material for energy generation, melliferous and medicinal plant, and green manure

Specification

The cultivars of *Galega orientalis* Lam. are perennial plants of the legume family used as green fodder and as silage and hay. The crops ripen in the first week of May. The *Kavkazkyi branets*, *Saliut*, NBS-75, and *Riabchik* cultivars have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine.

Yield of tops, t/ha	80–90
Yield of seeds, kg/ha	700–800
Protein output, t/ha	2.5–3.0
Biofuel output, t/ha	10
Energy value, Gcal/ha	60–80
Estimated biogas output, m^3/ha	15000–17000

IPR Protection

IPR3

Advantages

The varieties are notable for a long-term life of cultivated phytocoenosis (about 15 years). As compared with counterparts (lucerne and clover), they ripen earlier and have a higher frost resistance (can withstand frosts up to –300 °C) and resistance to pests and diseases. The leaves do not crumble in hay

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The use of varieties is governed by license agreements. Plant and propagation materials are available. Seeds and recommendations on plant cultivation and use are provided

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DIETARY GIRASOL CULTIVAR AS MULTIFUNCTIONAL MATERIAL FOR VEGETABLE GROWING

Areas of Application

The cultivar can be used in food industry as an alternative to traditional vegetable counterparts and in pharmaceutical industry and dietology as natural source of inulin, vitamins and other important bioactive compounds healing the human body

Girasol, *Dietary* cultivar

Specification

The cultivar is a perennial highly productive plant. The tubers are formed on truncated underground shoots, each plant having 20–25 pieces. They are pink colored and have a spherical or elongated-oval shape. The weight of one tuber is about 120 g, the yield is 45.0 t/ha. The cultivar is undemanding with respect to soils and growing conditions, resistant to downy mildew, and easy to overwinter. The plant is propagated by tubers, the rate of tuber planting is 1.0 t/ha. In the case of cultivation as food source, the cultivar is reseated every 2 years to avoid reducing the tuber size. The *Dietary* cultivar bred at the NBG is recorded in the State Register of Plants Varieties of Ukraine

Stage of Development. Suggestions for Commercialization

IRL3, TRL6
Propagation of original planting material and recommendations on cultivation can be provided upon request

Advantages

The bulbs of this cultivar contain dry substance 20.6%, protein 3.2%, minerals 1.1%, and carbohydrates 18.6%. As compared with other representatives of this group, the tubers of this cultivar are good for balanced nutrition due to a relatively high content of inulin

IPR Protection

IPR1, IPR2

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ECOVITAL BIOPREPARATION FOR PLANT GROWING




1 *2*

General view and root system of *Kyivska 27* soybean for various inoculation options: *1* — reference (without inoculation); *2* — complex inoculation with *Ecovital*

Areas of Application

This is a highly effective complex biopreparation for presowing treatment of legume seeds (soybean, pea, chick-pea, etc.) in order to raise their productivity.

Specification

ECOVITAL consists of complementary nitrogen-fixing rhizobium strains (*Rhizobium* or *Bradyrhizobium* or *Sinorhizobium*) and phosphate-mobilizing bacterium strain *Bacillus megaterium*. For each species of leguminous plants *ECOVITAL* is based on respective legume bacteria strains. The biopreparation has a positive soil fertility aftereffect

Advantages

ECOVITAL is the only complex inoculant based on the association of natural rhizobium strains and phosphate-mobilizing bacteria of local selection. It shows its properties in the best way under extreme factors of local climate and physical-chemical soil conditions. The biopreparation has a balanced strain biosynthetic activity and spectrum of microbial metabolites. It is notable for a high stability and competitiveness with respect to local rhizobium. The biopreparation is effective for promising recognized varieties and various soils. *ECOVITAL* protects plants from diseases and stress factors and increases crop yield by 17—38%. Its quality meets the requirements for environmental safety and organic agriculture. It is compatible with agricultural chemicals (Maxim Star, Maxim XL 035 FS, Kinto duo, Vitavax 200 FF, and Fundazol), herbicides, and insecticides

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Under the terms of license agreement, the microorganism strains and specifications are delivered. Advice can be provided

IPR Protection

IPR3

Contact Information

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ENVIRONMENT FRIENDLY TRACE ELEMENT COMPLEXES

Areas of Application

Trace element complexes for plant nutrition in commercial production and private gardens. They are used for preplant seed treatment and nutrition of growing plants in order to increase crop productivity and resistance to adverse environment factors

Specification

Trace element complexes include 18 micro- and ultramicroelements chelated with natural organic acids. The products are compatible with most pesticides and liquid fertilizers and significantly improve the efficiency of their use. The complexes are harmless for insect pollinators and soil biota

Avatar-1 preparation: 1 l pack (left) and 10 l pack

Advantages

As compared with counterparts based on synthetic chelating agents, the carboxylate trace element complexes are notable for a high efficiency, environment safety and suitability for organic agriculture as per Organic-Standard certificate

Wheat plantation treated with *Avatar-1*

Stage of Development. Suggestions for Commercialization

IRL5, TRL6
The production of trace element complexes is ready for implementation and can be commissioned at commercial level. Advice is provided upon request

IPR Protection

IPR3

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FEEDING AMARANTH CULTIVARS

Kremovyi rannii variety

Karmin variety

Sterkh variety

Areas of Application

The cultivars can be used in agricultural sector to produce a high-quality protein feed for farm livestock

Specification

Kremovyi rannii variety: the plants are light green colored, during maturation they have a creamy color; the inflorescence is spacious; the yield is 100—110 t/ha green mass; the leaves share is 36%; the seed maturation is 90—100 days; the seeds are light colored.
Karmin variety: the plant inflorescence during maturation is bright purple colored, .spacious; the yield is 100—110 t/ha green mass; the leaves share is 35%; the seed maturation is 90—100 days; the seeds are light colored.
Sterkh variety: the plant inflorescence during maturation is coral colored; compact; the yield is 110—120 t/ha green mass; the leaves share is 40%; the seed maturation is 130—135 days; the seeds are light colored.
The cultivars have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine

Advantages

As compared with conventional forage crops, the green mass has a higher content of high-lysine proteins, bioactive substances, calcium, potassium, and magnesium. The plant is harvested during a rather long period (within July–September)

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The commercial use of varieties is governed by license agreements. Seeds and recommendations on plant growing are provided

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FODDER PLANT VARIETIES FOR PHYTO-FERTILIZER PRODUCTION

Lybid Fodder Radish

Green mass of *Obrii* Turnip x Wild Cabbage Hybrid

Areas of Application

To be used in agricultural production and organic farming to fertilize soils for intermediate and repetitive planting and garden cenosis and to reduce chemical burden on environment

Specification

Annual (spring and winter forms) and perennial crops (*Leguminosae*, *Brassicaceae*, and *Malvaceae*) with a phyto-fertilizer yield of 30—60 t/ha; enrich soil with organic matter; improve soil agrochemical and biological properties; improve soil nutritional regime (N, P, K, and Ca);'prevent wind and water erosion; facilitate snow retention; suppress agrestal weed and pathogen growth; and remove allelopathic effects.
The *Horlytsia*, *Oriana*, *Rada*, *Sylva*, *Lybid*, and *NANU-90* varieties have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine

Plowing of green manure

Advantages

As compared with other sources of phyto-fertilizers, these crops have a higher ecological plasticity, a cheaper cost, and a more effective residual recovery.
One ton green manure generates 3 times higher profit than one ton mulch

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The commercial production of varieties is governed by license agreements.
Seeds and recommendations on plant cultivation and use are provided

Contact Information

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GAUPSIN BIOPREPARATION FOR PLANT GROWING

Areas of Application

GAUPSIN complex biopreparation is used for protecting grain, industrial, vegetable, and fruit-and-berry crops from pests and disease agents in agriculture and forestry.
It is applied to treat seeds and planting material and to spray plants after vegetation. It is also effective for treating crops before stowing

Specification

It contains two strains of *Pseudomonas chlororaphis subsp. Aureofaciens UCM B 111* and *UCM B-306*. The preparation is a cultural liquid of both strains taken at a certain concentration and obtained as a result of their joint cultivation.
GAUPSIN is compatible with chemical substances, except for those containing mercury and copper. It can be used in tank mixtures with chemical agents for plant protection

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Under the terms of license agreement, the microorganism strains and specifications are delivered. Advice can be provided

Advantages

The preparation has a highly effective entamopathogenic, antifungal, antibacterial, and antiviral action; it stimulates enhancing plant resistance to drought by 30—50%.
GAUPSIN relieves the adverse effects of stress factors, drought and chemical burns, on the plants

IPR Protection

IPR3

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HELIOS AMARANTH CULTIVAR

Areas of Application

Recommended for complex use:
Amaranth seeds are notable for the best quality and quantity of protein, contain valuable oil, squalene and other biologically active substances; it is a raw material for food, pharmaceutical, and cosmetic industries. Young plants are used as a vegetable. Overground biomass is a valuable feed for farm animals and a drug raw material. While flowering, the cultivar is highly productive source of pollen for honey bees. Can be used as ornamental plant

Specification

The variety has large, orange blossom clusters and big, oval, orange-green leaves. Seed is light-colored. The cultivar is recorded in the State Register of Plant Varieties of Ukraine.

Plant height, cm	200—220
Seed yield, t/ha	0.9—1.0
Yield of green mass during budding, t/ha	100—110
Seeds reach maturation, days	100—110
Oil content in seeds, %	6.26
Squalene content in oil, %	10

Advantages

The cultivar is resistant to drought, diseases, and drowning. It has a higher content of squalene in oil and a higher productivity as compared with counterparts

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The cultivar can be used for industrial production under the license agreement. The seeds and recommendations on plant cultivation are provided

Amaranth, *Helios* cultivar, fruiting phase

Amaranth, *Helios* cultivar, budding phase

Amaranth, *Helios* cultivar, seeds

IPR Protection

IPR3

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HEMEROCALLIS EARLY SUMMER FLOWERING VARIETIES

Veselyi Gnom variety

Ranok Elfa variety

Lelia variety

Areas of Application

Horticulture and landscaping; monoculture gardens, continuous flowering gardens, mixborders, group plantings, areas around ponds

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Planting material is available.
The recommendations on plant cultivation are provided

Specification

The varieties are based on hybridization of introduced cultivars; diploids, sleeping and semi-sleeping life forms;
Flowering period: 1st—2nd third of June;
The beginning of growth, early and medium: March, early April;
Type of flowers: single and double;
Color group: red, purple, yellow;
The flowers have a pattern on the floral envelope.
Veselyi Gnom, Lelia, Ranok Elfa, Tsarivna, Pisnia Horsa, and *Rodzynka* varieties have been recorded in the State Register of Plant Varieties of Ukraine

Advantages

The varieties flower early summer unlike other ornamental flowering plants, including Hemerocallis varieties, most of which starts blooming with the first week of July.
It is notable for high productivity and abundant flowering, high vegetative propagation factor, winter hardiness, and resistance to diseases and pests

IPR Protection

IPR2, IPR3

Contact Information

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HONEYSUCKLE VARIETIES

Nastunia variety

Slavia variety

Specification

Fruits are large, oblong, oval-shaped, of medium blue color. The varieties are regular fruiting; winter-hardy, and relatively resistant to pests and diseases. Two varieties, Nastunia and Slavia, have been created and recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine.

Average fruit weight, g:	0.9—1.2
Biochemical properties:	
carbohydrates, %	3.5—4.5
P-vitamin compounds, mg%	756—1230
ascorbic acid, mg%	50.5—70.9
acidity	1.8—2.4
tanning substance	0.6—0.7
carotene	0.6—0.7
Yield per bush, kg	1.5—2.6
Productive period, years	20—30

Advantages

The varieties are winter-hardy; fruits have no bitterness; bud opening in autumn is low. The plants have good prospects for being used in commercial and household arming/gardening

Areas of Application

Can be used in horticulture, food industry, confectionery, canning, and pharmacognosy. Fresh fruits are early-ripening, delicious, sweet-sour, with a high content of vitamins C, B1, B9, P, and provitamin A); juice of deep red color can be used for food coloring; fruits, teas and infusions of leaves, shoots, and flowers are used for medicinal purposes

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements.
Plant and propagation materials are available

IPR Protection

IPR3

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KANADCHANKA CULTIVAR *SILPHIUM PERFOLIATUM* AS PROTEIN FODDER SOURCE

Specification

The *Kanadchanka* cultivar is an early ripening perennial crop resistant to frost and drought, used for silage, green fodder, and hay.
The *Kanadchanka* cultivar bred at the NBG has been recorded in the State Register of Plant Varieties of Ukraine.

The yield of tops, t/ha	90—120
Protein content, %	19.6—23.0
Protein yield, t/ha	2.4—2.6

Areas of Application

The cultivar can be used in agricultural production and horticulture as fodder, melliferous, medicinal, and ornamental plant

Advantages

The main advantage of this variety is a durable life (over 15 years) and a high yield. Protein yield per 1 ha exceeds 2.0—2.5 times that of corn and sunflower. *Silphium* protein contains a complete set of essential amino acids. In regions with insufficient precipitation in summertime *Silphium* can be used as emergency culture. It is a good melliferous plant due to its long-term flowering and has a nice decorative appearance

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
License agreement for commercial use of varieties; seeds and recommendations on cultivation and use are provided

IPR Protection

IPR3

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LILY VARIETIES RESISTANT TO FUSARIUM FOR OUTDOOR CULTIVATION

Zharynka variety

Areas of Application

The varieties can be used in gardening on open and partially shaded areas (monoculture gardens, flower beds of various types, continuous flowering gardens) and for floral arrangement

Specification

The varieties (*Zharynka*, *Serpanok*) are obtained by free pollination of Asiatic hybrids followed by individual selection in harsh infected environment. The varieties are diploid. They are resistant to Fusarium and winter-hardy; the plants flower in late June–early July. The flowers are multicolor, with diversified patterns. The buds are tinted.
The *Zharynka* and *Serpanok* varieties have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Propagating material for commercial use and recommendations on plant cultivation are provided

Serpanok variety

Advantages

The varieties are created for cultivating outdoor in harsh infected environment. They have a high decorative value, are productive, winter-hardy, resistant to diseases, and notable for an abundant blossom and a high vegetative propagation rate

IPR Protection

IPR2, IPR3

Contact Information

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METHOD FOR DETECTING THE GENES OF RESISTANCE TO THE MOST DEVASTATING SPECIES OF RUST (GENUS *PUCCINIA*) IN WHEAT AND OTHER CEREALS USING THE MOLECULAR GENETIC ANALYSIS

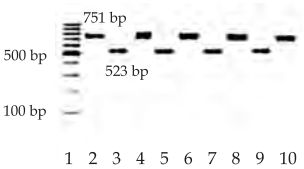
Rusty wheat leaf (brown rust)

Areas of Application

Identification of wheat and other cereals varieties resistant to various rust types for their further use in breeding and agriculture

Specification

A method that enables identifying the genes of resistance to different rust species (leaf rust (*Lr34*), stem rust *(Sr2* and *SrCad*), and yellow rust (*Yr36* and *Yr10*)) and determining their allelic states using molecular genetic markers has been proposed



1 — Molecular marker (O'GeneRuler™ 100 bp DNA Ladder);
Wheat varieties
2 — Thatcher +Lr34 (RL6058);
3 — Thatcher negative (–) control);
4 — Demeter (+);
5 — Myronivska 67 (–);
6 — Snizhana (+);
7 — Podolianka (–);
8 — Myronivska 30 (+);
9 — Podolianka (–);
10 — Vesta (+)

751 bp Lr 34 (+) — resistant to brown rust
523 bp Lr 34 (–) — nonresistant to brown rust

Detection of genes of resistance to brown rust using the molecular genetic analysis

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Upon request, sample analysis of cereals (e. g. wheat varieties) and recommendations for their further use in breeding and crop production are provided

IPR Protection

IPR1

Advantages

Upon request, sample analysis of cereals (e. g. wheat varieties) and recommendations for their further use in breeding and crop production are provided

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METHOD FOR DETERMINING THE STATE OF ECOCENOSIS, INTRODUCED, AND AGRICULTURAL PLANTS

Areas of Application

Determining the state of ecocenosis plants under unfavorable impacts; ecological monitoring (bioindication) of environment; searching plant test objects for environment bioindication; determining the state of introduced plants; testing new varieties of agricultural plants for genetic and breeding purposes

Specification

The content of protein biomarker in the plant sample (leaves) as measured by the immune-detection method is used as a biological indicator of the plant physiological state. Monoclonal antibodies, which are specific to the biomarker of a wide range of organisms including the plants, are used for immune-detection

Advantages

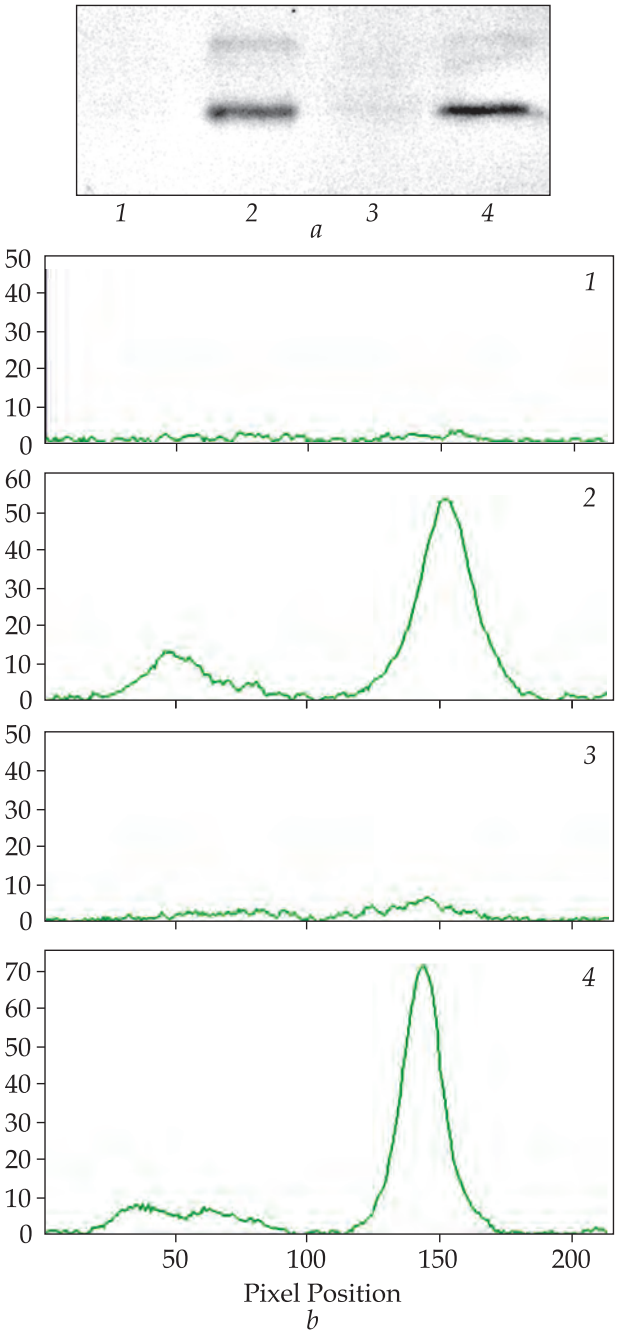
There are no absolute counterparts. The method gives an integral indicator of the plant state in unfavorable environment, it is suitable for testing of different plant species and early diagnostics of plant stress before appearance of negative symptoms (shape and color changes, retardation in growth and development, acceleration of aging)

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Recommendations and training are provided upon request

IPR Protection

IPR1, IPR2



Immune-detection of protein biomarker of the plant state in leaves of *Malva pulchella* (*1*, *2*) and *Malva sylvestris* (*3*, *4*): *a*) western blots; *b*) their densitometric scanograms; *1*, *3* — under normal conditions (moderate soil moisture, ambient temperature of 17 °C; *2*, *4* — under unfavorable conditions (drought, ambient temperature of 41 °C)

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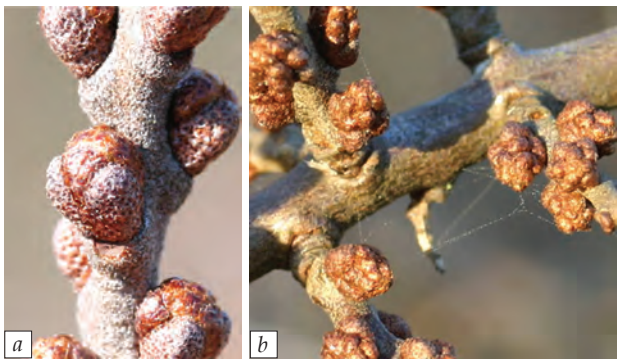
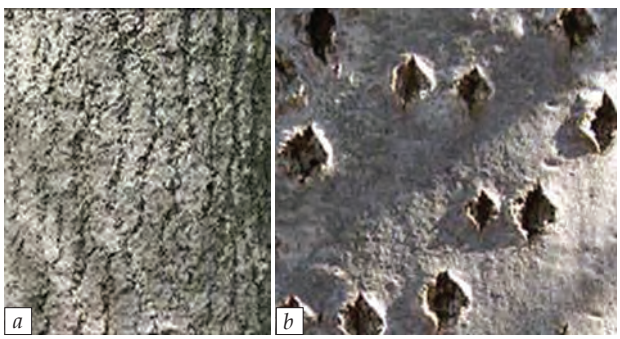
METHOD FOR DIOECIOUS PLANT GENDER IDENTIFICATION



Buds of sea buckthorn (*Hippophae rhamnoides*):
a — pistillate plant, *b* — staminate plant



Piece of *Populus tremula* bark:
a — pistillate plant, *b* — staminate plant

Arrangement of offshoots on Ginkgo biloba stem:
a —pistillate plant, *b* — staminate plant

Areas of Application

The method can be used in urban landscaping and commercial propagation, cultivation, and sales of decorative plants in order to identify male seedlings of woody plants, which is very important for the formation of green areas and for the study of plant resistance to extreme environmental factors in applied botany

Specification

Gender differentiation into the pistillate and the staminate dioecious plants at the early stages of ontogeny

Advantages

The method enables to find new diagnostic features of plant gender (male, female) distribution. The method applies to woody dioecious plants

Stage of Development. Suggestions for Commercialization

IRL3, TRL2
Diagnosis of features of dioecious plants before the generative period of development is provided upon request

IPR Protection

IPR2

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NEW CROP SHCHAVNAT

Areas of Application

The crop is used in agriculture, power generating and food industries for production of solid biofuels and biogas, valuable foodstuff and balanced feed

Specification

Perennial (10 years), ultra-early harvest culture *RUMEX OK-2*, *KYIVSKYI ULTRA*, and *NASTAVNYK* varieties bred at the NBG have been recorded in the State Register of Plants Varieties of Ukraine.

Yield of raw material:	
the first harvest, t/ha	76—82
the aftermath, t/ha	23—25
Protein content, %	30—40 (dry matter)
Ascorbic acid content, mg%	650—700
Yield of conventional biofuel, t/ha	12—15
Energy efficiency, Gcal/ha	65—80
Estimated biogas yield, m^3/ha	15000—16000

Advantages

The new crop has no counterparts. As compared with sorrel, its green mass has 2—3 time lower acidity; its protein and vitamin content is higher by 30—40%. It has the earliest harvest time among all known crops. The crop has high biomass productivity, environmental stability, and number of harvests per season (up to 4 times); cost effective

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
License agreement on the use of plant varieties for commercial production. Seeds and recommendations for the cultivation and use are provided

Shchavnat, *Rumex OK-2*

Shchavnat, *Kyivskyi ultra*

Products made of Shchavnat

IPR Protection

IPR3

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NEW HIGH-YIELD WINTER WHEAT VARIETIES

Astarta new high-yielding winter wheat variety

Areas of Application

Agricultural sector;
seed farms of Ukraine and CIS countries

Specification

In terms of productivity and use, new varieties are divided into two groups: short-stem heavy yielders and medium-high varieties of universal use.
The first group of varieties provides maximal yields on soils with high and optimal mineral nutrition. The second group varieties give optimal yields without a sharp decrease in the lower productivity threshold under extreme conditions

Darinka Kyivska new winter wheat variety of universal use

Advantages

The advantage of new winter wheat varieties is a high productivity combined with resistance to adverse environmental factors

IPR Protection

IPR3, IPR5

Stage of Development. Suggestions for Commercialization

IRL6, TRL8
The original seed material, scientific support, and co-cultivation within the framework of license agreement are proposed

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NEW INTRODUCED SPECIES OF SHADE-TOLERANT PERENNIAL PLANTS FOR DIVERSIFIED LANDSCAPE COMPOSITIONS

Primula Juliae

Brunnera macrophylla

Areas of Application

The species can be used in horticulture and landscaping of shaded areas in seasonal, geographical, botanical, and ecological plant compositions, as well as in continuously flowering gardens; for ecological and botanical educational activities in botanical gardens, arboretums, and ornamental gardens of educational institutions

Specification

High differentiation of biological and ecological characteristics and valuable decorative properties are distinctive features of these plants. The species are shade-tolerant, resistant to pathogens and pests, winter-hardy; have positive yield response to culture conditions

Advantages

The plants improve overall stability and decorative value of landscape compositions in shaded areas. Their use enables to create exhibition sites in a short time. They can be planted over free areas under the shelter formed by existing tree plantations

Anemone hupehensis

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The design of plant compositions and selection of appropriate assortment of shade-tolerant ornamental perennial herbaceous plants can be provided upon request

IPR Protection

IPR2

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NUTRIENT MEDIUM FOR HAWTHORN (*CRATAEGUS CHLOROSARCA* MAXIM) RHIZOGENESIS INDUCTION

Hawthorn (*Crataegus chlorosarka* Max.) rhizogenesis

Areas of Application

This nutrient medium is used for direct regeneration of *in vitro* rhizogenesis of *Crataegus* L. genus plants and provides wide opportunities to preserve the plant's gene pool. It enables the creation of original breeding material and rapid propagation of plants in ornamental horticulture, fruit growing, and breeding

Specification

The nutrient medium has been created using the Murashige-Skoog basic culture medium in author's own modification.
It has a lesser content of macro- and micro-salts and nitrogen-containing substances and has been complemented with vitamins (B_1, B_5, B_6, PP, C), in other proportions, and with β-IBA auxin

Advantages

The proposed culture medium enables reducing root formation time down to 1—2 weeks and enhancing rootage of shoots 6 times, which significantly increases the yield of planting and source material

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
The nutrient medium for hawthorn (*Crataegus chlorosarka* Max.) rhizogenesis is produced upon request. Staff training is provided upon request

IPR Protection

IPR1, IPR3

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NUTRIENT MEDIUM FOR *IN VITRO* PROPAGATION OF CHINESE REDBUD (*CERCIS CHINENSIS* BUNGE)

Areas of Application

This nutrient medium is used to increase the explant regeneration capacity and propagation rate of *C. chinensis*. It provides opportunities to preserve the plant gene pool and to obtain morphologically and genetically uniform planting material of this variety on the commercial basis for plant introduction and ornamental horticulture

Specification

The nutrient medium has been created using the Murashige-Skoog basic culture medium in author's modification. It has a lesser content of ammonium nitrate (NH_4NO_3) and potassium nitrate (KNO_3); the amino acid composition has a reduced content of amino acetic acid (glycine). Its vitamin composition has been supplemented with vitamins C and B_5, and the growth regulators composition has been modified as 6-BAP and 2,4-D added

Chinese redbud (*Cercis chinensis* Bunge) *in vitro* morphogenesis

Advantages

The proposed culture medium speeds up the start of morphogenesis by 6-days and raises the propagation factor from 3.0 to 4.99, while the average number of explants increases from 2.5 to 3.2 and the average length grows from 23.8 to 31.2 mm, which significantly increases the yield of planting and source material

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
The nutrient medium for Chinese redbud (Cercis chinensis Bunge) in vitro morphogenesis is produced upon request. Staff training is provided upon request

IPR Protection

IPR1, IPR3

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ORNAMENTAL ASTILBE VARIETIES RESISTANT TO AGRO-CLIMATE FACTOR

Aniuta variety

Ocheniata variety

Lebidonka variety

Specification

The varieties have been created by hybridization of introduced cultivars. The flowering time is the 1st–3rd thirds of June (very early, middle, late); flowering duration is medium-term; the plants are medium sized; inflorescence is a splendid dense panicle-type cluster of white, dark pink, violet or purple color.
The varieties are notable for their high ornamental, value and are resistant to agro-climatic effects.
The *Aniuta*, *Lebidonka*, *Ocheniata*, and *Khurdelytsia* varieties have been recorded into the State Register of Plant Varieties Suitable for Growing in Ukraine

Areas of Application

The varieties can be used for landscape gardening in monocultural, shady, continuous flowering gardens, mixborders, and group plantations, as well as for selection and creation of gene pools of regional botanical gardens and arboretums

Advantages

The varieties have a high ornamental and are resistant to abiotic factors, which enables a wider use of Astilbe plants in landscape gardening

Stage of Development. Suggestions for Commercialization

IRL5, TRL3
Planting material for commercial use and recommendations on plant cultivation are provided

IPR Protection

IPR2, IPR3

Contact Information

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PEACH VARIETIES

Lisostepovyi variety

Podarunok Kyeva variety

Areas of Application

Can be used in fruit-gardening, food industry, canning, confectionery, pharmacology, and cosmetology; Delicious and fragrant fruits have a balanced content of sugars and acids; can be used both fresh and canned. Due to a high content of bioactive substances all parts of the plant can be used for curing purpose

Specification

Fruits are oval- or round-shaped, cream, red, or orange colored. The plants are relatively resistant to pests and diseases. Fourteen varieties have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine.

Average weight, g	110—150
Maximum weight, g	280—350
Yield per tree, kg	25—35
Yielding period, years	15—25
Fruit biochemical parameters:	
sugars, %	10.0—18.0
vitamin C, %	9.98—17.6
total acidity, %	0.45—0.85
dry matter, %	8.35—12.68
anthocyanins, mg/100 g	25—122

IPR Protection

IPR2, IPR3

Druzhba variety

Advantages

The varieties can be used in the northern regions of Ukraine. They are winter-hardy and have different terms of ripening, so the fruits can be gathered throughout the entire summertime. These peach varieties have enriched the assortment of fruit plants

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant growing are provided. Plant and propagation materials are available

Contact Information

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PORTABLE DEVICE OF *FLORATEST* FAMILY

Areas of Application

Device is designed for "smart" agriculture, precision farming, commercial horticulture, ecological monitoring, and express-diagnostics of influence of stress factors of natural and anthropogenic origin on the plant's state. It enables to take timely measures for harvest preservation, water and energy saving and to protect plants from stressful environmental factors

Advantages

There are no counterparts in Ukraine; the device is 2—3 times cheaper than the foreign analogs; it can be customized and upgraded using variable sensors

Specification

Radiation wavelength, nm	450—470
Maximum luminous intensity, mcd	5000
Leaf emission wavelength, nm	670—770
Measurement error, %	≤5
Weight of computer unit, kg	0.5
Weight of portable optical sensor, g	40

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, maintenance within the warranty period, and staff training are provided under the license agreement

IPR Protection

IPR3

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QUINCE CULTIVARS

Shaidarova's Pear-Shaped variety

Darunok onuku variety

Areas of Application

The quince cultivars are used in gardening, food industry, canning, confectionery, and pharmacognosy. The quince multivitamin fruits are a source of macro- (Fe, K, and P) and microelements (Cu, Mn, Zn, and Co). The fruits, leaves, and seeds are used to treat anemia, hypertension, asthma, and diarrhea

Specification

The fruits are apple-shaped, pear-shaped or cylindrical; yellow or orange colored. The 5 quince cultivars (*Akademichna, Darunok onuku, No.18 Kashchenko, Maria,* and *Studentka*) bred at the NBG have been recorded in the State Register of Plant Varieties of Ukraine.

Average weight, g	250—500
Fruit biochemical parameters:	
pectin, %	0.88—1.30
sugars, %	10.0—12.0
organic acids, %	0.25—0.80
vitamin C, mg%	99.0—115.0
polyphenols, mg%	80.0—153.0
carotenoids, mg%	15.0—30.0

Advantages

As compared with counterparts these cultivars bred at the NBG are winter-hardy and can withstand temperature down to –30 °C; the plants abundantly yield fruits annually. The quince cultivation area has expanded by 500 km northward

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant growing are provided. Plant and propagation materials are available

IPR Protection

IPR2, IPR3

Contact Information

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RIZOSTYM BACTERIAL FERTILIZER

МІНІСТЕРСТВО ЕКОЛОГІЇ ТА ПРИРОДНИХ РЕСУРСІВ УКРАЇНИ

ПОСВІДЧЕННЯ

про державну реєстрацію

Серія А № 03583

Видане Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

про те, що відповідно до Закону України «Про пестициди та агрохімікати»

препарат «РИЗОСТИМ», порошок, біопрепарат

діюча речовина Rhizobium leguminosarum bv. viceae 2636, Bradyrhizobium japonicum PC-08 (Apco), Bradyrhizobium japonicum T-21-2

виробник препаративної форми Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

виробник діючої речовини Інститут фізіології рослин і генетики Національної академії наук України (Україна, м. Київ)

сфера та умови застосування Сої, горох

Тара: пакет із поліпропіленової плівки масою 0,2-1 кг

Зареєстрований в Україні терміном до "31" грудня 2022 р.

Занесений у Державний реєстр за № 7139 від "01" лютого 2013 р.

Заступник Міністра – керівник апарату

Л.Л. Мормуль

Areas of Application

Agriculture. Used for the treatment of grain legume seeds to increase yield, to accumulate biological nitrogen in soil, and to improve technology for agricultural crops cultivation involving biological components

Specification

Powder, biopreparation.
Fertilizer is a culture of microorganism modified by natural biologically active compounds on vermiculite (powder).
RIZOSTYM TU U 24.1-05417242-001:2012

Advantages

The bacterial fertilizer contains highly effective and competitive rhizobial strains, a unique component improving bacterial adhesion to seeds and bacterial colonization on the seed surface, and a natural complex of biopolymer compounds, which accelerates symbiosis and increases both bacterial nitrogenase activity and bacterial resistance to adverse environmental factors

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
The preparation is manufactured upon buyer's request.
Advice on the product application is provided upon customer's request

IPR Protection

IPR3

Contact Information

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SILICEOUS MIXTURES FOR SOIL REMEDIATION

Experiment. Sugar beet growth from seeds dressed and incrusted with natural minerals

Reference. Sugar beet growth from seeds dressed and incrusted with standard preparation

Areas of Application

The mixtures can be used in different soil and climatic zones in order to: increase the fertility of sandy soils; detoxify soils contaminated with heavy metals, radionuclides, and organic compounds; retain moisture in soils with various characteristics; provide soil ecosystem with self-healing capacity; adapt different species of plants to drought

Specification

The dosage is 300—600 kg/ha depending on mixture composition, soil properties, and biological characteristics of plants. The use of mixtures is aimed at optimizing and balancing the soil processes by controlling ratio between mono- and polyciliceous acids; retaining moisture in the soil; stimulating plant growth and development; and improving plant adaptation to any stress factors

Advantages

The mixtures can be used for producing recycled materials and mixtures of silicon minerals. The availability of raw materials for the production of silicon compounds almost everywhere and a simple technology of production make this product competitive, cheap, and environment friendly. The mixture is applied using standard equipment and technology for adding small amount of fertilizers

Stage of Development. Suggestions for Commercialization

IRL8, TRL7
The mixture is manufactured upon request

IPR Protection

IPR3

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SOVSKYI LETTUCE CULTIVAR AS HIGH-YIELD VEGETABLE CROP

Specification

The cultivar is an annual mid-ripening lettuce plant. The plants easily sustain transportation and storage (up to 30 days), resistant to diseases and bolting.
The Sovskyi cultivar bred at the NBG has been recorded in the State Register of Plant Varieties of Ukraine.

Ripeness for commercial purpose, days	45–65
Yield	
heads, t/ha	47
leaves, t/ha	28
Seed yield, kg/ha	800–1000
Sowing rate, kg/ha	6

Areas of Application

The *Sovskyi* lettuce cultivar (*Lactuca sativa* var. *romana* Lam.) can be used in food industry and dietology, both fresh and processed

Advantages

As compared with other representatives of this group of plants this cultivar is notable for a higher content of sugar (0.6%), protein (1.4%), ascorbic acid (80 mg%), carotene (1.3 mg%), vitamin B, E, PP, organic acids, etc. The average yield of leaves is higher by 8 t/ha than that of *Lactuca sativa*, so it is promising variety to be planted at farms and household gardens

Stage of Development. Suggestions for Commercialization

IRL3, TRL6
The original seeds material is propagated and recommendations on cultivation are provided upon request

IPR Protection

IPR1, IPR2

Contact Information

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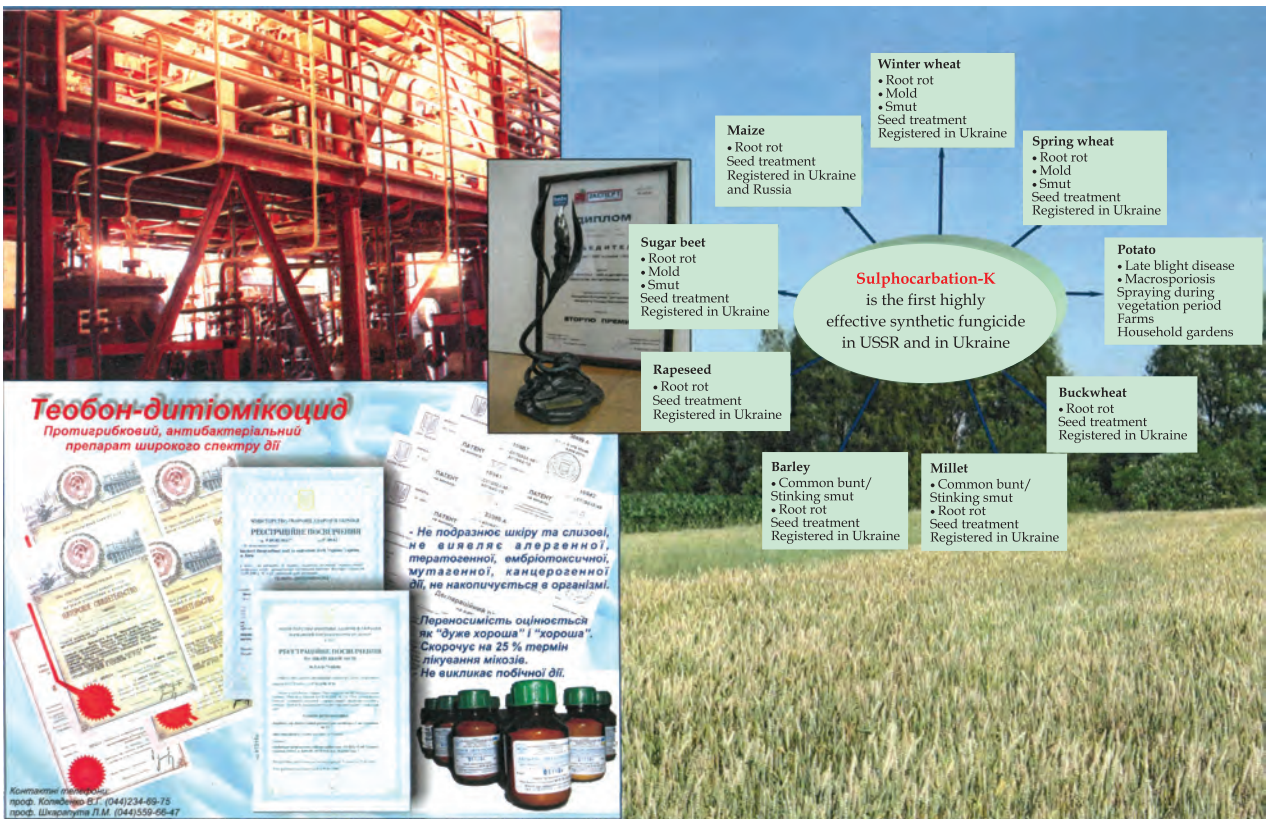
SULPHOCARBATION-K (SCK) SEED MORDANT



Areas of Application

The preparation for the treatment of sugar beet, wheat, corn, buckwheat, barley, millet, and rape seeds; used as a fungicide for fighting late blight decease of potato

Specification

SCK is a low toxic fungicide, contact type mordant, has been fully tested and registered in Ukraine. The preparation is a water-soluble powder, contains at least 950 g/kg of active substance. The technical specifications and process procedure for the primary and the secondary stages have been designed

Advantages

The use of SCK for seed treatment enables a substantial reduction (from 2 to 20 times) in the mordant consumption rate, while providing complete and comprehensive protection of plants from diseases, increasing yield by 10—60%, and cutting expenses on wheat seed protection by 20—50%.
SCK effectiveness is comparable to the best world counterparts.
The commercial production of SCK is environment friendly

Stage of Development. Suggestions for Commercialization

IRL8, TRL8
The preparation samples and the technology for production are proposed

IPR Protection

IPR1, IPR3

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TECHNOLOGIES FOR RAISING THE FERTILIZER EFFICIENCY IN GRAIN PRODUCTION

Areas of Application

The technologies are proposed for obtaining high yields of cereal crops by agroholdings

Specification

The technology includes the determination of elements effectiveness depending on cereal crop variety, the selection of optimal way of fertilizing soil with various forms of nitrogen, phosphorus, sulfur, potash, and trace elements and the harmonization of crops nutrition and protection system

Advantages

The technology enables to increase efficiency of use of nitrogen (by 5—15%), sulfur, phosphorus, and potassium (by 10—20%), to cut the nutrition costs by 15—20% and to reduce pollution of agrophytocenoses resulting from application of agrochemicals

IPR Protection

IPR1, IPR3

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
The introduction of technologies on customer's site and staff training are provided upon request

Contact Information

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TECHNOLOGY FOR ACCELERATED SEED MULTIPLICATION OF NEW SOFT WINTER WHEAT VARIETIES

Areas of Application

The technology is proposed for acceleration of multiplication of pre-basic, basic, and certified seeds and grain crops

Specification

The customized accelerated seed multiplication technology ensures a 4—5 time increase in seed multiplication factor and a 25—30% increase in pre-basic seed production profitability

Advantages

The accelerated seed multiplication enables a large-scale introduction of new winter wheat varieties and an increase in the winter wheat yield up to 8—10 tons per hectare, as compared with the conventional seed production technologies

IPR Protection

IPR2

Stage of Development. Suggestions for Commercialization

IRL8, TRL8
An agreement on scientific and advisory support and staff training can be concluded upon request

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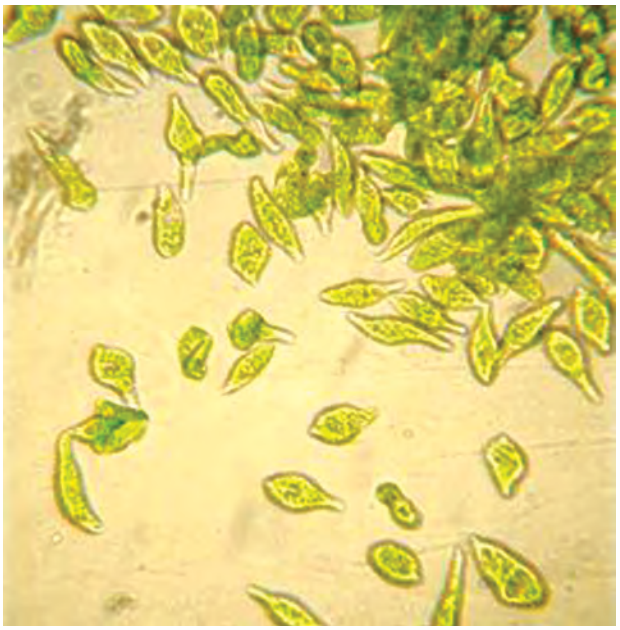
TECHNOLOGY FOR PRODUCTION OF BIOACTIVE COMPOUNDS FROM *EUGLENA GRACILIS* MICROALGA BIOMASS



Euglena gracilis microalga cells

Euglena gracilis microalga biomass

Areas of Application

Use of microalgal biomass for dietary supplements production; production of liposoluble vitamins for medicine, veterinary medicine, and cosmetology; production of paramylon for prevention and treatment of cardio-vascular diseases and cancer; use of microalgal biomass in aquaculture and fodder production

Specification

Two- or three-stage cultivation is used for varying content and composition of bioactive compounds, which enables to accumulate microalgal cellular mass at the first stage and to reach desired modifications of biochemical composition at the next stages. The technology involves biomass production and its further processing for tocopherol or paramylon extraction

Advantages

There are no absolute counterparts. *E. gracilis* has a high growth rate and is able to accumulate bioactive compounds in large amounts. Efficient and simple cultivation in artificial conditions excludes dependence of production on seasonal influences. Other advantages are the availability of main substrates for cultivation as well as waste-free and environment friendly production

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Technology transfer under the agreement

IPR Protection

IPR1, IPR2

Contact Information

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TECHNOLOGY OF COMBINED HERBICIDES APPLICATION FOR IMPROVING THE CROPS PROTECTION FROM WEEDS

Maize plantation with the use of herbicide mixture

Wheat plantation with the use of herbicide mixture

Soybean plantation with the use of herbicide mixture

Areas of Application

Agroindustrial sector: crop production and protection from weeds

Specification

Tanked herbicide mixtures with highly-selective phytotoxicity for the protection of major crops

Advantages

Combination of herbicides with different mechanisms of phytotoxicity taking into consideration the interaction effects enables an effective protection of crops from weeds as well as a high selectivity with respect to the crops and prevents the appearance of resistant weed biotypes

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Recommendations for the use of herbicidal complexes and mixtures to protect crops from weeds are provided

IPR Protection

IPR1

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VERY-EARLY- AND EARLY-FLOWERING PEONY VARIETIES

Iroquois variety

Blonde variety

Enchantress variety

Specification

The varieties have been created by remote hybridization involving wild species *Paeonia areitina, P. officinallis, P. Peregrin, P. wittmanniana* and varieties *P.lactiflora* and *P. officinallis*. The plants flower as early as mid- and late May.
The flowers are of Japanese or anemone type, single, semi-double, and double shaped.
The petals are pink, coral pink, purple, or dark red colored.
The *Iroquois, Blonde, Enchantress, Spring Catwalk, Coquette, Dawn Poem, May Dew, Hercules, Crimson Vatra, Kolomyia Easter Egg, Firefly, Milky Way*, and other varieties have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine

Areas of Application

The varieties can be used in ornamental horticulture and landscape gardening (monoculture gardens, mixborders, spring and continuously flowering gardens, single plantations, household gardens) and in floristry

Advantages

The plants start blooming 10—15 days before *P. lactiflora* flowering period.
They are notable for new decorative features of flowers (unique structure, shape, and color), a high propagation rate, high productivity and abundant blossom.
The plants are resistant to bacterial and fungal diseases

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Recommendations on plant cultivation are provided.
Planting materials are available

IPR Protection

IPR2, IPR3

Contact Information

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VIBURNUM OPULUS CULTIVARS

Berehynia variety

Nasoloda variety

Areas of Application

The cultivars can be used in gardening, food industry, confectionery, and pharmacognosy. The fruits have a high content of biologically active substances, are delicious and suitable for various types of processing. All parts are used as medicinal products

Advantages

The sweet cultivars of Viburnum opulus have good prospects for being used in commercial and household farming and enrich the assortment of fruits with a high content of vitamins

IPR Protection

IPR2, IPR3

Specification

The fruits are round-shaped red drupes with a red juicy pulp; the average weight depending on cultivar reaches 0.8—1.1 g; each cluster consists of 60 to 100 fruits. These cultivars are semi-sweet. The fruits ripen in September. Two Viburum opulus cultivars, *Nasoloda* and *Berehynia*, have been recorded in the State Register of Plant Varieties Suitable for Growing in Ukraine.

Biochemical parameters:

sugars, %	7.0—8.7
acids, %	1.25—1.5
carotenes, %	2.6
vitamin C, mg%	60—110

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
The use of varieties is governed by license agreements. Recommendations on plant growing are provided. Plant and propagation materials are available

Contact Information

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WINTER-HARDY ROSE CULTIVARS

Khortytsia rose cultivar

Vintage rose cultivar

Areas of Application

These cultivars (varieties) can be used for landscape gardening and urban greening

Specification

New rose cultivars *Khortytsia* and *Vintage* created at the Gryshko National Botanic Garden of the NAS of Ukraine are frost hardy (up to –30 °C) and suitable for the 5th hardiness zone. These cultivars are 2.5 m high shrubs early abundantly blooming with yellow flowers. *Khortytsia* and *Vintage* rose cultivars have been included into the State Register of Plant Varieties of Ukraine

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
The license agreement for the use of cultivars on commercial basis is under finalization. The material for propagation is available and recommendations on cultivation and use are provided

Advantages

The plants do not require winter covering. The labor and care costs significantly decrease. The proposed cultivars have a higher decorative value as compared with the well-known winter-hardy cultivars of Canadian selection

IPR Protection

IPR2, IPR3

Contact Information

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ZHARYNKA CULTIVAR OF *PHYSALIS PUBESCENT* AS PECTIN SOURCE AND VALUABLE DIETARY PRODUCT

Areas of Application

This cultivar can be used for food industry both fresh (in salads) and processed (canned, salted, pickled, jams, jellies, etc.)

Specification

Annual plant of the *Solanaceae* family; it is resistant to diseases (mildew), pests (Colorado potato beetle) and undemanding to soil. Its ripe fruits have yellow-amber color, sweet flavor and strawberry aroma. *Zharynka* cultivar bred at the NBG has been recorded in the State Register of Plant Varieties of Ukraine. The growing season of *Physalis* lasts for 90—120 days.

Productivity (yield)	
fruits, t/ha	12.3—12.6
seeds, kg/ha	120—180
Sowing rate	
seedlings method, kg/ha	0.5
sowing method, kg/ha	1.5

Advantages

The use of *Zharynka* cultivar enables to get a raw material with higher qualitative and quantitative indices. It has a high nutritional value as compared with other members of the family and a long term of fruit storage (about 3 months)

IPR Protection

IPR1, IPR2

Stage of Development. Suggestions for Commercialization

IRL3, TRL6
The original seeds and planting material and recommendations on *Zharynka* cultivation can be provided upon request

Contact Information

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INNOVATION READINESS LEVEL (IRL) SCALE

IRL	Innovation Readiness Level	Definition
IRL1	Inventor or team with a dream	The lowest level of readiness where the intention transforms into an idea of space system application or the space technology transforms into a business venture
IRL2	Paper studies produced	Once the basic ideas have been formulated, they are put down on paper in studies and analyses of business opportunities
IRL3	Experimental evidence of business opportunity	Active research and development are initiated, including analytical / laboratory studies to validate predictions regarding the market, the competition, and the technology
IRL4	Capability to implement limited-scope programs with project teams	Basic technological and business components have been developed to establish that they will work together; an initial business plan is available
IRL5	Capability to support project engineering development and design (no product, no revenues)	The basic technological and business components have been integrated with reasonably realistic supporting elements. The business plan is credible, but still needs to be validated against the final product characteristics
IRL6	Capability to support development and design with a market-driven business team (product, no revenues)	The representative prototype system has been tested in a relevant environment. The business team is still incomplete and the venture is not yet ready for commercialization. A full business plan including the market, the operational, the technological, and the financial aspects is available
IRL7	Capability to support limited production; full business team in place (product and limited revenues)	The business can run on a limited scale. The full team is in place
IRL8	Capability to advance to full production and distribution (product and revenues)	The technology has been proven to work and the venture structure has proven to be able to support growing market shares
IRL9	Fully articulated business with appropriate infrastructure and staffing (growing market share)	The offering incorporating the new technology has been used in operational conditions and the business is running with a growing market share

Intellectual Property Rights Protection[1] Levels

IPR codes	Protection Level
IPR1	Technical solutions are know-how[2]
IPR2	Applications for copyright protection of IPR objects are expected to be or have been submitted
IPR3	The copyright protection of IPR objects as established by the applicable law of Ukraine has been obtained and is kept in force
IPR4	International industrial patent application(s) (according to the PCT system, etc.) has (have) been submitted. Application(s) for industrial patents has (have) been submitted in foreign country(ies) under national procedure
IPR5	The industrial patent(s) in foreign country(ies) has (have) been obtained and is/are kept in force

[1] The IPR protection measures are implemented by R&D institutions in accordance with the applicable legislation of Ukraine and the requirements of paragraphs 5, 8, and 9 of the Regulations for the use of intellectual property objects at the NAS of Ukraine as approved by Resolution of the Presidium of the NAS of Ukraine No.15 of January 16, 2008, on the Structural Units Responsible for Technology Transfer, Innovation Activities, and Intellectual Property (as revised)

[2] Know-how is technical, organizational, or commercial data obtained with the use of experience and upon trials of technology and its components, which are: closely held (not a part of general knowledge or available for public) on the date of license agreement; essential, i.e. important and useful for manufacture of products, manufacturing process, and/or provision of services; and elaborate i.e. detailed and complicated enough to verify their compliance with the criteria of being never-before-known and essential (Clause 1 of the Law of Ukraine on the State Regulation of Technology Transfer Activities)

TECHNOLOGY READINESS LEVEL (TRL) SCALE

Stage	TRL	Interpretation	Definition and Description
Invention	TRL1	Basic principles observed	Basic scholarly research is translated into potential new basic principles that can be used in new technologies
	TRL2	Technology concept formulated	Potential areas of application of basic (technological) principles, including the technological concept are identified. Basic manufacturing principles are elaborated and potential sales markets are identified. A small research team is established to assess the project feasibility
Concept validation	TRL3	First assessment of concept and technology effectiveness	Based on preliminary study, actual research is conducted to assess technical and market feasibility of the concept. This includes active R&D works at the lab and first negotiations with potential customers. The research team expands. Market feasibility is assessed
	TRL4	Prototype validation at lab	Basic technological components are integrated to assess early feasibility by testing in laboratory environment. Manufacture options are studied with basic manufacturing principles identified. Key markets are researched to study demand. The organization is ready to scale up, possible services are analyzed. Comprehensive marketing analysis is made
Prototyping and incubation	TRL5	Prototype testing in user environment	The system is tested in user environment with broader technological infrastructure involved. The actual use is tested and validated. Production-support works and pre-production tests are done in lab environment. Trial batches of prototypes enter the key markets. The organization starts activities to further distribute the prototypes and to enter the sales markets
Pilot production and demonstration	TRL6	Pre-production, including tests in user environment	The product and manufacturing technologies are completely ready for launch of a pilot line/pilot plant (low-scale manufacture). The product and manufacturing technologies are assessed and finalized. This may include additional R&D works. The early products and manufacturing technologies are tested in the key markets with simultaneous organization of manufacture (marketing research, logistics, production facilities, etc.)
	TRL7	Low-scale pilot production demonstrated	The product manufacture is fully operational at low rate. Actual commercial products are manufactured. The final products are verified in the key markets. The organizational component is completed (comprehensive marketing strategy, all components of manufacturing activities). The products are formally launched in test markets
Initial market introduction	TRL8	Manufacture fully tested, validated, and certified	The manufacturing flow charts, product final version, production organization, and marketing tools are completed. The full-scale manufacture has been launched. The final product is sold in majority of domestic and international markets
Market expansion	TRL9	Manufacture and products fully operational and competitive	The full-scale manufacture is sustainable, with the product gaining new markets. Minor modifications and improvements create new versions. The technology and product output are optimized through implementing innovative concepts on manufacturing process. The product is fully customized to the key markets

Reference book

THE NATIONAL ACADEMY OF SCIENCES OF UKRAINE

R&D AND TECHNOLOGIES

THE NAS OF UKRAINE

IN 11 SPESIAL ISSUES

Issue
INDUSTRIAL AGRICULTURE
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