Cultivars of new and non-traditional plant species of high potential as fodder, honey and energy crops created at the National Botanical Garden (Institute) "Alexandru Ciubotaru" of the State University of Moldova

Soiuri de culturi de specii noi și netradiționale de plante cu utilitate furajeră, meliferă și biomasă energetică create la Grădina Botanică Națională (Institut) „Alexandru Ciubotaru” a Universității de Stat din Moldova

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Workshop exploratoriu "Alimentație sustenabilă în contextul schimbărilor climatice"

SMART DIASPORA 2023, Diaspora în învățământ superior, știință, inovare și antreprenoriat,
Timișoara 10-13 aprilie, 2023

Energy is the dominant factor that determines the welfare of the country and people, influences the level of development of all spheres of activity in society. The industrial progress has caused sudden increase of energy consumption. The sources of renewable energy acquire considerable interest. Plant species are efficient users of solar energy for converting CO_2 into biomass.

The Republic of Moldova has few fossil energy resources, so being forced to import near 95%, depending entirely on the supplying countries. Therefore, the issue of renewable energy sources has been and remains actuality.

The structure expected by 2020 of the total production and consumption of energy obtained from renewable sources based on biomass will constitute approximately 70.0%. The climatic conditions from the years 2007, 2012, 2015, 2020, 2022 which had serious consequences on the development of agriculture, revealed that only on the basis of agricultural remains - straw, sunflower stalks and corn, the problem of biomass supply cannot be solved, which determined the orientation of the research and innovation policy towards identifying new plant species by analyzing their productivity, environmental impact, economic efficiency and ensuring that they didn’t affect the food supply of the population. For biomass production on industrial scale, the most efficient crops that use to a great extent the photosynthetically active solar energy during the vegetation period, accumulate a considerable amount of dry matter and demand optimal expenses for establishment and low expenses for maintenance, harvesting and processing should be selected and implemented.

Valorification of gene pool of plant species for bioenergy production are a new research direction within the “Alexandru Ciubotaru” National Botanical Garden (Institute).

- **The giant knotweed or the Sakhalin knotweed, *Polygonum sachalinense* F. Schmidt (syn. Fallopia sachalinensis Ronse Decr., Reynoutria sachalinensis Nakai, Tiniaria sachalinensis Janch., Pleuropterus sachalinensis Moldenke) fam. Polygonaceae Juss. is widespread in the wild flora of norther Japan, Sakhalin Island and Kurile Islands. It appears in Europe the second half of the 19th century, being implemented in culture during the 20th century due to its tolerance to the soil climatic factors and stable productivity, serving as fodder from early spring until late autumn**
- ***Silphium perfoliatum* L., fam. Asteraceae Bercht. & J.Pres, the common name is Sylph or Cap plant, belongs to the genus *Silphium* L. which includes the 23 species, is originally from North America, East Coast of United State of America and Canada, introduced as an ornamental plant in the botanical gardens in France and in the UK in the second half of the 18th century and in the 20th century – as a fodder plant .**
- ***Sida hermaphrodita* (L.) Rusby (Virginia mallow, Pennsylvanian malva, River mallow, Virginia fanpetals) fam. *Malvaceae* Juss., polycarpic perennial herb, originates from south-eastern parts of Northern America, where it naturally grows in moist riverine habitats, has the form of a dense root bush with a few dozen of stems with the length of 400 cm and diameter of 5 to 35 mm. For the first time, *Sida hermaphrodita* was brought to Europe in 1930 and introduced in Ukraine as fodder and fibre crop.**
- **Jerusalem artichoke, Helianthus tuberosus L., family Asteraceae, plant group C4 native to North America, has strong, vigorous stems, sometimes branched at the base, 2.5-3.0 m tall, but can reach even 5 m.**
- **Miscanthus x giganteus, a sterile tetraploid hybrid, parental forms: Miskanthus sinensis Andersson and Miscanthus sacchariflorus (Maxim.) Franch., family Poaceae, plant group C4, natives to Asia, the end of vegetation reach 3- 4 m tall.**
- **Currently, these species are studied in different academic scientific centres and universities and implemented as crops with multiple use in different regions of the Earth**

  (Абдуллах, 2011; Rakhmetov, 2011; Boe et. al., 2012; Pichard 2012; Franzaring et al., 2014; El Bassam, 2013 Wrobel et al., 2013; Stolarski et al., 2014 **; Clifton-Brown et al., 2015; Haag et al., 2015).**
- **In order to evaluate the potential growth and bioenergy production of energetically species a the research was carried out to study agro-biological peculiarities and biomass yields as the first objective, while the second objective to estimate some energetically characteristics of biomass yield of herbaceous species that could be used for bioenergy production in Moldova**

MATERIALS AND METHODS

The local varieties: '*Gigant'* giant knotweed *Polygonum sachalinense,* '*Vital'* cup plant *Silphium perfoliatum* ' *Energo'* Virginia mallow *Sida hermaphrodita,* '*Solar'* Jerusalem artichoke *Helianthus tuberosus*, '*Titan'* giant miscanthus *Miscanthus x giganteus*, *'Argintina'* columbus grass *Sorghum almum, '*Ileana' elecampane *Inula helenium*, 'Vigor' milkvetch *Astragalus galegiformis and 'Mihaela' plume poppy Macleaya cordata* created in the Botanical Garden (Institute), registered in the in the Catalogue of plant varieties and patented of the State Agency on Intellectual Property of Republic of Moldova, served as objects of study. The most frequently used energy crops maize *Zea mays* (biogas production) and wheat straw *Triticum aestivum* (biosolid fuel) - control variants.

The experiments were performed on experimental land in the NBGI, on usual chernozem, latitude 46°58′25.7″ and longitude N28°52′57.8″E. The plant growth and development, their productivity were done according to methodical indications (Novoselov et al., 1983). The biochemical composition of the green mass and silage was determined by Petukhov et al. (1989) and accordance with the Moldavian standard SM 108. Organic dry matter was calculated through differentiation, the crude ash being subtracted from dry matter. The biogas and biomethane, liter per kg ODM, were calculated using the gas forming potential of nutrients according to Baserga (1998) and digestible index nutrients according to Medvedev and Smetannikova (1981). The evaluation of dry biomass – according to CEN/TC 335, automatic calorimeter LAGET MS-10A with accessories was used for the calorific value determination, according to CEN/TS 15400, in Laboratory of Solid Biofuels, TUM (SAUM). Neutral detergent fiber (NDF), acid detergent fiber (ADF), and acid detergent lignin (ADL) were determined by scanned with a near infrared reflectance spectrophotometer PERTEN DA 7200, Brasov Romania. Cellulose concentrations were calculated as ADF minus ADL and hemicellulose as the difference between NDF and ADF. The pentose and hexose carbohydrates concentrations, theoretical ethanol potential of biomass were estimated by Goff et al., 2010.







RESULTS AND DISCUSSIONSC

The experimental results revealed that cv. Vital *Silphium perfoliatum* does not develop shoots in the first year of the vegetation, but other species *develop stems about 150-170 cm.* However, in the second year and the in further years of the vegetation, in spring, when the air temperature exceeds 6°C (*Polygonum sachalinense*, *Silphium perfoliatum*, *Sida hermaphrodita*) and 10-12°C (*Miscanthus x giganteus, Helianthus tuberosus, Sorghum almum*), starts plant development from generative buds, which go through all stages of ontogenetic development, plants tall achieve 230 - 430cm and dependence on species. Research data demonstrated that the experimental plants are characterized by intensive growth and development that allow obtaining up to 100 t/ha annual yield of fresh mass with 14-25% dry matter, largely depends on the weather conditions, harvesting period and cuts.











Agro-biological characteristics of the cv. *Gigant* Polygonum sachalinense

REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE

ADEVERINŢĂ

pentru soi de plante

Nr. 564.2

Cultura HRIŞCĂ DE SAHALIN

Soiul GIGANT

este eliberată în corespundere cu Hotărîrea Consiliului Naţional pentru Soiurile de Plante în temeiul Legii privind protecţia soiurilor de plante Nr. 39-XVI/2008

la cererea Nr. 2492628 *din* 18/02/2011

Solicitantul(ţii) Grădina Botanică (Institut) a Academiei de Ştiinţe a Moldovei

Autorul(rii) Victor ŢÎŢEI, A.Teleuţă

Soiul este inclus în Registrul Soiurilor de Plante al Republicii Moldova în anul 2012

Preşedinte Mihail Machidon

REPUBLICA MOLDOVA
Agenţia de Stat pentru Proprietatea Intelectuală

BREVET
PENTRU
SOI DE PLANTĂ
Nr. 207

Eliberat în temeiul Legii nr. 39/2008 privind protecţia soiurilor de plante

Denumirea comună: HRIŞCĂ DE SAHALIN
Taxonul botanic: *Polygonum sachalinense F.Schmidt*
Denumirea soiului: GIGANT
Titular: GRĂDINA BOTANICĂ (INSTITUT) A ACADEMIEI DE ŞTIINŢE A MOLDOVEI, MD
Data acordării: 2016.05.31

Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă

Director General

CHIŞINĂU

28-40 thousand seedling plants/ha

The potential biomass yields 7.75-8.04 kg/m^2 GM or 3.65-3.95 kg/m^2 DM. Tardive source of pollen and nectar for bees (August-September)- 30-60 kg/ha of honey.

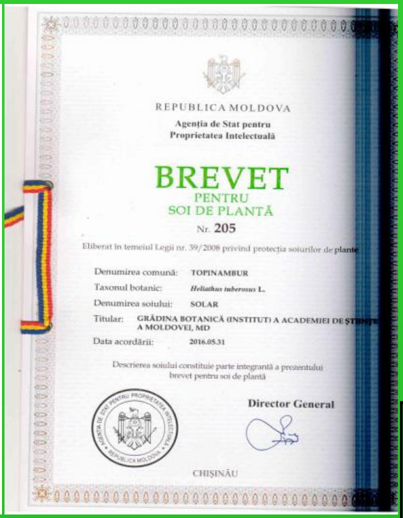
Indices	Giant knotweed *Polygonum sachalinense*		Maize *Zea mays*	
	green mass	silage	green mass	silage
Organic dry matter (ODM), g/kg	924.7	919.9	954.5	957.4
Digestible ODM , g/kg	597.7	574.9	673.3	695.6
Digestible proteins, g/kg	133.4	120.9	41.5	34.6
Digestible fats, g/kg	21.2	17.0	17.4	23.3
Digestible carbohydrates, g/kg	443.1	437.0	614.4	637.7
Biogas, l/kg ODM	460	451	536	557
Biomethane, l/kg ODM	251	246	278	292
Methane, %	54.6	54.6	51.9	52.4
Methane production, m3/ha	4850	4000	3296	3127

Characteristics of the dry mass cv. *Gigant* Polygonum sachalinense

Indices	Giant knotweed *Polygonum sachalinense*	wheat straw *Triticum aestivum*
Humidity of the stems December, %	23	10
Humidity of the stems January, %	18	9
Humidity of the stems March, %	13	9
Bulk density of the chopped stems, kg/ m^3	288	163
Gross calorific value, MJ / kg	19.3	17.0
Density of briquettes, kg/ m^3	832	704
Density of pelettes, kg/ m^3	1030	1007
Ash of briquettes, %	1.5	5.1
Potential of energy production, GJ/ha	435	65
- *equivalent coal, t*	16	1.8
- *equivalent to conventional oil, t*	11	1.5
Theoretical ethanol potential, *L/t*	557	513

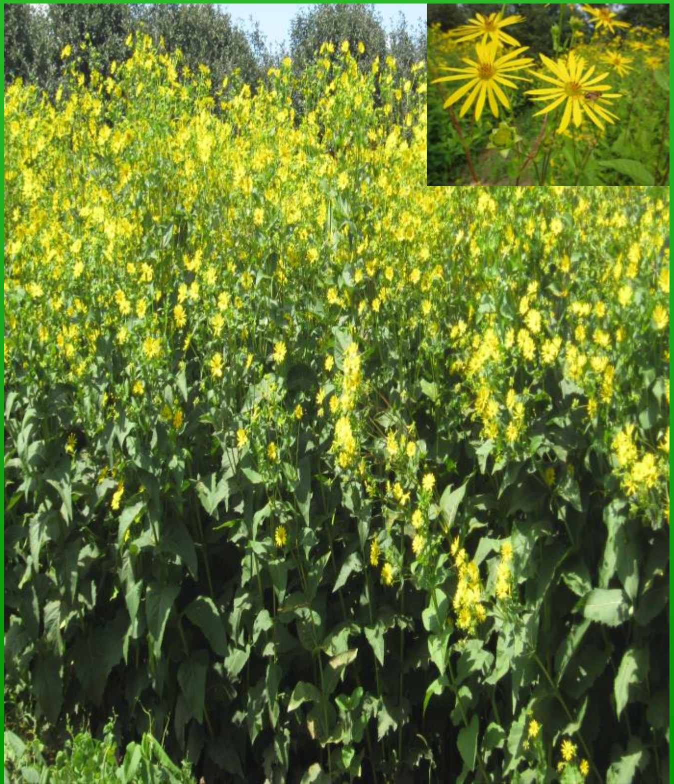
Agro-biological characteristics of the cv. *Vital Silphium perfoliatum*


REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINŢĂ
pentru soi de plante
Nr. 563.2
Cultura SILFIE
Soiul VITAL
Solicitantul(ţii) Grădina Botanică (Institut) a Academiei de Ştiinţe a Moldovei
Preşedinte Mihail Machidon


REPUBLICA MOLDOVA
Agenţia de Stat pentru Proprietatea Intelectuală
BREVET
PENTRU
SOI DE PLANTĂ
Nr. 205
Eliberat în temeiul Legii nr. 39/2008 privind protecţia soiurilor de plante
Denumirea comună: TOPINAMBUR
Taxonul botanic: Helianthus tuberosus L.
Denumirea soiului: SOLAR
Titular: GRĂDINA BOTANICĂ (INSTITUT) A ACADEMIEI DE ŞTIINŢE A MOLDOVEI, MD
Data acordării: 2016.05.31
Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă
Director General
CHIŞINĂU

5-10 kg/ha seeds incorporated at a depth 3-5 cm are necessary, sowing period April or 28-40 thousand seedling plants/ha. The potential biomass yields 8.09-14.21kg/m2 GM with 15-25% DM, 36-51% leaves. Medium source of pollen and nectar for bees (June-September)- 120-140 kg/ha of honey.

Indices	Cup plant *Silphium perfoliatum*		Maize *Zea mays*	
	green mass	silage	green mass	silage
Organic dry matter, g/kg	892.0	893.6	954.5	957.4
Digestible ODM , g/kg	672.8	711.3	673.3	695.6
Digestible proteins, g/kg	50.6	48.4	41.5	34.6
Digestible fats, g/kg	10.5	13.9	17.4	23.3
Digestible carbohydrates, g/kg	611.7	531.3	614.4	637.7
Biogas, l/kg ODM	532	471	536	557
Biomethane, l/kg ODM	275	245	278	292
Methane, %	51.7	52.4	51.9	52.4
Methane production, m3/ha	4235	3675	3296	3127



Characteristics of the dry mass cv. *Vital* Silphium perfoliatum

Indices	Cup plant *Silphium perfoliatum*	Wheat straw *Triticum aestivum*
Humidity of the stems December, %	25	10
Humidity of the stems January, %	20	9
Humidity of the stems March, %	14	9
Bulk density of the chopped stems, kg/m^3	241	163
Gross calorific value, MJ / kg	18.3	17.0
Density of briquettes, kg/ m^3	949	704
Density of pelettes, kg/ m^3	1038	1007
Ash of briquettes, %	3.0	5.1
Potential of energy production, GJ/ha	380	65
- *equivalent coal, t*	14	1.8
- *equivalent to conventional oil, t*	10	1.5
Theoretical ethanol potential, *L/t*	562	513

Agro-biological characteristics of the cv. Energo *Sida hermaphrodita*

REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE

ADEVERINȚĂ

pentru soi de plante

Nr. 626.2

Cultura NALBĂ DE VIRGINIA (Sida hermaphrodita Rusby L.)

Soiul ENERGO

este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008

la cererea Nr. [illegible] *din* 21.02.2013

Solicitantul(ții) Grădina Botanică (Institut) a Academiei de Științe a Moldovei

Autorul(rii) [illegible]

Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2014

Președinte Mihail Machidon

REPUBLICA MOLDOVA

Agenția de Stat pentru Proprietatea Intelectuală

BREVET
PENTRU
SOI DE PLANTĂ

Nr. 204

Eliberat în temeiul Legii nr. 39/2008 privind protecția soiurilor de plante

Denumirea comună: NALBĂ DE VIRGINIA

Taxonul botanic: *Sida hermaphrodita Rusby*

Denumirea soiului: ENERGO

Titular: GRĂDINA BOTANICĂ (INSTITUT) A ACADEMIEI DE ȘTIINȚE A MOLDOVEI, MD

Data acordării: 2016.05.31

Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă

Director General

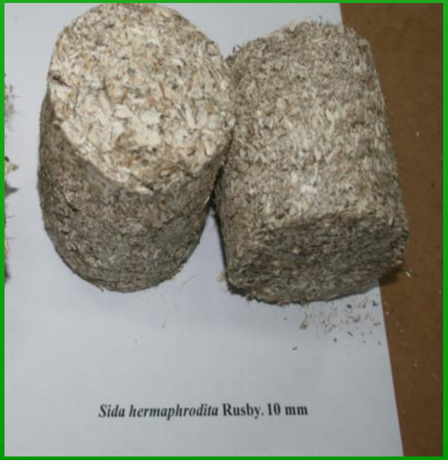
CHIȘINĂU

3-5 kg/ha seeds incorporated at a depth of 2-3 cm sowing period March -April or 28-40 thousand seedling plants/ha. The potential biomass yields 5.56-8.03 kg/m^2 GM or 1.81-2.35 kg/m^2 DM with 54.3-57.5% leaves. Medium-late source of pollen and nectar for bees (July-September)- 80-120 kg/ha of honey.

Indices	Virginia mallow *Sida hermaphrodita*		Maize *Zea mays*	
	green mass	silage	green mass	silage
Organic dry matter, g/kg	926.9	912.3	954.5	957.4
Digestible ODM , g/kg	577.0	579.3	673.3	695.6
Digestible proteins, g/kg	95.4	75.6	41.5	34.6
Digestible fats, g/kg	15.1	14.4	17.4	23.3
Digestible carbohydrates, g/kg	466.5	489.3	614.4	637.7
Biogas, l/kg ODM	454	458	536	557
Biomethane, l/kg ODM	244	243	278	292
Methane, %	53.7	53.1	51.9	52.4
Methane production, m3/ha	4050	4000	3296	3127

Characteristics of the dry mass cv. Energo Sida hermaphrodita

Indices	Virginia mallow *Sida hermaphrodita*	wheat straw *Triticum aestivum*
Humidity of the stems December, %	17	10
Humidity of the stems January, %	13	9
Humidity of the stems March, %	9	9
Bulk density of the chopped stems, kg/ m^3	268	163
Gross calorific value, MJ / kg	18.7	17.0
Density of briquettes, kg/ m^3	1162	704
Density of pelettes, kg/ m^3	870	1007
Ash of briquettes, %	1.5	5.1
Potential of energy production, GJ/ha	350	65
- *equivalent coal, t*	13	1.8
- *equivalent to conventional oil, t*	9	1.5
Theoretical ethanol potential, *L/t.*	614	513



Agro-biological characteristics of the cv. Melifera *Phacelia tanacetifolia*


REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINȚĂ
pentru soi de plante
Nr.
Cultura
Soiul MELIFERA
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
la cererea Nr. din
Solicitantul(ții)
Autorul(rii)
Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul
Președinte Mihail Machidon


REPUBLICA MOLDOVA
Agenția de Stat pentru Proprietatea Intelectuală
BREVET
PENTRU
SOI DE PLANTĂ
Nr. 208
Eliberat în temeiul Legii nr. 39/2008 privind protecția soiurilor de plante
Denumirea comună: FACELIA
Taxonul botanic: Phacelia tanacetifolia Benth.
Denumirea soiului: MELIFERA
Titular: GRĂDINA BOTANICĂ (INSTITUT) A ACADEMIEI DE ȘTIINȚE A MOLDOVEI, MD
Data acordării: 2016.05.31
Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă
Director General
CHIȘINĂU

6-10 kg/ha seeds incorporated at a depth of 2-3 cm sowing period March –July. Green mass yield varied from 31 t/ha (mowed in early May) to 51.4 t/ha (mowed in end June), leaf content from 65 to 54 % respectively, and the incorporation of phacelia green mass into the soil contributed to the increase of the amount of organic matter from 3.1 t/ha to 8.1 t/ha, contributed to the increase of the amount of nutrients from 458.6 kg/ha (in May) to 1028.1 kg/ha (in June), including 126 to 182 kg/ha N, 34 to 37 kg/ha P, 11.8 to 27.4 kg/ha Mg, 140.6 to 353.0 kg/ha K, 144.4 to 419.0 kg/ha Ca, respectively.

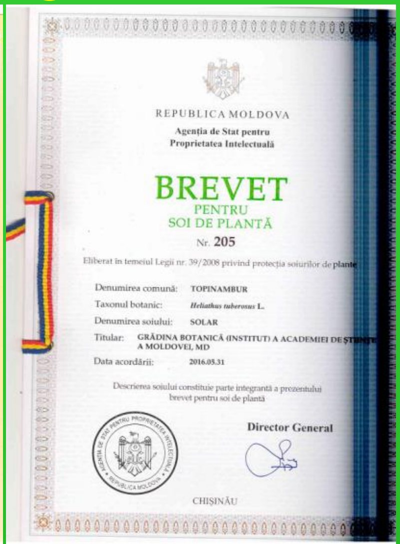
This cultivar is a source of pollen and nectar for bees, available for 40-50 days, and makes it possible to obtain 400-780 kg/ha of honey

Indices	*Phacelia tanacetifolia*		*Medicago sativa* 1st cut
	Early flowering	Full flowering	
Organic matter, g/kg	827.0	866.0	919.9
Digestible organic matter, g/kg	506.7	529.0	584.7
Digestible protein, g/kg	140.3	80.9	129.8
Digestible fats, g/kg	10.5	18.1	10.6
Digestible carbohydrates, g/kg	355.9	430.0	444.3
Ratio carbon and nitrogen	14	24	19
Biogas, l/kg organic matter	392	419	454
Biomethane, l/kg organic matter	217	225	248
Methane, % biogas	55.7	53.7	54.6
Methane productivity, m^3/ha	803	2160	2034

Indices	*Triticum aestivum*	*Phacelia tanacetifolia*
ash content of biomass, %	4.93	2.76
gross calorific value of biomass, MJ/kg	17.4	18.4
bulk density of chopped biomass,	79	93
kg/m^3	90	118
bulk density of milled biomass, kg/m^3	740	916
specific density of briquettes, kg/m^3	407	498
bulk density of briquettes, kg/m^3		

Agro-biological characteristics of the cv. Solar *Helianthus tuberosus*


REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINȚĂ
pentru soi de plante
Nr.
Cultura TOPINAMBUR (Helianthus tuberosus L.)
Soiul SOLAR
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
la cererea Nr. din 21.02.2013
Solicitantul(ții) Grădina Botanică (Institut) a Academiei de Științe a Moldovei
Autorul(rii)
Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2014
Președinte Mihail Machidon


REPUBLICA MOLDOVA
Agenția de Stat pentru Proprietatea Intelectuală
BREVET
PENTRU
SOI DE PLANTĂ
Nr. 205
Eliberat în temeiul Legii nr. 39/2008 privind protecția soiurilor de plante
Denumirea comună: TOPINAMBUR
Taxonul botanic: Heliathus tuberosus L.
Denumirea soiului: SOLAR
Titular: GRĂDINA BOTANICĂ (INSTITUT) A ACADEMIEI DE ȘTIINȚE A MOLDOVEI, MD
Data acordării: 2016.05.31
Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă
Director General
CHIȘINĂU

40-60 thousand tubers /ha incorporated at a depth 8-10 cm are necessary, planting period April

Indices	Jerusalem artichoke *Helianthus tuberosus* L.		Maize *Zea mays* L	
	green mass	silage	green mass	silage
Organic dry matter , g/kg	905.8	886.3	954.5	957.4
Digestible ODM , g/kg	585.1	552.1	673.3	695.6
Digestible proteins, g/kg	52.1	75.1	41.5	34.6
Digestible fats, g/kg	11.4	14.4	17.4	23.3
Digestible carbohydrates, g/kg	521.6	462.6	614.4	637.7
Biogas, l/kg ODM	463	436	536	557
Biomethane, l/kg ODM	241	232	278	292
Methane, %	52.1	53.2	51.9	52.4
Methane production, m3/ha	5300	4988	3296	3127

Characteristics of the dry mass cv. Solar *Helianthus tuberosus* L.

Indices	Jerusalem artichoke Helianthus tuberosus L.	wheat straw *Triticum aestivum*
Humidity of the stems December, %	23	10
Humidity of the stems January, %	20	9
Humidity of the stems March, %	13	9
Bulk density of the chopped stems, kg/ m^3	280	163
Gross calorific value, MJ / kg	18.6	17.0
Density of briquettes, kg/ m^3	722	704
Density of pelettes, kg/ m^3	844	1007
Ash, %	1.9	5.1
Potential of energy production, GJ/ha	465	65
- *equivalent coal, t*	17	1.8
- *equivalent to conventional oil, t*	12	1.5
Theoretical ethanol potential, *L/t*	598	513

Agro-biological characteristics of the cv. Titan *Miscanthus x giganteus*


REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINȚĂ
pentru soi de plante
Cultura
Soiul Titan
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
Solicitantul(ții)
Autorul(rii)
Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2021
Președinte Tabacari Ruslan


REPUBLICA MOLDOVA
Agenția de Stat pentru Proprietatea Intelectuală
BREVET
PENTRU SOI DE PLANTĂ
Nr. 348
Eliberat în temeiul Legii nr. 39/2008 privind protecția soiurilor de plante
Denumirea comună: MISCANT GIGANT
Taxonul botanic:
Denumirea soiului: TITAN
Titular: GRĂDINA BOTANICĂ NAȚIONALĂ (INSTITUT) "Alexandru Ciubotaru", MD
Data acordării: 2020.04.30
Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă
Director General
CHIȘINĂU

10-20 thousand rhizomes /ha incorporated at a depth 8-10 cm are necessary, planting period April-May

Indices	Giant miscanthus *Miscanthus x giganteus*		Maize *Zea mays* L	
	Green mass	silage	Green mass	silage
Organic dry matter , g/kg	938.3	919.0	954.5	957.4
Digestible ODM , g/kg	507.3	495.3	673.3	695.6
Digestible proteins, g/kg	29.2	37.8	41.5	34.6
Digestible fats, g/kg	8.3	10.3	17.4	23.3
Digestible carbohydrates, g/kg	469.8	448.2	614.4	637.7
Biogas, l/kg ODM	402	393	536	557
Biomethane, l/kg ODM	207	204	278	292
Methane, %	51.5	52.0	51.9	52.4
Methane production, m3/ha	4968	4500	3296	3127

Characteristics of the dry mass of cv. Titan *Miscanthus x giganteus*

Indices	Giant miscanthus *Miscanthus x giganteus*	wheat straw *Triticum aestivum*
Humidity of the stems December, %	42	10
Humidity of the stems January, %	27	9
Humidity of the stems March, %	11	9
Bulk density of the chopped stems, kg/ m^3	198	163
Gross calorific value, MJ / kg	19.8	17.0
Density of briquettes, kg/ m^3	882	704
Density of pelettes, kg/ m^3	1262	1007
Ash, %	2.2	5.1
Potential of energy production, GJ/ha	515	65
- *equivalent coal, t*	19	1.8
- *equivalent to conventional oil, t*	12.9	1.5
Theoretical ethanol potential, *L/t*	610	513

Agro-biological and energy biomass characteristics of the cv. Argintina *Sorghum almum*


REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINȚĂ
pentru soi de plante
Nr.788.1
Cultura Sorg peren (Sorghum almum Parodi)
Soiul Argentina
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
la cererea Nr.: 574504 din 20.07.2018
Solicitantul(ții) Grădina Botanică Națională (Institut) "Alexandru Ciubotaru"
Autorul(rii) Victor Țîței, Alexandru Teleuță
Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2021
Președinte Tabacari Ruslan


REPUBLICA MOLDOVA
Agenția de Stat pentru Proprietatea Intelectuală
BREVET
PENTRU
SOI DE PLANTĂ
Nr. 344
Eliberat în temeiul Legii nr. 39/2008 privind protecția soiurilor de plante

Denumirea comună: SORG PEREN
Taxonul botanic: *Sorghum almum* Parodi
Denumirea soiului: ARGENTINA
Titular: GRĂDINA BOTANICĂ NAȚIONALĂ (INSTITUT) "Alexandru Ciubotaru", MD
Data acordării: 2020.04.30

Descrierea soiului constituie parte integrantă a prezentului brevet pentru soi de plantă
Director General
CHIȘINĂU

10-25 kg/ha seeds incorporated at a depth of 3-4 cm and 30-45 cm between rows are needed.The yield, depending on age and manner of exploitation of the plantation, is about 11-15 t/ha. The bulk density of the biomass is of 118-133 kg/m3, the gross calorific value reaches 18.6 MJ/kg.
The density of the briquettes is 700 kg/ m3. The ash content absolutely dry mass is 3.7%.

Agro-biological and energy biomass characteristics of the cv. Ileana Inula helenium L.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COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE
ADEVERINȚĂ
pentru soi de plante
Nr. 790.1
Cultura [illegible]
Soiul Ileana
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
la cererea Nr.[illegible] din 19.02.2019
Solicitantul(ții) [illegible]
Autorul(rii) Victor Țîței
Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2021
Președinte Tabacari Ruslan

6-10 kg/ha seeds incorporated at a depth of 2-3 cm are necessary, sowing period April or 40-50 thousand seedling plants/ha. The potential biomass yields 4.61-5.23 kg/m^2 GM or 1.18-1.35 kg/m^2 DM with 300 L/kg biomethane potential. Tardive source of pollen and nectar for bees (June-July)- 60-120 kg/ha of honey.

Agro-biological and energy biomass characteristics of the cv. Vigor *Astragalus galegiformis*

REPUBLICA MOLDOVA
COMISIA DE STAT PENTRU TESTAREA SOIURILOR DE PLANTE

ADEVERINȚĂ
pentru soi de plante
Nr. 789.1

Cultura Astragal galegafolia(Astragalus galegiformis L.)
Soiul Vigor
este eliberată în corespundere cu Decizia Comisiei de Stat pentru Testarea Soiurilor de Plante în temeiul Legii privind protecția soiurilor de plante Nr.39-XVI/2008
la cererea Nr. 2584629 *din* 19.02.2019

Solicitantul(ții) Grădina Botanică Națională (Institut) "Alexandru Ciubotaru"
Autorul(rii) Victor Țîței

Soiul este inclus în Catalogul Soiurilor de Plante al Republicii Moldova în anul 2021

Președinte Tabacari Ruslan

8-10 kg/ha scarified seeds incorporated at a depth of 3-4 cm and 30-45 cm between rows are needed.
The potential biomass yields 5.56-6.63 kg/m2 GM or 1.05-1.21 kg/m2 DM with 337 L/kg methane potential.
Early-medium source of pollen and nectar for bees (May-June), 200-300kg/ha of honey.

SOLID BIOFUELS	
Dry biomass potential, t/ha	10-15
Humidity of the stems,%	**17**
Bulk density of biomas, kg/ m³	**268**
Heat capacity, MJ / kg	**18.7**
Density of briquettes, kg/ m³	**870**
Ash of briquettes,%	**3.3**
Potential bioenergy, GJ/ha	**268**
Theoretical ethanol potential, *L/t*	**598**

The new cultivar 'Mihaela' of plume poppy *Macleaya cordata*

Energy stem dry biomass for solid biofuel - briquettes with specific density 780-830 kg/m3 and pellets—960-975 kg/m3, with gross calorific value 18.8-19.1 MJ/kg and 1.5-2.0% ash, as well as utilized as a substrate to obtain cellulosic ethanol with a potential of 533 l/t.

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Macleaya cordata (Willd.) R.Br.

Carbohydrates concentrations and theoretical ethanol potential from biomass of the studied species

Indices	Wheat straw	Maize	Virginia mallow	Cup plant	Giant knotweed	Jerusalem artichoke	*Miscanthus giganteus*
Cellulose, g/kg	430	417	535	482	511	548	557
Hemicellulose, g/kg	277	250	307	292	256	276	283
Hexose carbohydrates,g/kg	77.66	75.09	96.17	86.83	91.4	98.04	99.68
Pentose carbohydrates,g/kg	45.56	41.12	51.07	48.03	42.10	45.39	46.55
Ethanol potential, l/t	513.8	484.6	614.0	562.4	556.7	598	609.8
Theoretical ethanol yield,l/ha	1950	2420	11670	11800	12800	14900	15850

COLLECTION OF ENERGY PLANTS SPECIES OF THE BOTANICAL GARDEN (INSTITUTE)

ŢÎŢEI, V.; ROȘCA, I. *Bunele practici de utilizare a terenurilor degradate în cultivarea culturilor cu potenţial de biomasă energetică*: Ghid practic pentru producătorii agricoli. Chişinău: S. n., 2021 (Tipogr."Bons Offices"). – 80 p. ISBN 978-9975-87-778-7 https://www.ucipifad.md/wp-content/uploads/2018/12/Bunele-practici-de-utilizare-a-terenurilor-degradate-%C3%AEn-cultivarea-culturilor-cu-poten%C5%A3ial-de-biomas%C4%83-energetic%C4%83.pdf

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"Mobilization of plant genetic resources, plant breeding and use as forage, melliferous and energy crops in bioeconomy"

Thank you for your attention!

Mulțumesc pentru atenție!

Vă invităm să vizitaţi Grădina Botanică Naţională (Institut) „Alexandru Ciubotaru", Chișinău

http://gbni.md