RESEARCHES ON THE CHEMICAL COMPOSITION OF SOME CEREALS GROWN IN THE MOLDOVA REGION FOR THE OBTAINING OF BIO-ETHANOL

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Abstract

In the hereby work, one presents a range of research concerning the chemical composition of some types of cereals: wheat, barley, two-row barley grown in the research station in Secuieni, Neamt. In the introduction one presents the soil and climate conditions for the region of Moldova. One also presents the main morphological, physiological and production features recommended for the growing of such cereals. The work also includes the chemical analyses for the types of cereals that are grown in large areas. Based on their chemical composition, especially on the starch content, one makes recommendations regarding the growing of theses cereals and their use in obtaining bio-ethanol from those cereals that contain great amounts of starch.

Keywords: *cereals, starch, bio-ethanol, soil, climate*

Introduction

From the geo-morphological point of view, Moldova has a great variety of geographical features, ranging from waterside: Siret to the Carpathians. The varied geographical features, the different kinds of rocks, the climate in this region have influenced the diversity of cereals.

In the hillside there are brown soils and in the low regions there are the chernosem soils, whereas in the area of watersides the main type of soil that is encountered is the alluvial one.

These types of soils are characterized by a low nitrogen level, middle phosphorous level and a good level of potassium. As far as the climate is concerned one can mention the continental type characterized by short springs, cool summers and cold winters.The average annual temperature is 8.5 ^{o}C. The coldest month of the year is January with an average temperature of -4.2 ^{o}C and the hottest is July with an average temperature of 19.6 ^{o}C.

In the hereby geographical and climate conditions it is recommended to grow the next following kinds of cereals:

Autumn wheat

FUNDULEA 4

Type created at I.C.D.A Fundulea and approved in 1987.

Morphological features: long ear, aristae, white cylindrical, having 15-20 ears. The plant is semi-short ranging from 80-90 centimeters. The grain is big, oval, red and has MMB: 41-45 g.

Physiological features: it is a semi late kind of cereal, drop resistant, middle resistant in winter conditions and during the period when the grain gets filled.

Baking quality: average.

Production capacity: 8-9 t/ ha with the recommendation of it being grown on fertile and humid soils.

Agro-technical requirements: sowing: 500-600 grains/ m, short coleoptiles demanding a very good preparation of the germination conditions. The seeds must be at 3-4 cm bellow ground level.

FLAMURA 85

Type created at I.C.D.A Fundulea and approved in 1989

Morphological features: semi short: 80-90 cm, middle aristae ears, white, and 16-18 ears. The grain is big oval, red and has MMB: 42-45 g.

Physiological features: drop resistant kind of cereal, resistant through winter and drought conditions.

Baking quality: very good.

Production capacity: 6-8.5 t/ha

Agro-technical requirements: low uniting capacity, 550-600 seeds/m for sowing, short coleoptiles demanding a very good preparation of the germination conditions. The seeds must be at 3-4 cm bellow ground level. It produces great quantities, should it be fertilized with nitrogen and phosphorous.

ARIESAN

Type created by S.C.D.A Turda and approved in 1985.

Morphological features: red aristae ears, cylindrical, 8-10 cm long, 16-22 ears. The grain is red, oval and has MMB: 42-46 g

Physiological features: middle drop winter resistant. The baking quality is middle.

Production capacity: 6-9 t/ha

Agro-technical requirements: Middle uniting capacities, 500-550 grains per m, long coleoptiles, 5-6 cm bellow ground level for sowing. Being a tall cereal, it needs fertilizers to prevent it from breaking to the ground.

DROPIA

Type created at I.C.D.A Fundulea and approved in 1993

Morphological features: middle height -87.5 cm, great ear, fusiform, aristae. It is white.

The grain is red, oval and has MMB: 44-48 g

Physiological features: resistant through winter, drop resistant, middle resistant to red robin. Baking quality is good, being one of the most favored cereals in this region.

Production capacity: 6-7 t/ha

CRINA

Type created at I.C.D.A Fundulea and approved in 2001

Morphological features: 81 cm tall, white ears pyramid shaped. As far as the density is concerned it is middle. The grain is big, long shaped, red and has MMB: 43 g.

Physiological features: drop resistant, middle resistant to red robin.

Baking quality: good and very good.

Production capacity: 5.8-6 t/ha

Autumn barley

MADALIN

Type created at I.C.D.A Fundulea and approved in 1995

Morphological features: 94-106 cm tall, 7-9 long ears. Middle sized grain with MMB: 36-47g

Physiological features: middle resistant to winter conditions and to dropping. It is middle resistant to the flying smut and to the yellowing virus as well as to the tearing of leaves.

Production capacity: 5.3-6.3 t/ha

ORIZONT

Type created at I.C.D.A Fundulea and approved in 1996

Morphological features: aristae ears, pigmented tips of the aristae. At maturity the ear is curved. The aristae are longer than the ear and they are crenated.

The grain is porosity free, and the front part has long filaments. MMB: 41-45g

Physiological features: drought resistant, middle resistant to winter conditions and to dropping. It is middle resistant to diseases, being sensitive to flying smug, viruses, and reticular staining.

Production capacity: 6 t/ha

Spring and autumn two-row barley

ANDRA

Type created at I.C.D.A Fundulea and approved in 1994
Morphological features: 100 cm tall, middle sized ear, easily curved port at maturity, bigger grain with MMB: 45-48 g.
Physiological features: good resistance to drought, middle resistant to dropping, winter, flying smug and leaf tearing.
Vegetation period: 211-250 days
Production capacity: 5-5.4 t/ha.

MARIA

Type created at S.C.D.A Fundulea and approved in 1998
Morphological features: 72±5.7 cm tall. Big, dense, semi-bent two row ears, maturity colour: yellow, golden, MMB: 42 g
Physiological features: resistant to dropping, middle resistant to drought. This type of two-row barley is resistant to leaf tearing and brown red robin and middle resistant to reticular brown staining.
Production capacity: good, with an average of 3986 kg/ha within a three year period.

Oat

SOMESAN

Spring type oat created at S.C.D.A. Turda and approved in 1988
Morphological features: 90-100 cm tall, non aristae yellow panicle, MMB: 31-38 g. The shape of the plant is semierect.
Physiological features: resistant to dropping and drought, to black robin
Production capacity: 5000-5490 kg/ha.

MURES

Spring type oat created at S.C.D.A. Turda and approved in 1991
Morphological features: 111 cm tall, non aristae yellow panicle, MMB: 32 g.
Physiological features: well resistant to dropping and very well resistant to oat diseases, especially to Pseudomonas coronafaciens. It has a high content of protein (16.18 %).
Production capacity: 5920 kg/ha.

Corn

TURDA MOLD

Three-line hybrid created at S.C.D.A. Turda and approved in 2001
Precocity group: FAO 290
Morphological features: 209 cm tall, the height of insertion of the corn cob is 69 cm. Yellow tooth-like grains, MMB: 277 g, with an output of 78.2 %.

Physiological features: good resistance to low temperatures, and also to the dropping of plants at maturity. It is drought tolerant, middle resistant to the breaking of the plant.
Production capacity: 11000 kg/ha STAS grains.

TURDA FAVORIT

Simple hybrid created at S.C.D.A. Turda and approved in 2001
Precocity group: FAO 380
Morphological features: 200 cm tall, the height of insertion of the corn cob is 74 cm. Yellow-golden semi tooth-like grains, MMB: 309 g with an output of 79.8%.
Physiological features: high resistance to low temperatures during the first period of vegetation as well as to the breaking of the plant at maturity. Good tolerance to drought
Production capacity: 11000-1200 kg/ ha STAS grains.

ELAN

Three line hybrid created at S.C.D.A. Turda and approved in 1992
Precocity group: FAO 280
Morphological features: up to 220 cm tall, 75 cm insertion height of the cob. Grains are yellow-golden semi tooth-like, MMB: 270-330g with an output of 82 %.
Physiological features: high resistance to low temperatures during the first period of vegetation, good resistance to drought and to dropping grains.
Production capacity: 1200 kg/ ha STAS grains

TURDA 200 PLUS

Three-line hybrid created at S.C.D.A. Turda and approved in 1996
Precocity group: FAO 270
Morphological features: 170-180 cm tall, 80 cm insertion height of the cob. Grains are yellow semi tooth-like, MMB: 270-300 g with an output of 81 %.
Physiological features: good resistance to drought and to dropping grains.
Production capacity: up to 12000 kg/ha STAS grains. It is highly stable, thus obtaining a good output even in drought conditions.

TURDA SUPER

Three-line hybrid created at S.C.D.A. Turda and approved in 1996
Precocity group: FAO 320
Morphological features: 200 cm tall, 70 cm insertion height of the cob. The grain is yellow orange, MMB: 270-300 g with an output of 80 %.
Physiological features: good to middle resistant to drought. Good resistance to dropping and to breaking. It is middle resistant to diseases.
Production capacity: up to 10000 kg/ha STAS grains.

Experimental

One used samples of cereals grown at the Research Station in Secuieni, Neamt:

- Dropia Wheat
- Arieşan Wheat
- Flamura 85 Wheat
- Gruia Wheat
- Crina Wheat
- Triticale Haiduc
- Mădalin Barley
- Capriana two-row barley
- Andra autumn two-row barley
- Mureş Oat

For each sample one noted the following parameters:

- Humid gluten content, %
- Humidity content, %
- Protein content, %
- Starch content, %
- Zeleny parameter, ml.

The determinations were performed with OmegAnalyzerGrain. apparatus.

Results and Discussions

The results are presented in the following tables: 1,2,3.

Table 1: Chemical composition of wheat types analyzed

Sample	Humid gluten content, %	Humidity content,, %	Protein content, %	Starch content, %	Zeleny parameter, ml
Arieşan Wheat	19,72	12,09	11,38	53,34	38,83
Flamura 85 Wheat	32,07	11,50	15,28	49,02	69,47
Gruia Wheat	19,47	12,13	11,00	53,16	41,98
Dropia Wheat	21,57	12,10	11,95	53,24	38,44
Crina Wheat	31,44	12,16	15,91	48,04	76,32

Table 2: Chemical composition of barley and two-row barley types analyzed

Sample	Humid gluten content, %	Humidity content,, %	Protein content, %	Starch content, %	Zeleny parameter, ml
Mădălin Barley	-	11,96	12,49	59,78	-
Andra two-row barley	-	11,94	11,41	59,92	-
Capriana two-row barley	-	11,60	17,38	56,33	-

Table 3: Chemical composition of oat and triticale types analyzed

Sample	Humid gluten content, %	Humidity content,, %	Protein content, %	Starch content, %	Zeleny parameter, ml
Mureş Oat	-	11,95	16,18	53,21	-
Triticale Haiduc	23,69	12,23	11,18	52,27	42,69

Conclusions

Of the five types of cereals that were analyzed, the one having the greatest amount of starch is: the Ariesan type 53.34%, the Dropia 53.24%, the Gruia 53.16%. These types of cereals are highly recommended for the production of bio-ethanol. These recommendations take into account the production in t/ha too. Thus the Ariesan has a production that is larger than 6-9 t/ha and the Gruia one has a production of about 6-7t/ha.
The other types of cereals have reduced content: 48.04% and 49.02% (Crina and Flamura 85).

Of the types of barley and two-row barley the highest content of starch is to be found in the Andra type 59.92% and Madalin with 59.78%. Theses are the types recommended for the bio-ethanol production. These recommendations take into account the production in t/ha too, thus Madalin=7t/ha and Andra 5-5.5 t/ha. The Capriana has a reduced content of starch 56.33%.

The Haiduc and Mures types also have reduced levels of starch 52.27% and 53.21%, thus not being recommended for the production of bio ethanol.

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