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BACKGROUND RESOURCE SAVING TECHNOLOGIES TO PRODUCE HIGH QUALITY RAW MATERIALS FOR BREWING IN UKRAINE

M. D. MELNYCHUK, Doctor of Biological Sciences professor, academician of NAAN of Ukraine
P. U. DROZD, applicant *
National Agriculture University of Ukraine

Annotation:Article deals the modern features of malting barley growing generalization of the new provisions on quantitative and qualitative metrics at all stages of formation materials. Proposed modern structure the main factors that influence the physiological and phyto-sanitary and ecological conditions of each crop barley steppes of Ukraine.

Agrocenosis, malting barley, quality raw materials for brewing, quantity and quality of malting barley, resource saving technologies, system of fertilizers and plant protection, KAC-32

Due to the rapid development of brewing industry in Ukraine there was an urgent need to optimize the basic processes of brewing, from growing barley to malt. Barley (Hordeum sativum L.) on the composition of extractives and their zbrodzhuvanosti more other cereals suitable for brewing malt [5].

In Ukraine barley is second on acreage and gross harvest of grain crops Kolosov after winter wheat. [12] More than half of the gross harvest in Ukraine is used to feed and about 20% for beer production.

Spring Barley grown in Ukraine as food, feed and crops. Its area is 2.5 mln. Ha [17]. According to the statistics in 2012 - 2014 gg., Sown area of barley were about 840 thousand. Ha (Table 1), including more than 117-135 thousand. Ha area is occupied by malting barley. [4] In some years the largest barley sowing areas in the territory of the forest-steppe characterized Vinnytsia (138.6 thousand. Ha), Poltava (112.6 thousand. Ha) and Khmelnytsky (102.8 thousand. Ha) area. However, the highest yield of spring barley installed in Vinnitsa (3.45 t / ha), Kiev (3.22 t / ha), Cherkassy (3.71 t / ha) and Ternopil (3.18 t / ha) areas.

** Supervisor Doctor of Biological Sciences, Professor, Academician of NAAS of Ukraine Melnychuk MD*

1. 1. acreage and yield of malting barley in the steppes of Ukraine (2012 - 2014.) State Statistics Committee of Ukraine

№	Region	Barley sown area, ths. ha		Yield, t / ha	
		Spring	Winter	Spring	Winter
1	Vinnitsa	93,2	45,4	3,35	3,55
2	Volyn	27,6	4,7	2,83	3,38
3	Zhytomyr	25,5	3,7	2,53	2,67
4	Kyiv	69,8	8,4	3,22	3,74
5	Poltava	106,3	6,3	2,46	3,46
6	Rivne	40,3	19,6	2,84	3,64
7	Sums	68,8	0,8	2,33	3,27
8	Ternopil	80,6	19,6	3,06	3,29
9	Khmelnytsky	82,1	20,7	2,95	3,26
10	Cherkassy	54,4	26,9	3,04	4,38
11	Chernihiv	31,1	1,4	2,27	2,76

In modern conditions for agricultural development urgent is the development and introduction of quality control methods in agricultural production chain "field - industrial processing."

Despite the fact that Ukraine barley grown in all breweries sufficient for the production of malt quantity, there is a need for high-quality raw materials. The need for the beer industry in product processing barley - malt in 2009 amounted to 260 ths. Tons per year by the end of 2011, due to increasing beer production, it increased to 600 ths. Tons. At that about 15-20% of domestic malt - low-quality raw materials that can be used only for the production of dark beers. According to the current ISO [10] (Table 2) most important requirements to barley used for malt, is good proroschuvanist grain (92-95%), sufficient particle size and vyrivnyuvanist (70-85%) and moderate protein content (not less than 8 and no more than 12%).

An important indicator is also brewing in ekstraktyvnist. Ekstraktyvnist - the sum of all substances barley, expressed as a percentage by weight of dry matter, which go into solution under certain conditions.

This figure depends on the composition of barley, since the solution is transferred almost all weight starch polysaccharides and nekrohmalnyh of 1 / 3-1 / 2 proteins, sugars and other compounds. In malting barley starch content of 60 to 70% dry matter. Especially weak extractive beer is made from barley with reduced krohmalnistyu. This also contributes to the high content of protein, the accumulation is observed inverse correlation with the amount of starch. High protein, on the one hand, prevents loosening of the endosperm and the exclusion of extractives on the other - promotes eclipse beer. Nyzkobilkovi barley (down 8%) contributes to a weak beer foam and flavor incomplete [16].

2. Basic quality requirements for brewing barley

Indicator	Requirements for barley, which is used for brewing	
	1 class	2 class
Color	Light yellow or yellow	Light yellow, yellow or grayish-yellow
Moisture,%, not more	14,5	15,0
Weight of 1000 grains g minimum	40,0	38,0
Mass fraction of protein in terms of absolutely dry matter%, not more	11,0	11,5
Foreign material,%, not more	1,0	2,0
Grain admixture,%, not more	2,0	5,0
Size,%, not less	85,0	70,0
Ability to germinate,%, not less (for grain delivered not earlier than 45 days after harvesting)	95,0	92,0
Viability,%, not less (for grain delivered earlier than 45 days after harvesting)	95,0	95,0
Ekstraktyvnist,%, not less than (set in the agreement (contract) between the supplier and the purchaser)	79,0	77,0
Contamination by pests	Not allowed, except mite infestation than 1 degree	

Production brewing spring barley varieties are concentrated mainly in the steppe regions of Ukraine and regions Woodlands, natural and climatic conditions which allow to receive grain with high technological performance. Based on data from studies conducted in different areas of cultivation of malting barley, the main components of the structure of the factors that affect the quality of harvests crops, highlighted five indicators of significant influence on the physiological, morphological and ecotoxicological state of the plant (Figure 1).

Thus, for the production of malt fit only certain varieties of malting barley. However, its high-quality properties significantly affect environmental conditions (soil, climate, fertilizers, etc.), resulting in areas zoned for certain varieties can not fully show their best quality indicators when grown in other areas. [21] To solve this problem you must use varieties that form high yields of grain and steel brewing of good quality. In Ukraine, along with domestic scientists derived varieties of spring barley is often used as imported varieties. Intensively used varieties Sebastian, Xanadu, Beatrice, Boyos Kang and others [1]. But often varieties do not yield maximum productivity and quality of grain through their nerayonovanist.

List of brewing varieties constantly browsing. In it include new varieties and exclude older who lost their brewing properties. As of 01.14.2015 p. 113 entered in the Register of spring barley varieties, including varieties are also valuable for brewing [8,15].

Table 3 shows the characteristics of some varieties of spring barley that zoned for forest-steppe zone and used in brewing.

As a result of three years of data revealed that the brewery new varieties of domestic breeding not only inferior to brewing qualities, but also dominated imports in terms of adaptability [23].

Brewing grain quality of spring barley is formed by metabolic processes occurring in plants under the influence of environmental factors. Adverse weather conditions (drought or rainy summer) lead to a deterioration of important technological characteristics of malting barley [11] As shown in Figure 1, including the important role played by the climatic conditions [14].

Established that the increase in temperature during grain filling 1 ° C above average results in reduction of yield 4,1-5,7% [2]. Prolonged exposure to freezing temperatures is generally detrimental to the aerial organs, although barley shoots can withstand frost to -3 ... -8 ° C [3].

Found that the optimal conditions for the growth and development of malting barley must meet the following requirements: average temperature 8.5 ° C, average annual rainfall is 560-600 mm, the amount of active temperatures 1700-2200 ° C [13].

Another important factor is the cultivation of the soil. Spring barley belongs to plants with special requirements for cultivation. Soil

for it must be loose, clean of weeds. In dense soils poorly developed root system barley zhovkne leaves, which reduces plant productivity. Barley responds well to water saving cultivation after all precursors [18].

To reduce costs and preserve soil is necessary to change the system of cultivation acreage under spring barley towards its minimization. It has been shown that when growing spring barley after winter crops on a large number of straw in the field (5-7 t / ha) Mulching provides more (0,33-0,51 t / ha) grain yield versus shallow cultivation moldboardless [7].

3. Characteristics of the main varieties of malting barley [11]

Sort	Protein, %	Starch,%	Size of, %	Vigor, %	extractivity, %	The number Kolbaha,%
Sebastian (Denmark)	10,2	54,3	95,8	95,0	81,5	40,1
Galaxies (Ukraine)	11,5	50,6	97,6	98,9	79,4	40,3
Aeneas	11,6	49,9	95,8	95,0	82,5	41,3
(Ukraine)	11,0	53,8	98,5	98,0	78,3	42,6
Fairy (Ukraine)	11,6	54,4	98,4	99,3	78,8	37,2
Southern (Ukraine)	12,1	53,1	93,6	99,9	78,2	38,7
Wonderful (Ukraine)	11,3	55,0	96,0	98,0	77,9	43,4
Hetman (Ukraine)	11,2	53,8	97,4	99,3	79,6	41,0
Commande r (Ukraine)	10,9	53,0	96,0	97,8	80,0	40,5
Universe (Ukraine)	10,8	52,6	97,7	99,7	82,7	45,2
Helios (Ukraine)	11,3	50,2	98,2	96,6	80,4	40,5
Fountain (Ukraine)	10,4	52,8	96,2	98,1	80,0	40,3
Svyatogor (Ukraine)	11,6	52,0	98,0	97,8	80,6	43,2
Voivod (Ukraine)	11,4	53,2	98,0	97,0	78,3	41,2
A specimen (Ukraine)	10,7	52,4	96,6	98,0	80,7	43,3
Etiquette (Ukraine)	11,7	53,4	98,4	99,0	79,7	45,5
Call (Ukraine)	11,3	52,0	98,2	98,2	78,9	34,5
Aspect (Ukraine)	11,3	54,4	98,2	97,6	80,8	48,0
Effect (Ukraine)	11,4	52,7	96,4	96,6	80,2	41,4

Thus the main condition for obtaining high yields is a timely and compliance all technological operations both in growing and during harvest. [22]

The quality malt and brewing system also affects fertilizer, which controls protein content [20].

It was established that the level of productivity and quality of grain of spring barley varieties studied largely dependent on weather conditions as well as doses of mineral fertilizers. [6] It is expedient to note that with increasing doses of mineral fertilizers barley productivity increased, not

deteriorated and brewing quality grain. Prolonged use of by-products predecessor in rotation led to an increase in the yield of spring barley. Reducing the dose of fertilizer to N60P60K60 led to lower yields. [19]

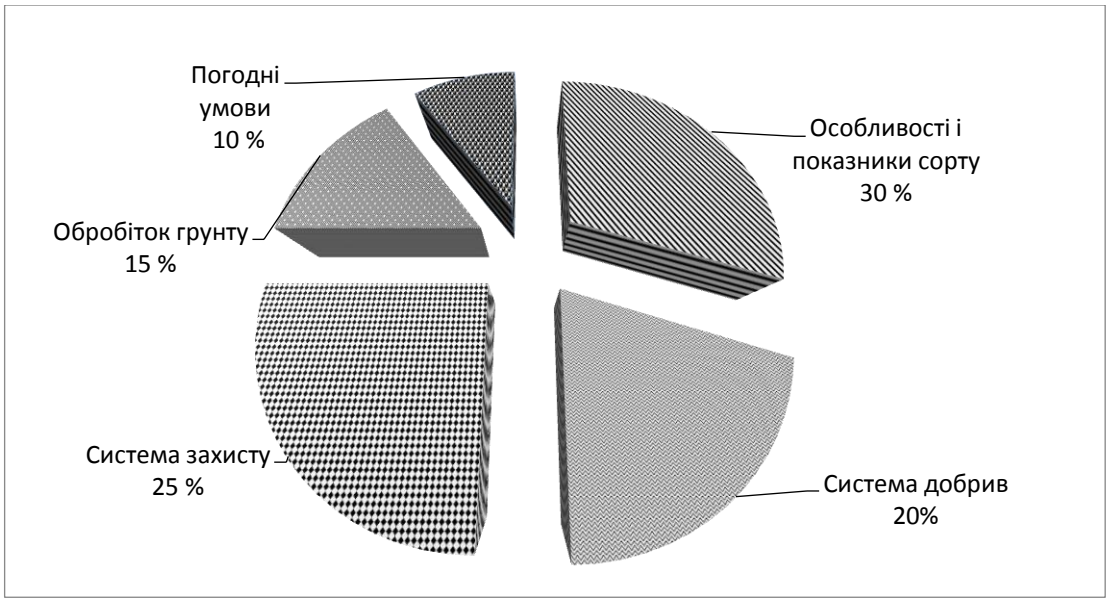

Fig. 1. Structure of the main factors influencing the quantitative and malting barley quality indicators in the steppes of Ukraine (2012 - 2014 years.).

In malting barley quality also affect the timing and application rate of nitrogen fertilizer. The greatest need for nutrients coincides with two important periods in the life of plants: the period of tillering and the beginning of the period stebloutvorennya and lay formation and ripening grain. Therefore, the greatest need for nitrogen barley plants observed in the period from early tillering to earing. The critical period in the availability of nitrogen plants from early tillering occurs to the output of plants in a tube. For lack of nitrogen in this period of growth and development of plants is depressed, disturbed the formation of generative organs, leading to a drastic reduction in yield. Marked positive impact on the quantitative and qualitative changes in crop grown barley for the application of neutral acidity macro - and micronutrients. In particular, soluble fertilizer liquid nitrogen karbomidno - ammonium groups (CAS - 32).

CAS - a mixture of aqueous solutions of ammonium nitrate and urea (in the ratio of 35.4% urea, nitrate, 44.3%, 19.4% water, 0.5% ammonia water). The density of liquid fertilizers up to 1.34 kg / m3.Tse only nitrogen fertilizer, which contains three forms of nitrogen:

• nitrate - provides instant effect on the growth and development of crops;

• ammonium - during nitrification passes in nitrate form;

• amide - as a result of soil microorganisms passes in the ammonium form, and then to nitrate.

Thus, the Code provides sustained power plants with nitrogen. In the absence of a part of the Code of free ammonia it does not evaporate into the atmosphere during application, but the presence of ammonium form makes minimal wrapping desirable, especially at high temperatures and lack of rainfall after application. Chemical product characteristics KAS-32 shown in Table 4.

3. Chemical characterization КАС 32

Indicator	Settings
Mass fraction,% of:	
	32,0
	35-37
	43-45
total nitrogen	-2
urea	-26
ammonium nitrate	8,5-8,9
The temperature of crystallization, C0	1,306÷1,326

However, the processes in growing barley should include a phased introduction of CAS-32 in an individual concentration which should not exceed 7 - 8% of the working solution.

Getting high and stable yields of grain of spring barley is impossible without the use of an effective system of plant protection. Particularly relevant is the use of resource-saving farming systems.

According to the list of pesticides and agrochemicals permitted for use in Ukraine in 2014 - 2015 gg., In crops of barley are allowed to use herbicides than 100 [9].

Application of CAS tank mixtures with herbicides, including current ai, Trybenuron-methyl particular Granstar (systemic herbicide for post-combat dicotyledonous weeds) - 15-18 g, are the basis of the complex control weeds and allows you to heal barley from "competitors" - vazhkoznyschuvanyh flowering species in all stages of organogenesis crops. If clogging barley cleaver (Galium aparine L.), which affects the timing and quality of the barley harvest advisable to strengthen the system of control of weeds preparations of 2,4 - D, Dikamba - e. G. - 3,6 - dichloro -O-anise acid or drugs with active substance - methyl tifensulfuron *. (* - 5% of norms regulated). It promotes the cultivation of barley for a resource-saving technological measures (tab. 5), with a yield of more than 4 tons / ha.

5. Resource saving technology of cultivation of spring barley and winter

№ п/п	Technological operations	Terms of performance	Efficacy and compliance of raw materials, %
1.	Seed treatment complex, insecticide + fungicide	By planting	81-85 %

	+ micronutrient - "Vitavaks 200 FF" - 2.5 l / t + "Matador" - 0.4 l / t + "Vanguard" - 1.5 l / t		
2.	The use of basic fertilizers NPK (Nitroamophoska) physically - 70 - 80 kg / ha	Before sowing	45-65 %
3.	Applying fertilizer CAS physically - 3.8 - 4.2 l / ha	Stairs	85 %
4.	The use of herbicides, "Granstar" + 2,4 - D * (* - when zaburyanenni thistles in the early phase of growth - tillering) "Granstar" - 15 g / ha + 2,4 - D + 0,8 l / ha with the addition of CAS - 32 10 l / ha	Sowing	95-97 %
5.	The use of fungicides: Tireks - 0.4 l / ha + KAS-32, 7 - 8 l / ha	Sowing	97-98 %
6.	The use of insecticides: Fastak - 0,15 l / ha or B-58, 1L / ha + KAS-32 7 liters / ha	Sowing	87-90 %

Considering all the above factors can influence the formation of high-quality grain that meets the technological requirements and ensures obtaining the necessary biochemical and taste characteristics for further processing barley into malt by European standards.

Conclusions

1. 2012 - 2014 quality raw materials for brewing depended mainly on systems of fertilizers and plant protection products, which are 82 - 88% provide appropriate performance standards.
2. The basic components of technology of cultivation and control the factors that affect the physiological and biological parameters of malting barley in particular during the formation of generative organs crops.
3. Qualitative and quantitative changes are to receive grain, and therefore the products for brewing, it is necessary to determine the level of joint action fertilizers and plant protection products including cash - 32 (7%) in the working solution.

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Освещены современные особенности выращивания ячменя пивоваренного с обобщением новых положений относительно количественных и качественных показателей получения продукции на всех этапах формирования сырья. Сформирована современная структура главных факторов, которые влияют на физиологическое, фито-санитарное и экологическое состояние каждого отдельного посева ячменя в Лесостепи Украины.

Агроценоз, ячмень пивоваренный, качество сырья для пивоварения, количественные и качественные показатели пивоваренного ячменя, ресурсосберегающие технологии, системы удобрений и защиты растений, КАС-32