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Rakoid O.O.

**ASSESSMENT OF N₂O DIRECT EMISSIONS FROM CULTIVATED SOILS
AT THE REGIONAL LEVEL**

*National University of Life and Environmental Sciences of Ukraine,
Kyiv, Heroyiv Oborony 15, 03041*

Ракоид Е.А.

**ОЦЕНКА ПРЯМЫХ ВЫБРОСОВ N₂O ИЗ ОБРАБАТЫВАЕМЫХ ПОЧВ
НА РЕГИОНАЛЬНОМ УРОВНЕ**

*Национальный университет биоресурсов і природопользования Украины,
Киев, Героев Обороны 15, 03041*

Abstract. In this paper we describe the dependence between direct nitrous oxide emissions from agricultural soils and application of mineral N fertilizers at the regional level. It is shown the necessity of the development the set of measures aimed at stabilizing and reducing emissions of nitrous oxide as one of the main greenhouse gases through the rational use of mineral fertilizers.

Key words: greenhouse gases, climate change, nitrous oxide, mineral nitrogen fertilizers, cultivated soils

Аннотация. В работе рассматривается зависимость объемов прямых выбросов закиси азота из пахотных почв от количества внесения минеральных азотных удобрений на региональном уровне. Показана необходимость разработки комплекса мер, направленных на стабилизацию и уменьшение выбросов закиси азота, как одного из основных парниковых газов, путем рационального применения минеральных удобрений.

Ключевые слова: парниковые газы, изменение климата, закись азота, минеральные азотные удобрения, обрабатываемые земли

Introduction

According to opinion of world scientific community the most possible reason of modern global warming is the intensification of natural greenhouse effect because of emission into the atmosphere of the hothouse gases in the result of economic activity, including the agricultural one [1]. At the moment when increase of global concentration of carbon dioxide is conditioned firstly by use of fossil fuel and changes in land-tenure, the changes in concentration of methane and nitrous oxide are mainly connected with agriculture.

According to National Cadastre of Anthropogenic Emission from Sources and Absorption by Hothouse Gases Absorbers in Ukraine [2] the main contribution into general emissions in the agricultural sector of the state is made by categories "Animal intestinal fermentation" and "Agricultural soils". That was respectively 33.7 and 55.9 % of total emission in the sector in 2013.

As the agriculture is one of the main sources of hothouse gases emission to the atmosphere, it also has a significant potential for efficient easing of consequences of climate change. Because of that the reasoning of events directed to decrease or to stabilize the emission of greenhouse gases, particularly nitrous oxide in the agrarian sector is extremely actual [3].



The main text

Nitrous oxide is naturally created in the soils in the way of microbial process of nitrification and denitrification. In the result of different kinds of agricultural activity nitrogen is added to the soil.

The amount of nitrogen (N) for nitrification and denitrification increases and in the end the volume of N_2O emission also enlarges. Emission of nitrous oxide as the result of anthropogenic addition of N happens both directly (that is directly from the soil where N is added) and from two indirect sources (because of fast evaporation in the form of NH_3 and NO_x and further repeated precipitation and because of wash-out and drainage) [4].

Direct emission of nitrous oxide from arable layers is calculated according to following sources: 1) introduction of nitrogen fertilizers; 2) introduction of organic fertilizers; 3) plant residues, including nitrogen fixation; 4) cultivation of organic (turfy) soil.

Gaseous losses mainly depend on soil-and-climate conditions, kind of fertilizer, terms of its introduction and way of plant sowing. At the main use of nitrogen fertilizers the gaseous losses can achieve maximum rates (25–50 %).

In Ukraine for an area of sufficient humidification rather popular practice is introduction of nitrogen fertilizers during spring cultivation before sowing because nitrogen introduced in autumn is washed out in nitrate form. On introduction of fertilizers directly under plants the gaseous losses are within the limits of 5–24 % [2].

The results of our previous studies on total direct N_2O emission from cultivated soils in Ukraine in general that has held to establishing the proportion of direct emissions of nitrous oxide from the use of mineral nitrogen fertilizers showed that nowadays almost the third part (29 %) of total volume of N_2O emission from the arable lands happens because of use of mineral nitrogen fertilizers [5].

For ecological justification methods of rational use of fertilizers with the purpose to reduce greenhouse gas emissions at the regional level, we have made the estimation of N_2O emissions from mineral nitrogen fertilizers in Kyiv region (Fig. 1).

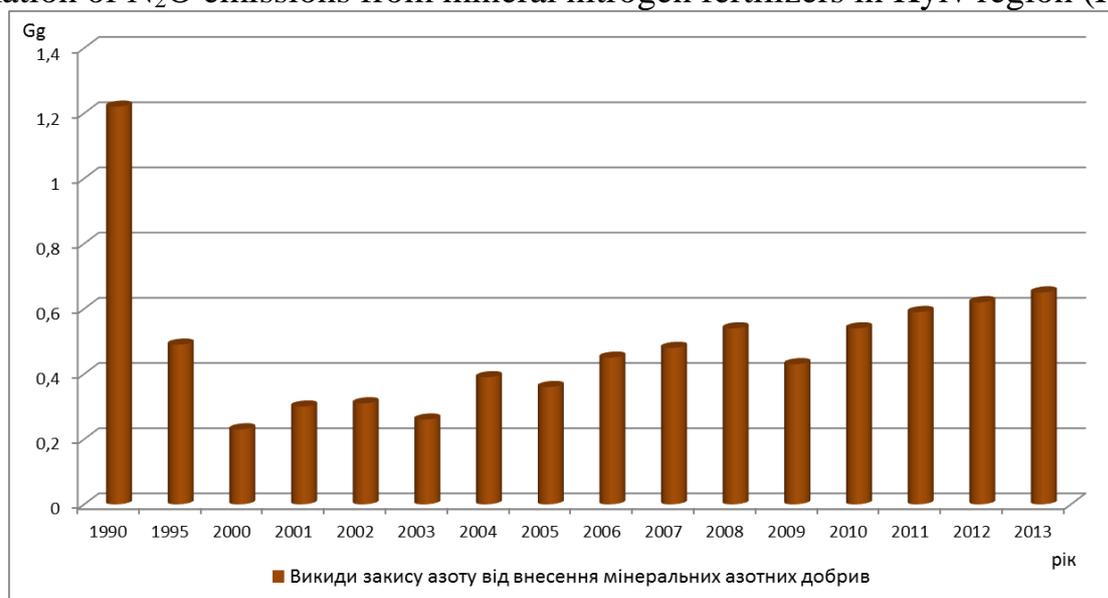


Figure.1. Dynamics of direct emissions of N_2O from use of mineral nitrogen fertilizers in Kyiv region, Gg



The biggest emissions (1.22 Gg) we can see in 1990, when the largest amount of nitrogen fertilizer (911.8 thousand tons) were used, then until the 2000s there is a significant reduction in emission of N₂O, which is associated with a catastrophic reduction the amounts of application of mineral fertilizers in the region for economic reasons.

Since the mid-2000s nitrous oxide emissions has been steadily increased except a little decrease in 2009 (as a consequence of the economic crisis of 2007–2008)., and now it is 0,59 Gg.

According to analysis of the dynamics of amounts of mineral nitrogen fertilizers and amounts of direct nitrous oxide emissions as resulting from their use, it is specifically determined that between them there is a direct correlation, that is the more nitrogen fertilizers are applied the more the gaseous losses of nitrogen from arable soils.

As the Fig. 2 shows, the amount of application of mineral nitrogen fertilizers in the Kiev region was a maximum in 1990 (911.8 thousand tons), and minimum – in 2000 (175.7 thousand tons).

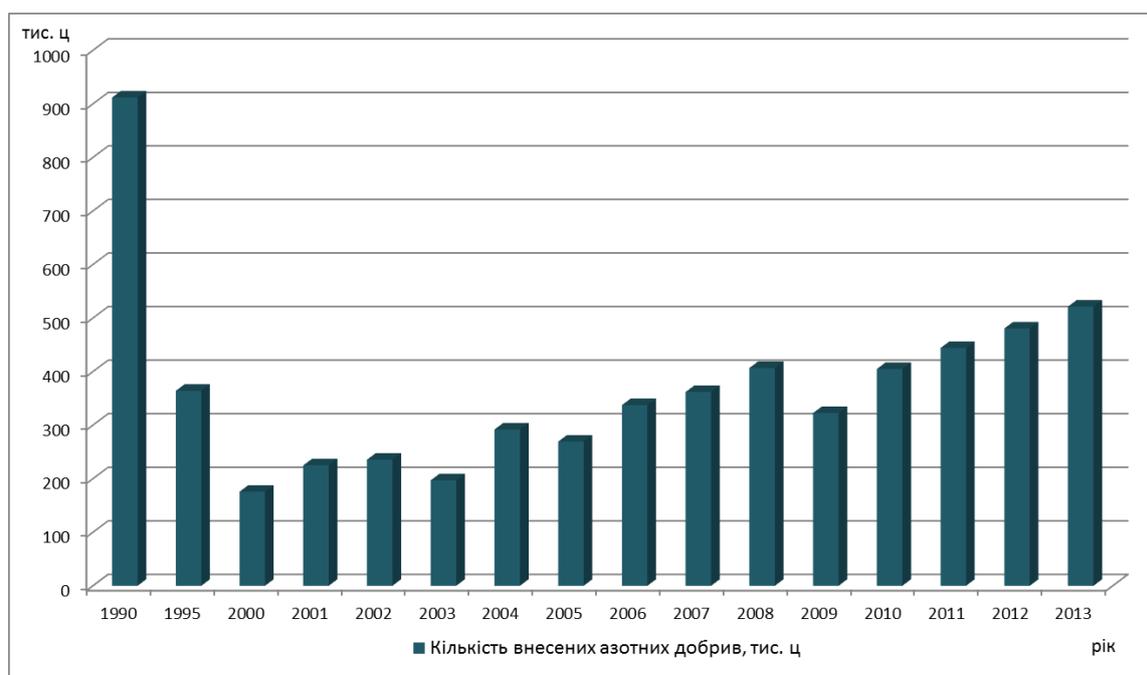


Figure.2. Dynamics of use of nitrogen fertilizers in Kyiv region, thousands of centners

Since the early 2000's, the amounts of nitrogen fertilizers have a general tendency to increase. Slight decline in fertilizer treatment in 2009 surely connected with the decline of agricultural manufacturing after the start of a land reform and a penetration of market relations in the agrarian sector of economics, which affected both the agricultural sector of Ukraine in general and Kyiv region.

All of the aforesaid certifies the necessity of development of the set of measures oriented to decrease the emission of nitrous oxide in the way of ecologically grounded use of mineral fertilizers in order to with increase of amount of their use the emissions of nitrous oxide is not increased.



The main principle of use of mineral fertilizers, especially nitrogen ones is "reasonable efficiency" that secures permanent productivity of plant cultivation and safe condition of the environment.

Rational methods of nitrogen fertilizers introduction to decrease the emission of nitrous oxide as the result of agricultural activity are following: local and belt introduction of nitrogen fertilizers during the sowing or extra nutrition; refusal from the introduction of nitrogen fertilizers in autumn; the introduction of anhydrous liquid ammonia into the soil to the depth of 10–18 cm with the purpose to avoid nitrogen losses; the introduction of nitrogen fertilizers after previous mulching of the soil surface with the plant residues.

Use of legumes becomes more significant for enlargement of involvement of atmospheric nitrogen into the biological cycle. So permanent leguminose grasses (clover, lucerne) accumulate in biomass up to 200-300 kg/ha of nitrogen from air, annual legumes - up to 60-100 kg/ha. Their use in crop rotation (20–30 %) allows decreasing the introduction of mineral nitrogen without significant slowdown of their productivity to 25–50 %.

Summary and Conclusions

According to the results of analysis of volumes dynamics of the introduction of mineral nitrogen fertilizers and volumes of direct emissions of the nitrous oxide after their use there is a direct dependence between them.

That means the more nitrogen fertilizers are introduced the biggest are the gaseous losses of nitrogen from the arable soil. This indicates of the necessity of implementation of the ecologically grounded methods of use of the mineral nitrogen fertilizers in the way that in case of increase of their introduction the emissions of the nitrous oxide do not enlarge.

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Kudriawytzka A.N.

STUDY OF INFLUENCE MINERAL FERTILIZERS ON THE PRODUCTIVITY OF WINTER WHEAT

National University of Life and Environmental Sciences of Ukraine
Kyiv, street of Heroes of defensive, 17, 03041

Кудрявицька А.М.

ВІВЧЕННЯ ВПЛИВУ МІНЕРАЛЬНИХ ДОБРИВ НА ПРОДУКТИВНІСТЬ ОЗИМОЇ ПШЕНИЦІ

Національний університет біоресурсів і природокористування України.
м. Київ, вул. Героїв оборони, 17, 03041

Abstract. Realization of signup by nitric fertilizers and "Crystalon special", stipulates considerable changes in the size of the productivity of wheat winter-annual from accordingly by the high indexes of quality of grain.

Key words: a wheat is winter-annual, fertilizers, nitric fertilizers, harvest, quality, albumen, "raw" gluten, soil.

Анотація. Встановлено, що позакореневе підживлення азотними добривами та «Кристалом особливим», зумовлює зростання врожайності пшениці озимої і показників якості зерна.

Ключові слова: пшениця озима, добрива, азотні добрива, урожай, якість, білок, "сир" клейковина, ґрунт.

For the receipt of high and stable harvests of quality grain of wheat winter-annual an important value gets to the expediently worked out and correctly organized system of fertilizer [1-3].

Fertility and nourishing mode of soil are factors that yield to the effective action of man and are one of main facilities of increase of the productivity of grain of wheat winter-annual [4-5].

Materials and methodology of researches. Researches were conducted in a crop rotation in the conditions of North Forest-steppe of Ukraine("Agronomical experimental station"). Soil of experience is a black carbonate soil on a loesslike loam. The provision of plants nitrogen and phosphorus is middle, by potassium subzero. Researches were conducted by the generally accepted methods.

Results of researches. It is set the results of researches, that the most productivity of wheat winter-annual of sort of "Миронівська-61" is marked in the variant of N45 +N30 + crystalon at the beginning of exit in a tube + a crystalon inphase, that presented, earing - 55,1 ce/he (2010-2011), from according to most an increase to control, that presented 24,0 ce/he (table 1).

The some less increase of harvest of grain of wheat winter-annual is got on the variant of N45 +N30 + crystalon at the beginning of exit in a tube - 22,5 ce/he Productivity in variants control, control +, water presented відповідно- 31, 15, 32,1 ce/he (2010-2011) (table 1). For the increase of the productivity of grain of wheat winter-annual necessary realization of позакореневого signup of N45 +N30 (by ammoniac saltpetre) and Crystalon special is in a dose 1 kg/he at the beginning of phase of exit in a tube, inphase earing.



1. Influence of nitrogen and crystalon of the special on the productivity grain of wheat winter-annual, 2010-2011, ce/he

Variant of experience	Variant of experience	Increase , ce/he			
		Control	Control + water	crystalon at the beginning of exit in a tube	crystalon inphase earing
Control	31,1				
Control + is water	32,1	1,0			
N45	41,6	10,5	9,5		
N45+ crystalon at the beginning of exit in a tube	46,0	14,9	13,9	4,4	
N45+ crystalon at the beginning of exit in a tube + crystalon inphase earing	47,8	16,7	15,7		1,8
N45 +N30	46,9	15,8	14,8		
N45 +N30 + crystalon at the beginning of exit in a tube	53,6	22,5	21,5	6,7	
N45 +N30 + crystalon at the beginning of exit in a tube+ crystalon inphase earing	55,1	24,0	23,0		1,5

HIP₀₅, u/2a

1,7-2,4

The greatest content of albumen and "raw" gluten in grain of wheat winter-annual of sort "Muronivska - 61" a crystalon is marked on the variant of N45 +N30 + at the beginning of exit in a tube + crystalon inphase earing, that presented - 13,9 % and 28,6 %, from accordingly by the high indexes of collection of albumen and gluten are 7,6 ce/he and 15,7 ce/he (table 2,3).

2. Influence of nitrogen and crystalon of the special on content albumen is in grain of wheat winter-annual, 2010-2011 %

Variant of experience	Albumen %	Increase , ce/he			
		Collecti on is a squirrel, ce/he	Control + water	crystalon at the beginning of exit in a tube	crystalon inphase earing
Control	10,2	3,2			
Control + is water	10,3	3,3	0,1		
N45	11,0	4,6	0,8		
N45+ crystalon at the beginning of exit in a tube	11,3	5,2	1,1	0,3	
N45+ crystalon at the beginning of exit in a tube + crystalon inphase earing	12,3	5,8	2,1		1,0
N45 +N30	12,3	5,7	2,1		



N45 +N30 + crystalon at the beginning of exit in a tube	12,5	6,7	2,3	0,2	
N45 +N30 + crystalon at the beginning of exit in a tube+ crystalon inphase earing	13,9	7,6	3,7		1,4

$HIP_{05},\%$ 0,63

Content of albumen on variants control, control + water presented accordingly - 10,2 %, 10,3 % (2010-2011) (table 2). Content of gluten on variants control, control + water presented accordingly - 18,8 %, 19,4 % (2010-2011) (table 3).

3. Influence of nitrogen and crystalon special is on content of "raw" gluten in grain of winter wheat, 2010-2011 %

Variant of experience	"Raw" gluten %	Increase , ce/he			
		Collecti on of "raw" gluten	Control + water	crystalon at the beginning of exit in a tube	crystalon inphase earing
Control	18,8	5,8			
Control + is water	19,4	6,2	0,6		
N45	21,4	8,9	2,6		
N45+ crystalon at the beginning of exit in a tube	22,5	10,3	3,7	1,1	
N45+ crystalon at the beginning of exit in a tube + crystalon inphase earing	25,7	12,2	6,9		3,2
N45 +N30	24,5	11,4	5,7		
N45 +N30 + crystalon at the beginning of exit in a tube	25,7	13,7	6,9	1,2	
N45 +N30 + crystalon at the beginning of exit in a tube+ crystalon inphase earing	28,6	15,7	9,8		2,9

$HIP_{05},\%$ 1,24

Conclusions:

Realization of signup by "Crystalon special"(a dose is 1 kg/he) consonant with the nitric fertilizers of N45 +N30 inphase exit in a tube, earing provides the increase of harvest of grain of the districted sort of wheat winter-annual "Mironovska 61" - 24,0 ce/he. The greatest content of albumen and "raw" gluten in grain of wheat winter-annual is marked in a variant for bringing of N45 +N30 + crystalon at the beginning of exit in a tube + crystalon inphase earing, that presented accordingly - 13,9 %, 28,6 %.



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Natalia V. Bogdanova

**AGE VARIABILITY OF EFFICIENCY OF STUD RAMS OF TAURIAN
INSIDE BREED TYPE OF ASCANIAN FINE-WOOL SHEEP***National University of Life and Environmental Science of Ukraine,**Kyiv, Heroyiv Oborony, 12b, 03041*

Богданова Н.В.

**ВОЗРАСТНАЯ ИЗМЕНЧИВОСТЬ ПРОДУКТИВНОСТИ БАРАНОВ-
ПРОИЗВОДИТЕЛЕЙ ТАВРИЙСКОГО ВНУТРИПОРОДНОГО ТИПА
АСКАНИЙСКИХ ТОНКОРУННЫХ ОВЕЦ***Национальный университет биоресурсов и природопользования Украины,**Украина, Киев, Г. Обороны, 12б, 03041*

Abstract. In the article are shown the results of research of the age variability of the live weight and wool clip of stud rams. It is found that the rams in the age of one year have the average live weight which has low frequency (0,20). Only starting from the age of two years this feature has high frequency (0,60–0,80). Wool clip of the rams which are two years old also have high frequency (0,60–0,80).

Key words: variability, stud rams, live weight, wool clip.

Аннотация. Приведены результаты исследования возрастной изменчивости живой массы и настрига шерсти баранов-производителей. Установлено, что у баранов средняя живая масса в годовичном возрасте имеет низкую повторяемость (0,20). Только с двухлетнего возраста этот признак имеет высокую повторяемость (0,60–0,80). Нاستриг шерсти двухлетних баранов также имеет высокую степень повторяемости (0,60–0,80).

Ключевые слова: изменчивость, бараны-производители, живая масса, настриг шерсти

Introduction. High productivity of animals always is based on relevant hereditary, which only improve through selection. The selection process should be conducted based on objective patterns of variation, screening and selection population structure [2, 4, 5, 8]. It is necessary to take into account patterns of variability of traits and character of reproduction of each gender and age group of sheep.

Parameters of age variability give theoretical reasons to justify the practical terms of the animals screening in system of selection programs, establishing optimal timing of their production usage and effective forecasting of absolute and relative level of animals productivity of the main herd [1].

Screening according to the maximum animals productivity is the most desirable. But, as known, it is achieved at a more later age, which significantly limits the widespread use of this indicator in practical selection. When evaluating rams according to phenotype important significance acquire absolute indicators of productivity, which change little with age, meaning they have high stability [7].

To the most common quantitative productivity indicators of sheep belong such features as live weight, clip of unwashed and clean wool, staple length, output of net



fiber. When screening according to wool clip size, it is important that high-productivity sheep retained their higher, than average herd, wool clip at the second, third and subsequent clipping and even in those years when in result of insufficient nourishment the average wool clip of herd may slightly change.

Material and research methods. Age variability of productivity of stud-rams investigated on livestock of Taurian inside breed type of Ascanian fine-wool sheep. It was conducted a selection differentiation and screening of 910 sheep, including: 590 repair rams of year age, 152 heads of two-years age of stud-rams, 79 of three years age, 49 of four years age and 40 of five years age. It was determined frequency of absolute indicators of wool clip and the live weight in the first five years of production activity of animals. It was used technique of recurrence calculation of a model variant in the age row by M. Kolesnik and others [3]. For the model variant was taken average animals productivity under the age of one, two and three years. Percentage relation defined in comparison with the average in the coming years. Probability of difference between the two values established according to the method of M. Plohinskiy [6].

Research results. The level of the average performance of the stud rams according to live weight and wool clip meets the high regulatory factory requirements (Table 1). This applies to both repair rams of year age and adult rams of the main herd.

Table 1

Productivity of stud-rams of Taurian type of different ages, M±n

Characteristic of sheep productivity	Amount of animals, heads	Average productivity	lim	
			Min	Max
Repair rams of year age				
Live weight, kg	590	72,9±0,56	77,9±0,66	66,2±0,53
Clip of unwashed wool, kg	588	9,89±0,15	9,31±0,09	10,4±0,12
Two years stud rams				
Live weight, kg	152	106,9±0,82	103,5±1,20	109,0±1,83
Clip of unwashed wool, kg	152	12,1±0,22	10,6±0,20	12,9±0,24
Three years stud rams				
Live weight, kg	79	119,1±1,30	108,0±1,77	125,7±2,65
Clip of unwashed wool, kg	79	13,4±0,32	12,0±0,45	14,5±0,49
Four years stud rams				
Live weight, kg	49	116,4±1,70	112,9±2,30	123,1±2,60
Clip of unwashed wool, kg	49	12,7±0,45	12,0±0,56	13,2±0,39
Five years stud rams				
Live weight, kg	40	113,0±2,33	107,1±3,76	119,5±4,13
Clip of unwashed wool, kg	40	12,8±0,54	10,3±0,92	14,8±0,69

Average indicators of live weight and wool clip of stud rams grow to the age of 3 years. Then somewhat stabilize and reduce. The maximum live weight the stud rams were achieving in the age of three years (26-33%), four (34-42%) and five (22-



26%) and the largest wool clip – in the age of two (28-29%), three (37-39%) and four years (18-23%).

Based on the model age deviations was established (Table 2), that the live weight of sheep in the year age has a low frequency (0,20). The high frequency of absolute indicators of the live weight and wool clip is reached in the age of two years (0,60-0,80).

Table 2

Frequency of live weight and unwashed wool clip of stud rams of Taurian type, n=40

Age, years	Live weight	Unwashed wool clip
1	0,20±0,18	0,40±0,22
2	0,80±0,18	0,60±0,22
3	0,80±0,18	0,60±0,22
4	0,80±0,18	0,80±0,22
5	0,80±0,18	0,60±0,22
Max	0,80±0,18	0,60±0,22

Frequency indicators attest about age diversity of rams according to live weight significantly more than unwashed wool clip. Rams do not reach maximum productivity in the first year. They have higher precocity according to the unwashed wool clip than according to the live weight amount.

Summary and Conclusions

1. It was studied age variability of productivity of stud-rams of Taurian inside breed type of Ascanian fine-wool sheep of stud farm “Chervonyi Chaban”.

2. The maximum live weight the stud rams were achieving in the age of three years (26-33%), four (34-42%) and five (22-26%) and the largest wool clip – in the age of two (28-29%), three (37-39%) and four years (18-23%).

3. It was established that the live weight of sheep in the year age has a low frequency (0,20). The high frequency of absolute indicators of the live weight and wool clip is reached in the age of two years (0,60-0,80).

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Koreyba L.V., Suslova N.I., Makeyeva N.S., Golub A.A.
BIOCHEMICAL BLOOD PROFILE OF PREGNANT COWS WITH
OSTEODYSTROPHY

Dnipropetrovsk State Agrarian and Economic University, Dnipropetrovsk, Ukraine

Корейба Л.В., Суськова Н.І., Макеева Н.С., Голуб А.А.
БІОХІМІЧНИЙ ПРОФІЛЬ КРОВІ ХВОРИХ НА ОСТЕОДИСТРОФІЮ
ВАГІТНИХ КОРІВ

Abstract: Researched the concentration of total protein, albumin, globulin, urea, creatinine, glucose, carotene, total calcium, inorganic phosphorus, total lipoproteins, the activity of aspartate and alanine aminotransferase, and alkaline phosphatase in blood plasma of the cows in "dry" period.

It was established that during the subclinical osteodystrophy the concentration of total calcium, inorganic phosphorus, carotene and glucose in blood plasma was reduced, evident high content of total lipoprotein and increased activity of aspartate and alanine aminotransferase, and alkaline phosphatase.

Key words: cows, "dry" period, blood plasma, biochemical indicators, osteodystrophy.

Анотація. Досліджено вміст у плазмі крові сухостійних корів загального білку, альбумінів, глобулінів, сечовини, креатиніну, глюкози, каротину, кальцію загального, фосфору неорганічного, загальних ліпопротеїдів, активність аспарат-і аланін амінотрансферази і лужної фосфатази.

Доведено, що за субклінічної остеодистрофії знижується концентрація у плазмі крові кальцію загального, фосфору неорганічного, каротину, глюкози, високий вміст загальних ліпопротеїдів та підвищується активність аспарат-і аланін амінотрансферази й лужної фосфатази.

Ключові слова: корови, сухостійний період, плазма крові, біохімічні показники, остеодистрофія.

Introduction: Osteodystrophy – is a chronic disease characterized by degenerative changes in the bone tissue due to the disturbed calcium, phosphorus and vitamin D-metabolism; damage to the nervous and muscular system, liver and other organs [1, 3–5].

Mass affection of highly productive animals by osteodystrophy causes great economic losses to animal husbandry due to death of animals, forced slaughter; reduce animal fatness and milk production, prolonged estrus cycle, barrenness, the extra cost for treatment of animals and culling non-viable calves [1–4].

Literature review: Metabolism processes are occurring more rapidly in cows with high milk production and that in certain circumstances leads to various diseases. The leading role in internal pathology of farm animals occupies diseases that are proceeding with deviations in metabolism, including mineral.

Subclinical osteodystrophy occurs relatively lightly, unnoticed and not accompanied by specific characteristics. Overall condition can be satisfactory, the average fatness is fatness satisfactory and even good. There may be a loss of appetite. With progression of the disease are reduced animal fatness; productivity; delayed



molting; there may appear licking and digestion problems mainly in the cows during the late pregnancy. Hypoproteinemia is detected in blood plasma, shift of acid-alkaline balance toward acidosis. It has been established that during the development of mineral deficiency in animals all the biochemical parameters are changing [1, 3].

Input data and methods: The aim of this work was to investigate the biochemical parameters of blood of cows suffering from osteodystrophy during the “dry” period.

Material and methods: Research conducted in conditions of Private-Corporation "Agro-Union" in Dnepropetrovsk region on 20 cows Holstein black-motley breed, with body weight 550 - 600 kg, and an annual milk production of 9000-9200 kg.

Development of osteodystrophy was studied on blood biochemical indicators of 20 animals 10 days before calving; blood was taken from the jugular vein in the morning before feeding.

The content in cow's blood plasma of total protein and its fractions, urea, creatinine, glucose, total calcium, inorganic phosphorus, carotene and total lipoprotein and the activity of aspartate- (AST) and alanine aminotransferase (ALT) and alkaline phosphatase was determined by common-accepted methods [2] and on the biochemical analyzer STATFAX 1904 PLUS at the physiology, biochemistry and chemical-toxicological analysis department of Research Centre for Biosafety and environmental control resources of agro industrial complex DSAEU.

Results. Discussion and Analysis: Biochemical parameters of cow's blood plasma were researched during late pregnancy (10 days before the expected calving).

The results of biochemical studies of blood plasma of cows during the “dry” period are presented in Table 1.

Table 1.

The biochemical composition of cows blood plasma, $M \pm m$; n = 20

Indicators	The concentration in the blood 10 days before calving	Norm
Total protein, g / l	76,6±2,22	67 – 75
Albumin, g / l	42,8±1,18	30 – 35,5
Globulin g / l	33,8±1,71	30 – 35
The protein coefficient, units	1,32±0,13	0,5-0,8
Urea, mmol /L	4,9±0,43	2,8 – 5,8
Creatinine umol/L	112,4±7,39	88 – 177
AST, mmol/L	1,4±0,19	0,11 – 0,57
ALT, mmol/L	0,5±0,03	0,12 – 0,45
Alkaline phosphatase, U /L	158,7±16,70	Less than 80
Glucose, mmol/L	1,56±0,13	2,50 – 4,16
Total Calcium, mmol/L	1,54±0,04	2,43 – 3,10
Inorganic phosphorus, mmol/L	1,32±0,06	1,81 – 2,10
Ca: P, Units	1,15±0,07	1,2 – 1,6
Carotene, mcg%	101,4±13,0	375 – 965
General lipoprotein mg%	1377,46±89,8	250 – 550



Analysis of biochemical parameters of blood plasma of cows during the “dry” period showed (Table 1) that the most significant changes in relation to the norm are marked in indicators of total protein and albumin and therefore to the protein coefficient, activity of aspartate- (AST) and alanine aminotransferase (ALT), alkaline phosphatase, glucose, total calcium, inorganic phosphorus, carotene and total lipoproteins.

The rates of total protein and albumin tend to increase ($76,6 \pm 2,22$ g / L and $42,8 \pm 1,18$ g / L, respectively) in cows 10 days before calving. Due to increase in indicators of total protein and albumin content the protein coefficient is also rises and makes $1,32 \pm 0,13$ units. Also increased the activity of AST ($1,4 \pm 0,19$ mg, / L) and the number of total lipoprotein ($1377,46 \pm 89,8$ mg%). The trend towards increasing of activity indicator for ALT, the total content of lipoproteins and albumin is typical for osteodystrophy and degenerative changes in the liver of cows [1, 3].

From the obtained results (Table 1) we can see that the glucose level was also low and amounted at $1,56 \pm 0,13$ mmol / L, which is typical for the osteodystrophy. Increase in concentrations of urea ($4,9 \pm 0,43$ mmol / L), usually passes during the enhanced exchange of proteins due to the albumin fraction. Indicators of total calcium and inorganic phosphorus were also lower than normal and were $1,54 \pm 0,04$ mmol / L and $1,32 \pm 0,06$ mmol / L respectively. Calcium-phosphorus correlation herewith amounted to $1,15 \pm 0,07$ units. The lowest was the content of carotene ($101,4 \pm 13,0$ mcg%).

Decrease in concentration of carotene in blood plasma of pregnant cows is a result of inadequate absorption of it from the intestine during the metabolism disorders, and also of insufficient its receipt in the composition of feed intake.

On the background of increased concentrations in blood plasma of protein and albumin, reduced glucose level can course the development of ketosis [3, 5].

Conclusion: In blood plasma of deeply pregnant cows affected by subclinical osteodystrophy the concentrations of total calcium, inorganic phosphorus, carotene, glucose is decreasing, but evident high content of total lipoprotein and increased activity of aspartate and alanine aminotransferase, and alkaline phosphatase.

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Ponomarenko N., Goncharik O.

**AGE FEATURES OF REPRODUCTIVE QUALITIES OF HENS OF EGG
CROSSES**

*National University of Life and Environmental Sciences of Ukraine,
Kiev, Heroev Oborony 15, 03041*

Пономаренко Н., Гончарик О.

**ВОЗРАСТНЫЕ ОСОБЕННОСТИ РЕПРОДУКТИВНЫХ КАЧЕСТВ КУР
ЯИЧНЫХ КРОССОВ**

*Национальный университет биоресурсов и природопользования Украины,
Киев, Героев Обороны 15, 03041*

Abstract. Age-related changes of the level of egg production of hens of parent stock and hatching quality of eggs were studied. It found a significant effect of hens age on their egg production and the level of quality of hatching eggs. An analysis of the dynamics of the level of egg production and egg weight of hens evidence of their compliance with regulatory parameters. Established curvilinear dependence qualities of hatching eggs on the age of the bird of parent flock. Egg production and hatching quality of eggs of hens of cross «Hysex white» higher than the bird of cross «Hysex brown». Hatching quality of eggs of hens of two studied crosses grow up to 40-45 weeks of age, and then - decline. The highest quality parameters of hatching eggs marked in the 35-50 weeks of age for birds of brown cross and 35-45 weeks of age for birds of white cross.

Key words: hens, parent stock, egg cross, reproductive qualities, hatching egg

Аннотация. Изучены возрастные изменения уровня яичной продуктивности кур родительского стада и инкубационные качества яиц. Установлено значительное влияние возраста кур на их яичную продуктивность и качество инкубационных яиц. Анализ динамики уровня производства яиц и их массы свидетельствует об их соответствии нормативным показателям. Установлена криволинейная зависимость качества инкубационных яиц от возраста птицы родительского стада. Яйценоскость и инкубационные качества яиц кур кросса «Хайсекс белый» выше, чем птицы кросса «Хайсекс коричневый». Инкубационные качества яиц кур-несушек двух исследованных крестов повышаются до 40-45-недельного возраста, а потом - снижаются. Самые высокие показатели качества инкубационных яиц отмечены в 35-50 недельном возрасте кур коричневого кросса и в возрасте 35-45 недель для птицы белого кросса.

Ключевые слова: куры, родительское стадо, репродуктивные качества, инкубационные яйца.

Introduction. Work with specialized crosses egg hens in a poultry breeding requires a comprehensive comparative analysis of their productivity. This is especially important in the extension of the productive use of the birds.

Formation of eggs, its fertilization is closely related to the physiological state of hens, which is dependent on many factors. One such factor is the age of the bird,



which affects the quality of the eggs, on the embryonic and postembryonic development of the offspring [1,2]. High quality hatching eggs - is the basis of high hatching rate and high quality day-old chicks for further productive poultry. The study of age-related changes of hens productivity is important to determine the duration of the effective use of parent stock. «Hysex white» and «Hysex brown» - crosses of egg hens which are widely used in poultry farms therefore questions of the level of reproductive qualities of birds are important [3-5].

The purpose of research - to conduct a comparative assessment of reproductive qualities of hens of cross «Hysex white» and cross «Hysex brown» during their productive use.

Materials and Methods. The studies were conducted in the conditions of breeding poultry enterprise for breeding hens of egg crosses Hysex. Terms of keeping and feeding the birds comply with the existing requirements and recommendations of the ISA / Hendrix Genetics Company. We studied the level of egg production of hens of parent stock from 25 to 72 weeks of age. Rated quality hatching eggs derived from poultry for the entire period of productive use. Conventional methods of investigation levels of reproductive qualities of poultry have been used.

Results of research. The following table shows productivity and quality indicators of hatching eggs of hens cross «Hysex white» and cross «Hysex brown» (table 1).

Table 1

Productivity and quality indicators of hatching eggs of hens

Age, week	Intensity of egg production, %	Egg production, egg	Egg weight, g	Hatching quality, %		
				fertilized eggs	hatch-ability	hatching rate
«Hysex brown»						
25	88	30,47	53,9	87,9	84,8	74,5
30	90	76,84	59,4	93,9	80,5	75,6
35	86	98,2	62,3	94,0	87,9	83,0
40	84	117,8	63,5	94,5	89,9	84,9
45	81	153,2	62,9	92,7	88,8	82,3
50	79	173,20	62,9	90,9	89,6	81,4
55	75	207,26	61,5	91,4	84,9	77,7
60	70	236,12	62,5	87,0	84,8	73,8
65	68	257,40	63,4	86,7	83,9	72,7
70	67	274,30	64,4	86,2	84,1	72,5
72	65	284,16	65,7	85,7	83,4	71,4
«Hysex white»						
25	88	30,89	53,9	96,4	83,2	80,2
30	90	65,21	62,0	96,5	85,9	82,9
35	89	90,98	61,0	97,8	88,0	84,0
40	88	137,5	62,3	97,2	89,2	86,7
45	86	157,91	63,5	96,9	92,0	89,1
50	82	194,56	63,4	95,5	86,4	82,5



55	79	209,54	63,5	95,4	85,4	81,5
60	79	232,14	65,0	94,0	86,3	81,1
65	74	256,17	66,4	92,0	84,9	78,1
70	69	281,12	67,5	91,2	84,9	77,4
72	67	292,18	67,5	90,2	85,0	76,7

Changes in the intensity of egg production curve is practically were in line with normative values. We note a higher level of this feature at the beginning of egg-laying birds. The maximum intensity of egg production observed in 30-week old hens for the studied breeds.

The level of egg poultry productivity determined by the number and quality of eggs produced. According to the recommendations hens of parent stock used to 70 weeks of age. In recent years, in the breeding and the industrial poultry there is a tendency to increase the useful life of the bird. The duration of use of poultry farms laying hens is defined, first and foremost, economic indicators of production of hatching eggs and day-old chicks getting. Analysis of the level of egg production has shown higher rates of hens of cross «Hysex white» compared with «Hysex brown» cross hens to 8.02 eggs. A comparison of the data with the recommended for each cross show higher indicators of hens white cross on 1.81 eggs and lower for hens of brown cross - to 6.78 eggs. It should be noted that the level of egg-laying hens of cross «Hysex brown» in the first half of the productive period (up to 40 weeks of age) is higher than the standard values.

Mass hatching eggs to a large extent affects their quality characteristics. Analysis of changes in egg weight with age confirms its general biological regularity increasing with age. The mass of eggs of hens of brown cross increases with age from 53.9 g to 65.7 g, and the hens of white cross - from 53.9 to 67.5 g. At the end of the period of productive use of hens higher values are set for cross «Hysex white». The weight of the eggs exceeds performance standards of 3.5 g.

Incubation results show a higher level of quality of hatching eggs of hens of white cross. The level of fertilized eggs of hens of cross «Hysex white» is at a high level in 25 weeks of age (96.4%) and increased to 97.8% at 35 weeks of age. It established a high level of this figure - above 95%. With only 55 weeks of age it begins to decrease to 90.2% at the end of the production period. Fertilized eggs of hens of cross «Hysex brown» reaches its maximum (94.5%) at 40 weeks of age, then gradually reduced to 85.7% at the age of 72 weeks.

Hatchability (80,5 ... 89.9% - for «Hysex brown» and 83.2 ... 92.0% - for «Hysex white») increased to 40-45 weeks of age and then gradually decreases.

Changes in these indicators cause changes in the hatching rate - to increase in the 40-45 weeks of age and decline thereafter.

The highest quality parameters of hatching eggs marked in the 35-50 weeks of age for birds of brown cross and 35-45 weeks of age for birds of white cross.

Conclusions.

It found a significant effect of hens age on their egg production and the level of quality of hatching eggs. An analysis of the dynamics of the level of egg production and egg weight hens evidence of their compliance with regulatory parameters.



Egg production and hatching quality of eggs of hens of white cross «Hysex white» higher than the bird brown cross «Hysex brown». Hatching quality of eggs of hens of two studied crosses grow up to 40-45 weeks of age, and then - decline.

Researches of quality of chickens obtained from hens of different ages are planned in the future.

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Boroday V.V.

EFFICIENCY OF THE APPLICATION BY PLANRIZ WITH RIDOMIL GOLD MZ COMBINATION FOR INCREASE OF THE POTATO TUBERS COMMERCIAL QUALITY AND YIELD

The National University of Life and Environmental Sciences of Ukraine

Kyiv, Heroyiv Oborony st., 13, 03041

Бородай В.В.

ЭФФЕКТИВНОСТЬ СОВМЕСТНОГО ПРИМЕНЕНИЯ ПЛАНРИЗА И РИДОМИЛА ГОЛД МЦ ДЛЯ ПОВЫШЕНИЯ ТОВАРНОГО КАЧЕСТВА И УРОЖАЙНОСТИ КЛУБНЕЙ КАРТОФЕЛЯ

Национальный университет биоресурсов и природопользования Украины

Киев, Героев Обороны 13, 03041

Abstract. The results of studies of the application by Planriz (based on bacteria strains Pseudomonas fluorescens AP-33) with Ridomil Gold improved of commercial quality and yield of potato tubers have been shown. The increase of productivity, a large amount of marketable tubers (average marketability of tubers on average from 85.2% versus 76.8%) at the combined using of Planriz and Ridomil Gold (2,0 + 2,5 l / ha) on average, reducing the number of diseased and small tubers were observed.

Key words: commercial quality, productivity, potatoes, fungicides, biologic preparations.

Аннотация. В работе представлены результаты исследований по изучению влияния совместного применения Планриза (на основе штаммов бактерий Pseudomonas fluorescens AP-33) и Ридомила Голд на повышение товарного качества и урожая клубней картофеля. Установлено, что при совместном применении Планриза и Ридомил Голда (2,0 + 2,5 л/га) в среднем наблюдалось повышение урожайности, образование большего количества товарных клубней (в среднем товарность клубней составила соответственно 85,2% против 76,8%), уменьшение числа пораженных болезнями и мелких клубней.

Ключевые слова: товарное качество, урожайность, картофель столовый, фунгициды, биопрепараты

Introduction.

During of the growing season potato is diseased by large number of bacterial and fungal pathogens. It reduces of the tubers quality. Sustainable protection of potatoes at the growing season does not guarantee of disease-free (devoid from the latent infection) bubbles with good preservation. Mixed application of biopesticides and chemical pesticides increases of preservation, potatoes safety and environmental chemical protection from diseases.

Literature review.

At present some research on biologics and growth regulators showed that their efficiency in combination with chemical protection agents may increase. The data about effectiveness of combined fungicides and biologics using in potatoes (*Solanum tuberosum* L.) agrocenosis in the scientific literature are not enough.



Input data and methods.

The aim of research was to study the effect of combined using of Planryz and Ridomil Gold for improving of marketable quality and yield of potato tubers at 2 landing terms of Lviv region. The plants were sprayed directly before planting, and then during budding - flowering by water solution (3 ml/l) based on the strains of bacteria *Pseudomonas fluorescens* AP-33 (Planryz) and 0.5-0.6% solution – based on fungicide metalaxyl-M and mankotseb (Rydomil Gold MC 68WG) (two planting dates -27-30 April and 12-15 May). The experiments were made with varieties of Lily and Skarbnitsya according to the scheme: 1) control - no treatment, 2) biological control - bacteria *Bacillus subtilis* (biopreparation Fitotsyd 2.0 l/ha) variants 3,4,5,6) Treatment by solution based on the bacteria *Pseudomonas fluorescens* AP-33 (Planryz in concentration of 1.0; 1.5; 2.0; 2.5 l/ha), 7) chemical control - Rydomil Gold 2.5 l/ha; 8) processing by mixture based on bacteria strains *Pseudomonas fluorescens* AR-33 and a chemical fungicide Rydomil Gold at the rate of (2.0 + 2.5 l/ha).

Results. Discussion and Analysis.

Application of compatible solution based on the bacteria strains *Pseudomonas fluorescens* AP-33 (biopreparation Planryz) and Rydomil Gold in Western Forest Steppe of Lviv region in two planting dates contributed to formation of more marketable tubers (accordingly 85.3% versus 73.4% in control variant, separately by Planryz - 81.6% and Rydomilom Gold - 80.6%).

Non-standard crop part was smaller than other variants due to the formation of diseased tubers (accordingly 3.1% versus 3.3-10.6% as compared with the Rydomil Gold), and small tubers (11.7% against 14.1%). The highest yield in Western Forest Steppe among the variants was at the application of Planryz and Rydomil Gold composition for concentration 2.0+ 2.5 l/ha (39.7 t/ha against 30,3-37,2 t/ha in others variants). The potato yield at the second planting term in all variants was lower than in the first (on average within 23,2-39,6 t/ha), but the marketability of tubers in the application mix of Planryz and Rydomil Gold was also higher (82.5% against 73.7% in the variant with single Rydomilom Gold) and the number of diseased and small tubers was smaller accordingly in 2.7 and 1.3 times. Similar regularities were observed on the effectiveness of combined using Planryz and Rydomil Gold on potato yield and its structure compared with the use of a single fungicide and landing for a second term in West zone steppe, Carpathian Foothills area, and Carpathian of Lviv region. The population density in soil of pathogens *Fusarium*, *Alternaria* genus was decreased; the total number of bacteria, micromycetes *Trichoderma* spp. was increased at the application mix of Planryz and Rydomil Gold. Biologically active extractives of *Pseudomonas fluorescens* stimulated of plant growth and inhibited of disease development at the planting treatment by mixture with Planryz at the vegetation.

Summary and conclusions.

The results of studies of the application by Planriz (based on bacteria strains *Pseudomonas fluorescens* AP-33) with Ridomil Gold improved of commercial quality and yield of potato tubers in 4 districts of Lviv region, which differ in their soil and climatic conditions have been shown. The increase of productivity, a large



amount of marketable tubers (average marketability of tubers on average from 85.2% versus 76.8%) at the combined using of Planriz and Ridomil Gold (2,0 + 2,5 l / ha) on average, reducing the number of diseased and small tubers were observed.

Table
Structure of commercial quality potato after using of Rydomil Gold and biopreparation in Lviv region (cv. Skarbnytsa)

Variant	Crop capacity			Unstandardized crop						
	general, t/ga	marketable, t/ga	marketable, %	The whole		which includes, %				
				t/ga	%	small	with pro-tuberances, gre-enish	me-cha-nically dama-ged	dama-ged by pests	dama-ged by dise-ase
West zone steppe, Zhovkva district										
Control	33,7	26,0	77,0	7,7	23,0	6,1	0,3	4,4	3,2	9,0
Planriz	36,7	30,4	82,7	6,3	17,3	5,8	0,0	4,0	2,9	4,6
Rydomil Gold MZ	39,1	33,8	86,2	5,3	13,5	4,1	0	2,7	1,3	4,8
Planriz + Rydomil Gold MZ	37,4	32,6	87,1	4,8	12,9	4,3	0	3,0	2,4	3,1
<i>ID₀₅</i>	1,4	1,0								
West Polesie (Radekhiv district)										
Control	34,0	27,3	80,2	6,7	19,8	6,7	0,5	2,9	2,2	7,5
Planriz	38,3	32,8	85,8	5,5	14,2	6,3	0,1	2,3	2,3	3,2
Rydomil Gold MZ	41,1	34,5	83,9	6,6	16,1	6,5	0,0	3,2	1,1	5,3
Planriz + Rydomil Gold MZ	40,1	35,4	88,2	4,7	11,8	4,7	0,0	2,7	1,2	3,5
<i>ID₀₅</i>	1,3	1,0								
Carpathian Foothills area, Stryj district										
Control	29,2	20,4	70,0	8,8	30,0	7,1	0,0	4,6	8,9	9,4
Planriz	32,1	24,2	75,5	7,9	24,5	6,3	0,1	4,9	6,8	6,4
Rydomil Gold MZ	44,6	29,2	65,3	15,5	34,7	6,7	0	4,0	10,0	8,7
Planriz + Rydomil Gold MZ	35,3	30,6	86,7	4,7	13,3	4,3	0	2,8	2,0	3,9
<i>ID₀₅</i>	1,5	1,2								
Carpathian, Skole district										
Control	21,0	14,4	68,7	6,6	31,3	16,8	0,2	2,8	1,9	9,6
Planriz	25,5	19,6	76,8	5,9	23,2	12,1	0,4	1,9	1,6	7,2
Rydomil Gold MZ	26,1	19,8	75,6	6,4	24,4	14,6	0,3	1,3	2,7	5,7
Planriz + Rydomil Gold MZ	28,6	23,3	84,3	5,3	18,7	11,5	0	3,0	1,8	2,3
<i>ID₀₅</i>	1,1	1,0								

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Zavadska O.V., Kolisnyk E.M.

**VARIABILITY OF BIOCHEMICAL PARAMETERS IN POTATO TUBERS
DURING LONG TERM STORAGE***National University of Life and Environmental Sciences of Ukraine**Kyiv, Heroyiv Oborony, 13, 03041*

The results of research of economic-biological, biochemical parameters and trade indexes five varieties of potato tubers are presented in the article grown in conditions of the Ukraine's Forest-steppe. For complex of parameters among the studied varieties evolved tubers Rozara and Labadia. The content of the basic biochemical indicators dominated tuber varieties Sifra. For long term storage tubers were most suitable varieties Sifra and Satina.

Keywords: potato tubers, variety, quality, biochemical parameters, starch, ascorbic acid, storage, loss

Introduction. Ukraine has grown each year over 20-22 million tons of potato tubers. This intensive culture, which is able to give harvest of 30-50 tons / ha, equivalent to 11-18 tons / ha of grain crops [1,2]. To obtain high yields greatly depends on the variety [3].

The potato - a valuable and indispensable food. Nutritional and biological value determined by the content of tubers basic biochemical compounds, primarily – dry matter, carbohydrates, proteins, vitamins, etc. Amount biologically valuable component determines the suitability of tubers for processing or long-term storage and much depends on the varietal characteristics [2,3,5].

Marketability of products is also important, as this parameter depends greatly on the efficiency of potato tubers, so –manufacturing in general. In addition, for long-term storage suitable only standard tubers [5]. One of the objectives of our research was rating parties' potato varieties studied for crop capacity, commodity, organoleptic and biochemical parameters.

Material and methods research. The study was conducted during 2013-2014 years in accordance with the method of single-factor experiments. For experiments selected 7 varieties and hybrids recommended for cultivation in the conditions of Ukraine's Forest-steppe. Standards were determined variety of variety Rosara used in Ukraine, recommended for zone Forest-steppe and registered in 1997 year [6]. Biochemical, commodity and organoleptic tests were performed in potato research and teaching laboratory of storage, processing and product standardization by the generally accepted methods [4]. Tubers stored in stationary storage without artificial cooling during seven months.

Results of research. Tubers studied varieties differed biometric and morphological parameters (Table 1). Important in practice, post-harvest handling and storage with indicators such as the mass of bubbles, their marketability and contents of the main biochemical parameters [7].



Table 1

Quality of potato tubers different varieties, average for 2013-2014 years

Name of the variety	Biometric parameters		The content of chemical elements in tubers			Marketability, %
	weight, g	diameter, mm	dry matter, %	starch, %	ascorbic acid, mg%	
Rozara (control)	140.2	62.0	24.2	17.0	12.3	90.5
Aroza	111.5	56.5	19.4	13.6	11.2	86.2
Satina	88.0	54.5	22.0	15.8	8.4	88.5
Labadia	130.4	59.0	18.3	12.2	4.9	90.6
Sifra	96.8	49.1	28.0	20.2	14.5	88.4
NIR ₀₅	7.8-8.1		1.5-1.8			1.3-1.8

The largest mass marketable of tubers was variety Santa Rozara (control) – 140.2g and Labadia (130.4 g). One of the main biometric indicators normalized current standards is the size of tubers for the largest transverse diameter. For transverse diameter of the largest varieties of tubers studied comply with the requirements of existing standards. The shape of tubers all grades were rounded-oval – shape index was 1.1-1.4.

Contents of dry substances in the tubers fluctuated within 18.3-24.2 %. No substantial correlation between ripening variety and dry matter content were found.

The greatest amount of dry matter detected in potato tubers grade Sifra – more than 28.0 % dry matter, which is 3.8 % more than in the control.

The greatest amount of starch as solids contained tuber varieties Sifra – 20.2%. For this indicator could refer to a group of tubers that have a high starch content (20 %). Tubers sorts Rozara (control) and Satina by starch content belong to the group of middle its content (15-20%); tubers of other varieties studied were characterized by low starch content (12-15%).

Tubers sorts studied the contents of the titrated acids did not significantly differ. Their accumulated from 0.28 to 0.32 %.

Content of monosaccharide affects the susceptibility to darkening tubers and their suitability for processing. The content of sugars in the tubers studied varieties ranged from 0.20 to 0.45 %. As a result of the correlation analysis revealed that the sugar content in potato tubers significantly affect their susceptibility to rotting ($r = 0.76 \pm 0.07$).

Ascorbic acid is accumulated in tubers of different varieties range from 8.4 to 14.5 mg%. The highest contents of vitamin C also accumulated tuber varieties Sifra – 14.5 mg%, 2.2 mg% more compared to the control. Significantly less vitamin C was in grade tubers Labadia – 4.9 mg% (7.4 mg% less than in the control variant tubers).

The content of basic biochemical parameters separated grade Sifra in tubers which accumulated the greatest amount of dry matter (28.0 %), starch (21.2 %) and ascorbic acid (14.5 mg%).



For long-term storage tubers are only suitable standard. So, one of the objectives of our research was commodity estimation parties studied potato varieties. Highest standard of tubers formed plant varieties Rosary (control) and Labadiya – more 90,0% (3,8% compared with the standard). Significantly lower this index compared to control samples of was in grade Aroza – 86.2% (4.3 % less than in the control). Established that on traumatized tubers influenced their weight and shape index. That, most mechanically damaged tubers found in a variety of varieties Rosary (control) and Labadia.

Established a close direct correlation between the mass tubers and their marketability ($r = + 0,72$). There was no significant difference between the tubers for marketability grades Satina and Sifra.

As in the any living organism, in potato tubers in storage period occurring biochemical changes. From their intensity depends on keeping quality, these losses, taste, disease resistance (Table 2).

Table 2

Variability of biochemical parameters in potato tubers during long term storage

Name of the variety	The content in tubers of basic biochemical parameters											
	dry matter, %		soluble substances, %		starch, %		acid, %		invert sugar, %		ascorbic acid, mg%	
	to storage	after storage	to storage	after storage	to storage	after storage	to storage	after storage	to storage	after storage	to storage	after storage
Rozara (control)	24.4	21.2	4.2	6.0	17.0	13.4	0.32	0.27	0.45	0.70	12.3	11.9
Aroza	19.5	16.0	4.0	6.0	13.6	11.4	0.32	0.27	0.20	0.73	11.2	7.9
Satina	22.1	18.4	4.6	6.2	15.8	11.6	0.32	0.30	0.33	0.71	8.4	5.7
Labadia	18.9	15.7	4.9	5.8	12.2	10.3	0.28	0.30	0.40	0.65	4.9	2.3
Sifra	27.9	24.8	5.4	7.0	20.2	17.2	0.32	0.34	0.34	0.67	14.5	8.8

After seven months of storage in the tuber dry matter content remained quite high, ranging from 15.7 to 24.8%. How to store most of them were in potato tubers



grade Sifra – 24.8%, 3.6% higher than in controls. The period of storage tubers lost 2,8-3,7% dry matter.

The content of dry soluble substances and sugars during the period of storage of tubers all varieties increased. The value growth depended on the variety. Most sugars after storage installed in tubers variety Aroza – 0.73%. The content of their increased almost threefold compared to the initial value.

During the period of storage of tubers significantly decreased content of ascorbic acid, and reduced their biological value. The highest biological value after seven months of storage had tubers variety Rozara (kontrol) – 11.9 mg% of ascorbic acid. However, the higher the nutritional value was of potatoes variety Sifra – 24.8% dry matter and 17.2% starch.

Ascorbic acid is directly involved in the metabolism, acts as a catalyst decomposition of complex reactions of chemicals in a simple. Dynamics of ascorbic acid content in potato tubers during storage shown in Figure 1.

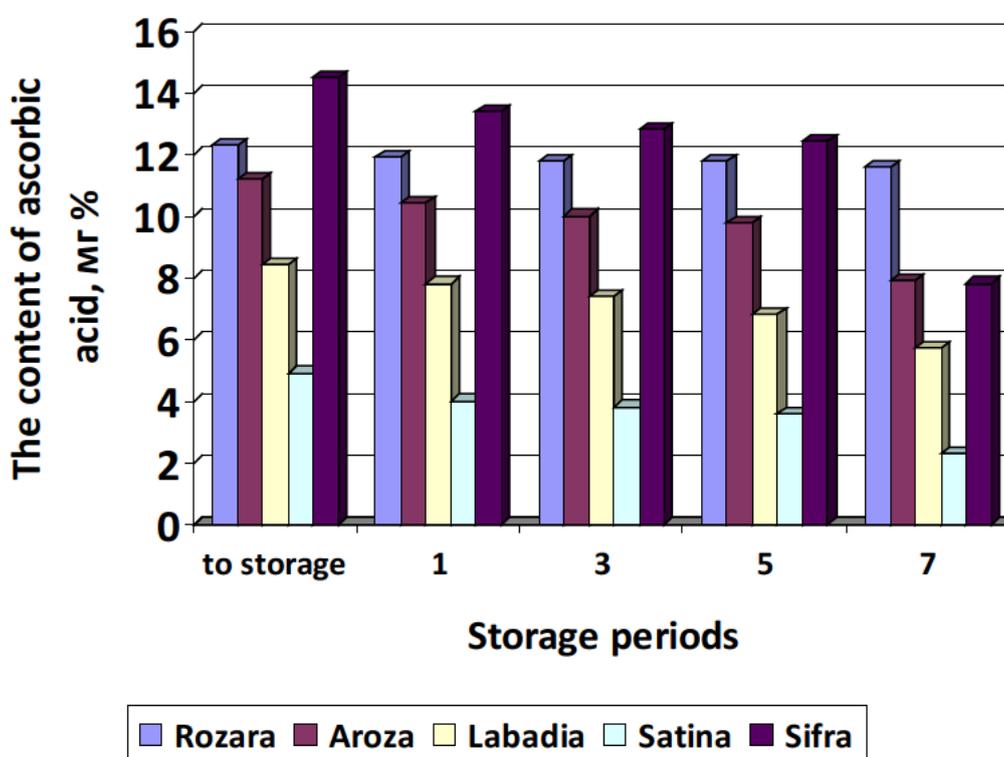


Fig. 1. Dynamics of ascorbic acid content in potato tubers during storage

Thus, the storage period smallest lost starch tuber varieties Sifra and Satin – loss in relative percent of were 14.9 ta 15.6% respectively. Most sugars accumulated tuber variety Aroza – their content storage period increased almost threefold. The most economically spent ascorbic acid during storage of tubers variety Rozara (kontrol) – its content decreased by 0.7 mg% or 5.7%.

After 7 months of storage the highest nutritional and biological value with tuber varieties Sifra and Rozara (kontrol) (Figure 2). They keep the highest dry matter content (24.8 and 21.2% respectively), starch (20.2 ta 17.0%) and ascorbic acid – 8.8 and 11.9 mg%.

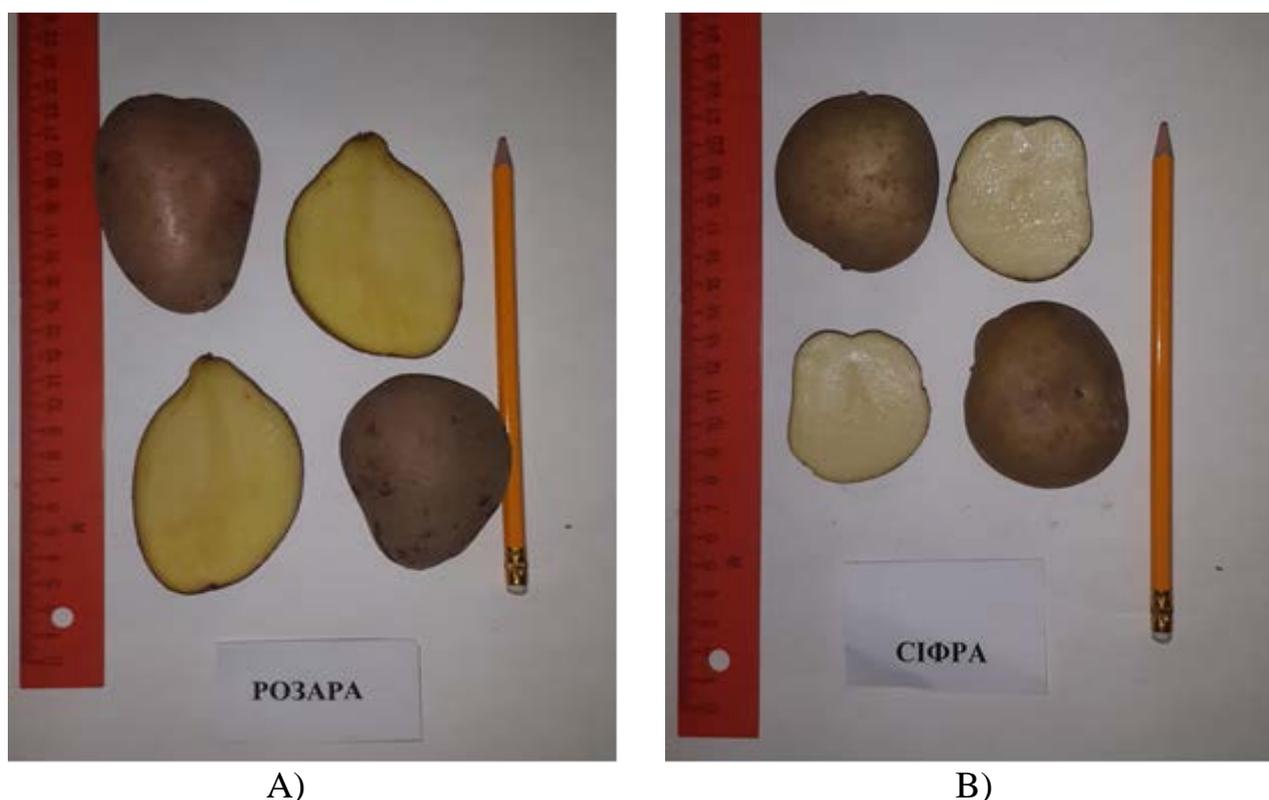


Fig. 2. The tubers of varieties Rosarf (A) and Sifra (B)

Conclusions: Thus, for complex of biometric and commodity parameters among the studied potato varieties were distinguished varieties Rozara and Labadia. which form the largest tubers and have high marketability (90%).

The content of basic biochemical parameters dominated tuber grade Sifra in tubers which accumulated the greatest amount of dry matter (28.0 %), starch (21.2 %) and ascorbic acid (14.5 mg%). The highest estimate tasting received tubers varieties Rozara.

After 7 months of storage the highest nutritional and biological value with tuber varieties Sifra and Rozara (control) (Figure 2). They keep the highest dry matter content (24.8 and 21.2% respectively), starch (20.2 ta 17.0%) and ascorbic acid – 8.8 and 11.9 mg%.

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Bober A.V.

FORMATION OF ESSENTIAL OIL CONTENT IN HOP CONES DEPENDING ON THE VARIETAL CHARACTERISTICS AND GROWING SEASON TERMS

*National University of Life and Environmental Sciences of Ukraine
Kyiv, Heroyiv Oborony, 13, 03041*

Abstract. The effects of the varietal characteristics and conditions of the vegetation on the content of essential oils in hops cones. Established that the content of essential oils in hops varieties of aromatic type affect more features than the variety of vegetation weather conditions.

Key words: Varieties, hop, essential oils, hop cones, vegetation conditions.

The essential oil of hops – volatile, oliyepodibna liquid. Formed in the cones of hops and has a pleasant fragrance. Aromatic substances essential oils are concentrated mainly in lupulinovyh glands cones.

The content of essential oil in different varieties of hop cones ranges from 0.1 to 3.0 % [7]. Quality of essential oil is a sign of quality seeds is controlled at the genetic level is a reliable criterion for identifying breeding varieties. Essential oil provides specific characteristic hop aroma. Despite the fact that 80-90 % essential oils lost by boiling the wort with hops, that it makes the hop aroma of beer [2,3]. It should be noted that the quality of essential oil in breeding varieties of hops different. The aroma of hop cones aromatic varieties such gentle, high quality, whereas bitter varieties – rough, sharp. Because essential oil has an important role in the pricing of hops. This is because the subtle aroma hops characteristic feature is its high quality brewing.

Aromatic substances like bitter, concentrated in lupulinovyh glands. Essential oil accumulated only during the maturation of hops, the amount gradually increasing. In overripe hop number of essential oil does not decrease, but some of its components are oxidized and hops loses its delicate flavor. When the essential oil contains large amounts of monoterpenes it is transparent, and when presented sesquiterpenes and oxidized compounds – light yellow [1,2,3,7].

Essential oil – a complex mixture of hydrocarbons and oxygen-containing compounds, preferably terpene series [7]. Percentage distribution of individual components of the essential oil is genetically determined, that depends on variety and changes little under the influence of external factors such as the mineral composition of the soil and climate [4,7].

The quality of the essential oils in the cones of different hop varieties breeding very excellent. The composition of the essential oil is more than 300 compounds. Essential oils consists of two main factions: the hydrocarbon and oxygen-containing. Aroma cones aromatic hop varieties, very gentle, high quality. Varieties of hops aromatic type hops on the world market are valued much more than rough bitter varieties. Farnezenu presence in the essential oil is characteristic of the type of



aromatic varieties of hops and tonkoaromatychnyh Czech Republic, Germany, Poland and Ukraine [7,8].

According to research [5], composed of essential oils includes more than 200 components, 95 % of which were identified, 70 % were hydrocarbons, and the remaining 30 % – a mixture of alcohols, esters, ketones. There are three main groups of hops: a) varieties which contain mirtsen, kariofilen, humulen; b) varieties which have, in addition to the above components farnezen; c) varieties rich in hydrocarbons, boiling point which is higher than the boiling point humulenu and do not represent value for brewers.

Therefore, for qualitative assessment of hops and hmeleproduktiv taken to determine the total content of essential oil, and for a more accurate identification of varieties determining components of hydrocarbon fractions of essential oil (mirtsen, kariofilen, humulen).

Given that the existing literature data on the effect of weather conditions on the formation of complex substances in hops cones varied and very limited, so the researches we paid attention to the study of the subject content of essential oil based varietal characteristics.

The aim of research was to study the effects of vegetation and varietal characteristics essential oil content in hop cones.

Material and methods of research. Research carried out during 2014–2015 years the department has storage technology, processing and product standardization Ya. prof. BV Lesik NUBiP Ukraine and certified laboratory in the Department of Biochemistry hops and beer Institute of Agriculture Polissia NAAS of Ukraine. Research conducted with the most common varieties in terms of production of hop aroma type: Slavyanka (control), National, Zagrava that are grown in JV «Union of Brewers and hmelyariv" Chudnovsky district, Zhitomir region with. Karpivtsi.

Results. The content of hop essential oil is an important component that determines the value of the raw hops. Essential oils contained in hops has a pleasant aroma. This fragrance depends on the varietal characteristics, weather and climate, the timing of collection, storage and others. As a result of studies found that the formation of hop cones as domestic varieties of the aromatic type as raw materials for beer production, is based on the characteristics of the variety of vegetation and weather conditions (Fig.).

Depending on the particular variety and agro-climatic conditions in the accumulated hop cones from 0.61 mg / 100 g (in a variety of control Slavyanki) to 0.83 mg / 100 g (Zagrava) essential oil. Fewer essential oil was observed in 2015 in the National varieties – 0,55 mg / 100 g and Zagrava – 0.66 mg / 100 g This is because the spring growing season in 2015 was extremely unfavorable for the growth and development of plants hops. The average air temperature exceeded the average long-term rates on 1,2–4,4 ° C, precipitation for the period amounted to only 50 % of normal, during this period form the hop plant and provides potential for future harvest.

On average in 2015 was at record high temperatures in the growing season, which was 16.1 °C, while the average long-term – 12.5 °C. The lack of rainfall and high temperature negatively influenced the formation and accumulation of essential



oil of hop cones. High content of essential oil was observed in 2014 in varieties Slavyanka – 0.67 mg / 100 g and Zagrava – 1.0 mg / 100 g.

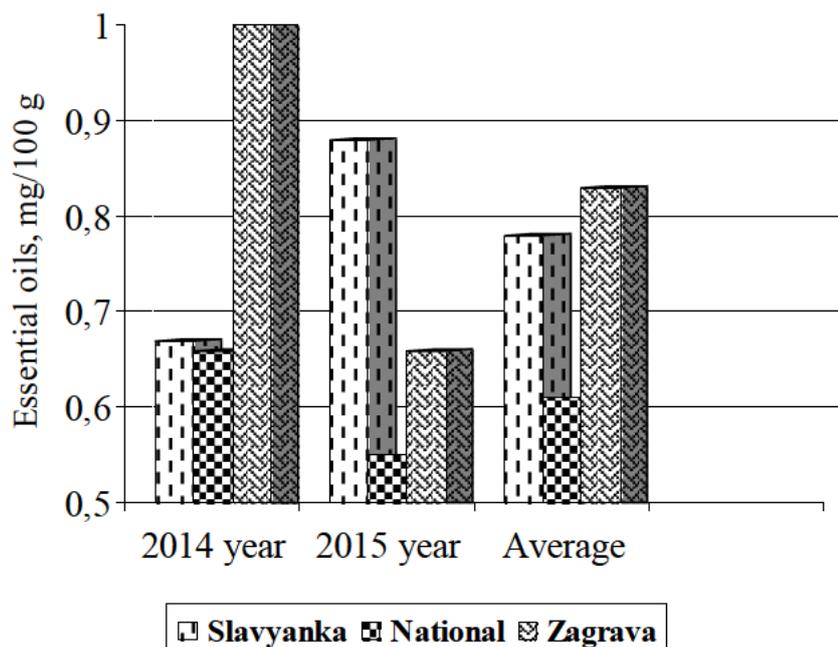


Fig. The content of essential oils in hops cones, mg / 100 g for the 2014-2015 biennium.

From the literature it is known [7] that the content of essential oils in hops varieties ranges from 0.1 to 3.0 %, which is confirmed by our research.

According to the classification [5], these varieties of hops can be attributed to the group of varieties rich in essential oil. The minimum amount of essential oil was observed in cones of hop varieties National – 0.6 mg / 100 g, which is in the same classification belongs to the group of varieties low in essential oil (Table.).

Based on the analytical data (Table.) Held two-factor ANOVA experiment tested the hypothesis and found statistical significant difference between the varietal characteristics hops growing season weather conditions and changes in the content of essential oil in th 5% significance level.

$$NIR_{05} \text{ flavor. varieties} = 0.12 (F_f(13.30) > F_T(2.69)).$$

Table

The content of essential oils in hops cones, mg / 100 g

Varieties of hops	2014 year	2015 year	Average	to ± control
Slavyanka (k.)	0.67	0.88	0.78	—
National	0.66	0.55	0.61	–0.17
Zagrava	1.0	0.66	0.83	+0.05
NIP ₀₅	0.02	0.01	0.12	—

Correlation ratio η_{yx} (1) for aromatic varieties of hops factor for type varieties (η_{yx} (1) = 0,35 ± 0,02) indicates moderate dependence of the content of essential oil on the characteristics of varieties of hops.



Analyzing the data, we concluded that quantitative resins, alpha-acids, essential oils can be used independently to identify the data selection varieties. Therefore, for accurate identification of breeding varieties only need to use modern methods of research – high performance liquid chromatography and gas, which makes it possible to present the quality of the components studied the chemical composition of hop cones. Studies have shown that between smoloproduktyvnisty and the accumulated number of essential oils in hops cones there is a correlation.

The close correlation between the content of total resins and essential oil shows the relationship biosynthetic pathway of these substances in lupulinovyh glands of hop cones. The coefficient of determination (R) shows that 83–85 % dependent accumulation of total resin content of essential oils in hops cones.

Conclusions

1. Formation of hop cones as domestic aromatic varieties such as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. Depending on the particular variety and agro-climatic conditions in the hop cones accumulate essential oil of 0.61 mg / 100 g in the National class to 0.83 mg / 100 g glow.

2. The content of essential oil of aromatic hop varieties such features affect more variety. Found the average connection between the characteristics of the variety and content of essential oil ($\eta_{yx}(1) = 0,35 \pm 0,02$) in the context of botanical varieties.

3. Between smoloproduktyvnisty and the accumulated number of essential oils in hops cones there is a correlation. The close correlation between the content of total resins and essential oil shows the relationship biosynthetic pathway of these substances in lupulinovyh glands of hop cones. The coefficient of determination (R) shows that 85% dependent accumulation of total resin content of essential oils in hops cones.

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**j1109-009****UDC 678.746.4:631.57:582.635.38****Bober A.V., Lotovskyy V.V.****FORMATION OF CONTENTS POLYPHENOLS IN HOP CONES
DEPENDING ON THE VARIETAL CHARACTERISTICS AND GROWING
SEASON TERMS**

*National University of Life and Environmental Sciences of Ukraine
Kyiv, Heroyiv Oborony, 13, 03041*

Abstract. The effects of the varietal characteristics and conditions of the vegetation on the content of polyphenols in hops cones. Established that the content of polyphenols in hops varieties of aromatic type affect more features than the variety of vegetation weather conditions.

Key words: Varieties, hop, polyphenols, hop cones, vegetation conditions.

Along with bitter substances and essential oil contained in the cones of hop polyphenols compounds. Polyphenols substances – a compound of a secondary source, but they play a very important role in the metabolism of plants. Established that the phenolic compounds involved in the processes of growth and development of plants in breathing, promote resistance against diseases, and is the material energy [3, 4]. The content of polyphenols compounds in different varieties of hop cones ranges from 2 to 6 %, depending mainly on the area of cultivation of hops, the timing of its collection and weather conditions of the year [1,5]. In cones hop polyphenolic substances are distributed as follows: the petals - 79.0 %; veretentsyah - 13.0; lupulinovyh glands - 8.0 % [9].

Polyphenolic compounds hop cones, in addition to performing various physiological and biochemical functions in the cell, are important in the production of beer. Hop phenolic compounds differ from malt polyphenol composition varied considerably better soluble in water, more reactionary and therefore less stable. [6] A lighter acetified and large renewable capacity polyphenolic substances alfa-acid oxidation and the hops "protect" bitter substances, mainly formation of complexes. They also precipitated proteins wort and thus contribute to its lighting, and participate in shaping the taste of beer. Always gets better assessment beer made from hops, containing at least 4.5% of polyphenols [8].

Polyphenols are proantotsianidynamy hop, catechins, flavonolhlikozydamy, coumarin, substances such as chlorogenic acid and phenol carboxylic acids [2, 10]. Given the importance of polyphenolic compounds in the life of the plant organism and to obtain high-quality beer, you need technological quality cones estimate based on the content of these compounds in breeding varieties, the development of complex agronomic measures on growth, during post-harvest handling and processing, and storage hop cones and its products.

Given that the existing literature data on the effect of weather conditions on the formation of complex substances in hops cones varied and very limited, so the researches we paid attention to the study of the subject content of polyphenols, taking into account the varietal characteristics.



The aim of research was to study the effects of vegetation varietal characteristics and content of polyphenols in hop cones.

Material and methods of research. Research carried out during 2014-2015 years the department has storage technology, processing and product standardization Ya. prof. BV Lesik NUBiP Ukraine and certified laboratory in the Department of Biochemistry hops and beer Institute of Agriculture Polissia NAAS of Ukraine. Research conducted with the most common varieties in terms of production of hop aroma type: Slavyanka (control), National, Zagrava that are grown on hmeleplantatsiyah JV «Union of Brewers and hmelyariv" Chudnovsky district, Zhitomir region with. Karpivtsi.

Results. As a result of studies found that the formation of hop cones as domestic varieties of the aromatic type as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. The research results polyphenolic compounds in breeding varieties of hops are shown in Fig.

The experimental data (Fig.) Shows that the number depending on the genotype of total polyphenolic compounds ranging from 4.2 % to 5.6 %. Different amount of polyphenol compounds in cones breeding varieties that were grown in the same conditions, with varying intensity yazana'pov formation and accumulation of these compounds depending on the particular variety and vegetation conditions during the research.

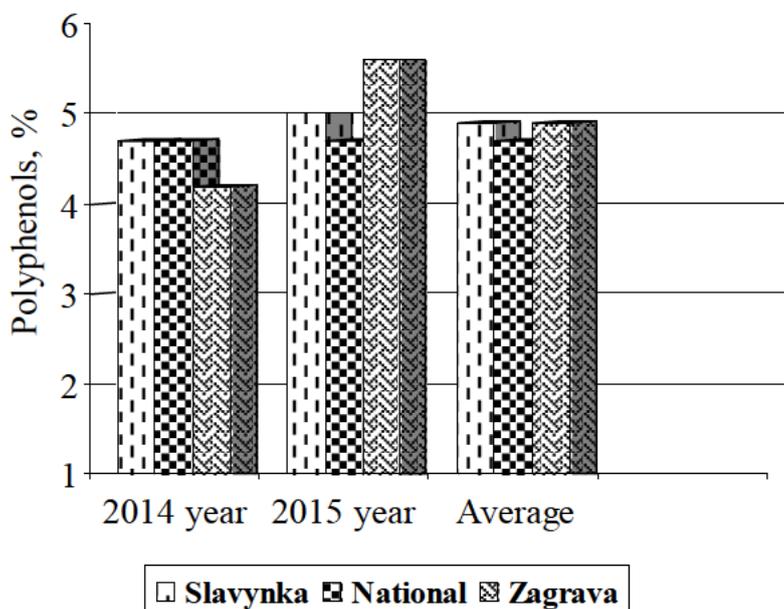


Fig. The content of total polyphenols in hop cones% for the 2014-2015 biennium.

Analyzing the data table held two-factor ANOVA experiment polyphenols content changes depending on pomology general characteristics of the variety and weather conditions of vegetation.

Was established significant difference between the varieties of hops on the content of total polyphenols th 5% significance level.

$$\text{NIR}_{05 \text{ flavor. varieties}} = 0.42 (F_f(122.30) > F_T(2.69)).$$



Correlation ratio η_{yx} (1) for aromatic varieties of hops factor for type A (η_{yx} (1) = $0,62 \pm 0,02$), for factor B (η_{yx} (1) = $0,33 \pm 0,03$). Thus, the accumulation of polyphenols in hops aromatic varieties such features affect more variety (as the correlation ratio is 0.62, which indicates the average relationship between these factors).

Table

The content of total polyphenols in hop cones, %

Varieties of hops	2014 year	2015 year	Average	to \pm control
Slavyanka (k.)	4,7	5,0	4,9	–
National	4,7	4,7	4,7	–0,2
Zagrava	4,2	5,6	4,9	0,0
NIP ₀₅	0,23	0,13	0,42	–

Correlation ratio of 0.33 indicates a connection between the average impact factor of the weather and the accumulation of total polyphenols.

According to the literature [7], in the process of maturation of hop cones decreases the amount of polyphenols. It is proved that the maximum number of observed in the phase formation of cones, the minimum – in the phase of physiological maturity. The vegetation period of 2015 was characterized by higher air temperatures and lack of moisture, so hop phase of technical maturity and the timing of its collection began earlier than usual. In 2015, observed a high content of polyphenols in hop cones compared to 2014 year.

Conclusions

1. Formation of hop cones as domestic aromatic varieties such as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. Depending on the particular variety and agro-climatic conditions in the cones of hop polyphenolic substances collected from 4.2% to 5.6%.

2. Polyphenol content in aromatic hop varieties such features affect more variety. Revealed links between the average grade features and content of polyphenols factor A (η_{yx} (1) = $0,62 \pm 0,02$) in the context of botanical varieties.

3. In 2015, noted the high content of polyphenols in hop cones compared to 2014 year. The vegetation period of 2015 was characterized by higher air temperatures and lack of moisture, so hop phase of technical maturity and the timing of its collection began earlier than usual, contributing to greater content of polyphenols.

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Yashchuk N., Chemersky A.

**SUITABILITY GRAIN OF BARLEY DIFFERENT PARTIES QUALITY
BREWING GOALS DEPENDING ON HOW STORAGE***National University of Life and Environmental Sciences of Ukraine**Kyiv, Heroyiv Oborony, 13, 03041*

Abstract. The dynamics of technological parameters of malting barley quality various parties depending on the method and duration of storage was investigated. It is established that grain 1st party is suitable for brewing and can be implemented first class quality within twelve months of storage for storage in polymer sleeves. Grain 2 party in the normal storage for the first 1-9 months of performance ability for germination 95-97% can be used in brewing 1st class quality. Variance analysis studied parameters during storage of malting barley showed significantly different parties higher impact way of storage.

Key words: grain, barley, party, quality, brewing, storage, term, ways.

Study of the technological properties of grain and influence of environmental conditions showed that the intensity of all processes that occur in it depends on the same factors, the most important of which are: grain moisture and the environment; grain temperature and surrounding objects; air access to grain.

Modern storage technology based on the use of three modes: mass storage of grain in the dry state, the critical moisture; storage of grain mass in the cooled state, when their temperature is lowered to the limit, which greatly hinders the vital functions of components of the grain mass; grain mass storage without air that is in a sealed condition.

Select the mode and method of storage is determined by a number of conditions, including the need to take into account the climatic conditions of the area, where the economy; types of silos and their capacity; technical capabilities that have to prepare the economy for proper storage of grain; the purpose of the parties grain; party quality grain; economic feasibility of a particular regime [1, 3, 5, 6].

One of the best examples regime storage of grain is without air storage in plastic sleeves. The most important advantages of plastic bags for grain are low cost and simplicity. Plastic bags allow you to pack and store grain directly at growing that promotes rapid harvesting process, because at this time the transport system and product acceptance overwhelmed [2, 4].

Materials and methods. Tests to determine the quality of barley were conducted with samples of spring barley varieties Dacha as the two parties: the first batch of high initial indicators of quality class 1 brewing (control) and the second batch of low initial rates as unsuitable for brewing. Studies conducted in the laboratory of department technology of storage, processing and standardization of plant products after prof. B.V. Lesik of NULES of Ukraine for 2014-2016 years. In two ways: storage: grain storage in normal tissue bags; grain storage in sealed polymer sleeves of thickness 90 microns.



Quality assessment was performed after harvesting (control), after one, three, six, nine and twelve months storage of barley.

Analyses were carried out by methods state standards.

Results. When storing barley investigated parties happening slight fluctuations in humidity, less noticeable during storage in polymer sleeves – within 0.1-0.2 % and a more prominent when stored under normal warehouse conditions – within 0.1-0.6 %.

Storage in polymer sleeves provides less change in moisture content of barley during storage due to its sealing and thus less interaction with the environment.

1000 grain mass index – a measure of technological and sowing. What larger grain output by more malt. At the same time, large seed is more viable, as have more supply of nutrients.

Barley samples had high rates of weight of 1000 grains – 43.7 and 45.4 g, which may be a good sowing material and good raw material for malt during brewing (tab. 1).

Table 1
Changing the mass of 1000 grains of barley different parties during storage, g

Parties	Way of storage	To storing (control)	Period of storage, months				
			1	3	6	9	12
1	Normal storage facility (control)	45.4	46.1	46.0	46.0	45.8	45.5
	Polymer sleeve	45.4	45.5	46.3	46.4	46.3	46.1
2	Normal storage facility	43.7	43.9	44.0	43.3	43.9	43.7
	Polymer sleeve	43.7	43.7	44.5	44.7	44.8	44.7
LSD ₀₅			0.4-0.9				

During storage was slight fluctuation mass of 1000 grains, which does not exceed 1%. The first half was characterized by low growth rate, and the second a gradual decrease. As in the first case associated with increasing mass due to the formation of complex compounds from simple during post-harvest ripening in turn are more complex compound density and thus weight. Reducing mass is due to the cost of complex substances, including carbohydrates for respiration.

As already noted, an important indicator which determines the quality of beer is the protein content in barley grain.

To storing grain barley 1st party with 10.7 % protein, allowing its use for brewing the first class quality. A 2nd batch of protein 11.3 % – is only second class (tab. 2).

During storage protein change was within the error of the experiment ($\pm 0,5$ %).

Also the variation of this indicator was due to a decrease or increase in the ratio of starch. The most stable indicators (variations within 0.1 %) provide storage of barley in plastic sleeves.

**Table 2****Changing the protein content in barley grain of different parties during storage**

Parties	Way of storage	To storing (control)	Period of storage, months				
			1	3	6	9	12
1	Normal storage facility (control)	10.7	10.9	10.8	10.6	10.6	10.4
	Polymer sleeve	10.7	10.7	10.8	10.8	10.7	10.6
2	Normal storage facility	11.3	11.4	11.5	11.4	11.3	11.1
	Polymer sleeve	11.3	11.3	11.4	11.4	11.4	11.3
LSD ₀₅		0.2-0.3					

Analysis of variance dynamics of protein during storage of malting barley different parties showed a statistically significant impact methods and longevity in the study figure $F_{\text{calc}} > F_{\text{crit}}$. In particular, during the storage of barley significantly higher impact on the protein content was a way to store $F_{\text{calc}} = 113.88 > F_{\text{crit}} = 3.29$ and somewhat less shelf life $F_{\text{calc}} = 4.79 > F_{\text{crit}} = 2.90$.

Important quality indicators that determine the suitability of barley for brewing, is the ability to germinate and vitality.

To keeping the ability to germinate grain barley 1st party having a rate of 95 % belonged to the 1 class brewing and 2 party – 90 % (with a minimum of 92 %) - does not allow grain barley of the party in brewing (Table 3).

Table 3**Dynamics ability to germinate barley different parties during storage, %**

Parties	Way of storage	To storing (control)	Period of storage, months				
			1	3	6	9	12
1	Normal storage facility (control)	95	100	100	100	100	93
	Polymer sleeve	95	97	100	100	99	97
2	Normal storage facility	90	96	97	96	95	93
	Polymer sleeve	90	93	99	95	93	90
LSD ₀₅		4-6					

In the first months of storage due to the passage of post-harvest ripening growth rate was the ability to germinate. After the first month of storage capacity for the highest rate of germination was 1 party and in normal storage repository (100 %). Due to higher initial rates of 1 party for storage and faster passage of maturation in normal storage repository (where free access of oxygen). Somewhat lower rate (96 %) after one month was in the 2nd batch of barley. However, it allowed the use of grain for brewing barley party purposes.



The highest rates of germination reached capacity for grain barley investigated parties for storage in plastic sleeves after three months: 100 % – 1 party and 99 % – 2 party.

A significant decrease in the ability to germinate for all investigated variants were observed after twelve months of storage – at 3-9 % compared with the third month of storage.

When storing barley of the 1st batch of high initial quality indicators and humidity below the critical (13.1 %) use plastic sleeves ensure better preservation capacity for storage – 97 % compared with storage in normal storage 93 % (end of life). At the same time, after twelve months storage of grain barley 1st party in the normal storage can be used in brewing only second class quality, for storage in plastic sleeves – 1 class.

A completely different situation when stored barley 2 party. In particular, the end storage 93 % higher performance storage provides simple compared to polymeric sleeve – 90 %. Net capacity for germination 2 parties can be explained by higher moisture percentage (14.2 %), which adversely affects the embryo in the absence of oxygen.

You should also note that the storage of barley 2 party in the normal storage for the first nine months of performance capacity for germination 95-97 % can be used in brewing 1 class quality. A grain that was kept in plastic sleeves for only a 3-6 month provides 1 class brewing.

However, after twelve months storage of grain barley 2 party again is not suitable for use in brewing.

Mathematical treatment by analysis of variance dynamics ability to germinate during storage of malting barley different parties showed a statistically significant impact methods and in shelf life in investigational index $F_{\text{calc}} > F_{\text{crit}}$. In particular, during the storage of barley significantly higher influence on the ability to germinate was a way to store $F_{\text{calc}} = 12.35 > F_{\text{crit}} = 3.29$ and somewhat less shelf life $F_{\text{calc}} = 8.45 > F_{\text{crit}} = 2.90$.

Conclusions.

Much better performance in the 1st party ensures good preservation of grain for the duration. Grains party is eligible for brewing and can be implemented first class quality. However, after twelve months storage of grain barley 1 party in the normal storage can be used in brewing only second class quality, for storage in polymer sleeves – 1 class.

Grain of barley 2 parties during storage has passed post-harvest ripening and improved quality. Grain 2 parties in the normal storage for the first 1-9 months of performance capacity for germination 95-97% can be used in brewing 1st class quality, in polymer sleeves for only 3-6 month provides 1st class brewing. At the end of the barley grain storage 2nd party again is not suitable for use in brewing.

Analysis of variance of the studied parameters during storage of malting barley different parties showed a statistically significant impact method and in shelf life with a much higher impact on quality indicators storage method.



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I. Bobos, V. Lopata *

AN INFLUENCE OF PLANTING TERMS FOR THE WINTER GARLIC VARIETIES' PRODUCTIVITY IN THE CONDITIONS OF KYIV REGION*National University of life and environmental sciences of Ukraine,**Kyiv, Heroyv Oborony str., 15, 03041*

Abstract. It was studied and evaluated the planting terms for the varieties of garlic Prometheus and Sophiyvskiy in the Kiev region by precocity, yield, and resistance to pests and diseases that will give the possibility to use them in the production. It was established that the productivity of winter garlic was dependent on the variety, and the terms of planting. By using the second term of planting (III decade of October) the commodity yield of garlic was higher for both varieties Prometheus (8.1 t / ha) and Sophiyvskiy (6.5 t / ha), due to better winter hardiness of plants (100%), high resistance to diseases and pests (70-75%) and higher average weight of heads 25.6 and 20.7 g

Keywords: winter garlic, variety, term, planting, yield, bulb

Introduction. Garlic is very common vegetable crop in the world. It is one of the main suppliers of natural vitamins, sugars, organic acids, fiber, minerals and other valuable substances for our organism that provide the full nutrition. This is the best antiseptic with strong bactericidal and phytoncide effects that increases its importance, especially during virus outbreaks [1,3,6].

The acute problem in front of the producers of canned fruit-vegetable products affects on the increase of garlic production [2,3,6]. However the proposals of the production are significantly behind from the increase of demand for the product. The widespread implementation of winter garlic is constrained by the lack of a sufficient number of varieties adapted to specific growing conditions. In addition, in order to obtain the high yields of the crop – the main issue remains the selection of the optimal terms of planting.

Literature review. Taking into account the biological characteristics of garlic enables to use more efficiently the certain elements of crop's growing technology. For winter garlic varieties the most important are planting terms, the size of chives, frost and winter resistance. Also for all varieties an important is their resistance to diseases and pests [2,3,5].

Recently, the production of vegetable crops has decreased due to the primarily low yield because of non-receiving enough the basic elements of growing technology, including the optimal seedling terms. Furthermore, the sowing terms impact not only on the yield but also on the quality of the product that makes the products' storage and their use for different methods of processing [3,4,6].

It is known that the formation and growth of bulbs during the high temperatures adversely affect their quality indicators and storage [1,5,6]. Immature garlic bulbs, especially during early harvesting, start to lose earlier the dry substances and are more affected by diseases [1,3,5,6]. That's why it was the need to study the effect of



the planting terms during the winter garlic production that influence the economically-valuable indicators of varieties.

Output and methods. The study was carried out in 2014-2015 on the collection area of vegetable growing cathedra "Fruit-Vegetable Garden" in three stages by method of two-factor experiments [7]. It was studied the following winter terms: I-st decade of October (20.10) (control), III-rd decade of October (31.10), I-st decade of November (10.11). The scheme of winter garlic planting was 45×7 cm. The experiments were conducted with the domestic varieties Prometheus and Sofiyivskiy.

Results of experiments. The productivity of garlic was depended on variety and terms of chives' planting (Table. 1). The variety Prometheus was characterized by higher commodity yield of underground bulbs, for which was received significantly higher yield increase of 0,6t / ha during the planting in the third decade of October. The variety Prometheus obtained low marketable yield during the last term of planting, whose yield is 0.1 t / ha less compared to the control. The same regularity was observed for the marketability, which was higher for Prometheus variety during the second term of planting 87%. The low marketability was observed by the variety of Prometheus during the planting in I-st decade of November, which was 82% that is 2% less than the control variant.

Table 1

Economically-valuable indicators of garlic varieties depending on planting chives' terms

Variety (factor A)	Options of experiment (factor B)	Average weight of bulb, g	Commodity yield, t/ga			Average commodity yield, t/ga	Harvest increase		Marketability, %
			I	II	III		t/ga	%	
Prometheus	I decade of October (20.10) (control)	23,7	6,8	7,6	8,1	7,5	0	100	84
	III decade of October (31.10)	25,6	7,8	8,2	8,3	8,1	+0,6	+8	87
	I decade of November (10.11)	23,4	7,1	7,5	7,6	7,4	-0,1	-1	82
Sofiyivskiy	I decade of October (20.10) (control)	20,0	6,0	6,3	6,6	6,3	0	100	70
	III decade of October (31.10)	20,7	6,2	6,8	6,5	6,5	+0,2	+3	74
	I decade of November (10.11)	18,3	5,6	6,0	5,8	5,8	-0,5	-8	68
HIP ₀₅						0,6			
<i>factor A</i>						0,4			
<i>factor B</i>						0,2			



The plants of Prometheus varieties were distinguished by greater heights of bulbs during the second term of planting (III decade of October), the height of which was 48.1 mm and the average weight of the bulb - 25.6 g that is more for 1.9 g compared with the control.

The variety Sophiyvskiy had less an average weight per head during all terms of planting (18,3-20,7 t / ha) compared to the variety of Prometheus, that affected its marketable yield, which was 5,8-6,5 t / ha. However, higher marketable yield was obtained in the second planting term - 6.5 t / ha, that is 0.2 t / ha more than control.

Conclusions. The planting terms of chives affected on the economically-valuable indicators of winter garlic varieties. The obtained results show that high-productive varieties of garlic were Prometheus and Sophiyvskiy with chives' planting in the III decade of October, the marketable yield of underground bulbs of which was received respectively 8.1 and 6.2 t / ha with an average weight of marketable bulbs 25.6 and 20.7 g.

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**Supervisor: candidate of agricultural sciences, docent I.M. Bobos*

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Pikovska O.V.

**DEHUMIFICATION OF CHERNOZEM AND WAYS OF RESTORATION
SOIL ORGANIC MATTER**

*National University of Life and Environmental Sciences of Ukraine,
Kyiv, Heroiv Oborony 17, 03041*

Піковська О.В.

**ДЕГУМІФІКАЦІЯ ЧОРНОЗЕМІВ І ЗАХОДИ ВІДНОВЛЕННЯ
ОРГАНІЧНОЇ РЕЧОВИНИ**

*Національний університет біоресурсів і природокористування України,
Київ, Героїв Оборони, 17, 03041*

Abstract. In this paper the problem of reducing the content of humus in chernozem soil and causes of dehumification was researched. Describe ways to restore organic matter, found that reducing tillage and application of organic-mineral fertilizer system improves the condition of black soil humus.

Key words: humus, chernozem, reducing tillage, dehumification

Анотація. У роботі розкрито проблему зменшення вмісту гумусу у чорноземних ґрунтах і основні причини дегуміфікації. Встановлено, що мінімізація обробітку ґрунту і застосування органо-мінеральної системи удобрення сприяють покращенню гумусового стану чорноземів.

Ключові слова: гумус, чорнозем, мінімізація обробітку ґрунту, дегуміфікація

Introduction. In the present circumstances of agricultural production, special attention is attracted to one of the main resources of Ukraine - chernozem. Changes in the agricultural sector and land-use patterns require the development of modern methods of management.

Literature review. Medvedev V. [1] identifies four main types of soil degradation, mechanical, physical, chemical and physical chemical, which considers dehumification. Research questions of organic matter in the soil of Ukraine dedicated works of A. Balayev, V. Degtyarev, M. Laktionov, G. Mazur, A. Donghae and others.

Panas R. [2] notes that the reduction of humus in the soil is the most controllable measure reducing its fertility. Long-term studies show that the main causes of soil dehumification Ukraine is to reduce the overall culture of agriculture, reduction of organic fertilizers and uncontrolled development of water erosion and deflation. Unfortunately, the processes dehumification the last 20 years did not stop and continued with sufficiently high intensity.

The decrease of humus content and deterioration of its quality characteristics caused by a lack of permanent compensation plant remains and organic fertilizers current cost of organic matter, mainly because of biological its mineralization and changing relationship between salinity of fresh organic matter formation and stabilization of new humic substances in the soil [3]. For an estimation and forecast



the development dehumification using humus balance calculations and mathematical models [4].

Degradation processes common in Ukraine soils, cause, an estimated loss of productivity of major crops from 10-12 to 40-60%. This necessitates constant monitoring of soil, which is the basis for the theory and practice of management of soil, its environmental and productive function. Baluk S.A. emphasizes that the number one priorities in the field of soil should be optimizing content in soil organic matter, achieve a balanced balance of humus in the soil. According to objective data, over the past 100-120 years Ukraine soils have lost 20-25% of humus. In recent years, losses are 300-700 kg / ha per year [5].

Research Methods.

The study was conducted in two experiments. First - stationary experiment in EP NUBiP Ukraine "NDH Velykosnitynske them. O. MUZYCHENKO "of Fastiv district of Kiev region. Soil research area - a typical chernozem soil. The experiment includes three options tillage: plowing at 25-27 cm; reduced tillage on 23-25 sm; reduced tillage on 10-12 sm.

The second - the AOZT "Agro-Soyuz" Dnipropetrovsk region. Soil research area - ordinary chernozem humus. Compared three methods of tillage: plowing at 20-22 cm; reduced tillage on 10-12 sm and No-till. In the samples of soil humus content determined by the method of Turina in the modification V.Simakov.

Results.

Studies typical chernozem organic matter showed that fertilization is more influenced changes in humus content than the variants of tillage. The research results of stationary experiment showed that all systems fertilizer had greater influence on the humus content than tillage systems. The lowest humus content in the plow layer of chernozem model seen in variant without fertilizers for plowing - 3.44% (Table.).

Table

Effect of different tillage and fertilization of spring barley in typical chernozem humus content, %

Variants of fertilization	Variants of tillage		
	Plowing	Reduced tillage on 23-25 sm	Reduced tillage on 10-12 sm
Without fertilizer (control)	3,44	3,41	3,48
Straw 1,2 т/га+N ₁₂ + N ₅₅ P ₄₅ K ₄₅	3,56	3,62	3,64
Straw 1,2 т/га+N ₁₂ + N ₇₈ P ₆₈ K ₆₈	3,57	3,63	3,64
Straw 1,2 т/га+N ₁₂ + green manure+N ₇₈ P ₆₈ K ₆₈ + N ₅₅ P ₄₅ K ₄₅	3,61	3,65	3,67
Straw 1,2 т/га+N ₁₂ + green manure+N ₇₈ P ₆₈ K ₆₈	3,61	3,67	3,69

The highest humus content in the topsoil was at after-compatible version of the straw, green manure and fertilizers on tillage on 10-12 sm (3.69)%. Reduced of tillage depth also resulted in increasing differentiation 0-30sm layer. The content of



humus in the plowing layer in 0-15sm was 3.45 - 3.62% for tillage on 23-25 sm 3.46 - 3.71 %, and tillage on 10-12 sm 3.48 - 3.81%.

Consequently, organic-mineral fertilizer system compatible with mineral fertilizers, green manure and straw aftereffect best effect on humification typical chernozem. Skrylnyk E.V. [3] also notes that long-term use of organic and organo-mineral fertilizer systems in chernozem will help increase content of humus, humification degree of organic matter and causes a change in its composition. In studies [6] is a positive change group and fractional composition of humus reduced tillage and fertilization system with straw and green manure.

It was observed changes contents of humus and its distribution in the 0-30 cm layer of chernozem by various conventional cultivation. The top 0-10 cm layer logical characterized by the highest rates. At the same time, the option of zero tillage was the most distribution in the 0-30 cm layer (0,1-0,19% compared to the 10-20 cm layer), for plowing - 0,04-0,1%, and minimum tillage - 0 07-0,17%. Research ordinary chernozem humus content were conducted at the link rotation. We found that the highest humus mineralization was for growing corn, and the best conditions for humification were for winter wheat.

Conclusions.

1. One of the main conditions of preserving chernozem Ukraine is protection of dehumification which becomes threatening.
2. Reducing of tillage provided the highest content of humus in chernozem ordinary and typical chernozem.
3. Application of organic-mineral fertilizer system promoted increase humus content of a typical chernozem.

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Opryshko O. O., Pasichnik N. A.

ASSESSMENT OF THE ENERGY VALUE OF PINE BARK AS A RAW MATERIAL FOR THE PRODUCTION OF FUEL PELLETS*National University of Life and Environmental Sciences of Ukraine**Str. Heroiv Oborony, 15, Kiev, Ukraine.*

Опришко О. О., Пасічник Н. А.

ОЦІНКА ЕНЕРГЕТИЧНОЇ ЦІННОСТІ СОСНОВОЇ КОРИ ЯК СИРОВИНИ ДЛЯ ВИРОБНИЦТВА ПАЛИВНИХ БРИКЕТІВ*Національний університет біоресурсів і природокористування України,**м. Київ, вул. Героїв Оборони, 17*

Abstract: The influence of the bark content in pine pellets on their mechanical strength is studied. It is shown that wood pellets made from bark and branches have static bending strength compared with standard samples made of sawdust. It is proved that the bark is a promising raw material for production of wood pellets, without additional components. The strength of the granules obtained is the same as the pellets made from pine sawdust. Samples of bark and sawdust from the tree trunk were obtained from pine industrial wood. Tests were conducted according to the method created on the basis of "National State Standard 16483.3-84 Wood. The method of determining the ultimate strength in static bending".

Key words: wood pellets, bark, sawdust.

Анотація: Досліджено вплив вмісту кори в соснових брикетах на їх механічну міцність. Показано, що деревні гранули, виготовлені з кори і гілок, мають вищу статичну міцність на вигин порівняно зі стандартними зразками з тирси. Доведено, що кора є перспективною сировиною для виготовлення деревних брикетів, без додаткових компонентів. Міцність брикетів була такою ж, як і брикетів, виготовлених із тирси сосни. Зразки кори і тирси зі стовбура дерева були отримані з промислової соснової деревини. Випробування проводилися відповідно до методу, розробленого на основі "Національного ГОСТу 16483.3-84 Метод визначення межі міцності деревини в статичному вигині".

Ключові слова: деревні брикети, кора, тирса.

Currently, coal, oil and gas that are exhaustible energy sources provide about 80% of the energy demands of mankind. However, the availability of those resources is reduced. Its use make the negative impact on the environment such as acid rain, carbon dioxide emission and so on. Economic and political problems with energy supplies in Ukraine stimulates the search of alternative sources of energy such as solar, wind, use of biomass for energy [1, 2, 3].

Biomass energy accounts for less than 1 percent of U.S. electricity generation and 2 percent in Europe, where much of the available biomass is waste from lumbering operations in Finland and Germany [3]. Sharp rise in prices and changing conditions of gas supply in recent years have led to the introduction in Ukraine the heating technologies using wood pellets and briquettes. These technologies are used



in the EU. Traditionally wood pellets are made from sawdust. In modern manufacturing sawdust is used to produce chipboards. That makes sawdust a valuable resource. Therefore, its use for making wood pellets can be economically impractical. The perspective raw material for making wood pellets is bark. Volume content of bark in the wood of pine is 10-11% of the total volume of wood [4]. This amount of material that is not used in the processing industry, prompted us to research the efficiency of bark use as fuel [4, 5, 6, 7].

Dajneko and colleagues [8] investigated the chemical composition of the bark, and found that the percentage of elements that determine the caloric value such as C, H, O, N, P is almost according to the stem wood. It means that calorific values of bark were similar to stem wood. The main obstacle to the use of bark as raw material for wood pellets is their low mechanical strength [4, 6] that leads to their destruction during storage. The literature has emphasized the importance of such research. But Tsyvin [4] to create pellets used old-fashioned technology, products moisture content reached 20%. This indicator does not meet modern requirements. Rynkevych [6] carried out research exclusively for one type samples (bark content 10%), which would be insufficient to determine the dependence.

The aim of this essay is to explore the relationship between content of the bark in wood pellets composed of pine and its mechanical properties.

Materials and methods. Samples of bark and sawdust from the tree trunk were obtained from pine industrial wood. Samples were selected in 2014 year during the procurement of timber. Sawdust was obtained by crosscutting of a pine trunk during procurement of timber, previously the bark was cut from a place with an ax. The samples were dried in the open air in the hangar without direct sunlight at a temperature of 20 ± 8 ° C during 4 months. Samples were stored on a flat surface, the thickness was 2 cm. Intermittently they were mixed up to prevent decay. Wood pellets were manufactured from samples in October 2014. Their diameter was 8 mm. Wood pellets were produced in accordance with DIN 51731 on industrial equipment. The length of the pellets was 35-40 mm. The following examples were produced:

C – sample made only from sawdust (standard sample);

CK10 – sample (90% - sawdust, 10% - bark). This proportion is specific to pine needle;

CK30 – sample (70%- sawdust, 30% - bark);

K - sample made only from bark (waste is obtained during primary processing of sticks).

Percentage of components of samples contained in the composition sawdust and bark was defined on their mass. The components were previously fragmented, so as to ensure maximum fraction of 5 mm. Humidity and quantity of minerals in the composition of bark and sawdust was significantly different [4]. Total moisture of samples and percentage weight that accounts for ash matter was determined.

Tests were conducted according to the method created on the basis of "National State Standard 16483.3-84 Wood. The method of determining the ultimate strength in static bending" The methodology of National State Standard stated that the samples should have a moisture content of 12%. If more humidity value results should be



recounted. Therefore, we decided to carry out comparative characterization of samples where 100% strength accepted sample C (only sawdust).

In studies samples were placed on a stand of two monolithic copper wires. Wire diameter was 3 mm. They were placed parallel to each other. The distance between them was 30 mm. The load on the prototype was carried out using a lever kit. Lever kit was made of copper wire, its diameter was 3 mm, it was placed in the middle between the supports. At the end of the lever kit we suspended the load. Thus changed the capacity. At this time, the other end of the lever kit was fixed on the link. Before the test samples were visually checked for absence of cracks and chips. The strength of the pellets was determined in triplicate.

Results. During the production of wood pellets, that contained bark, we observed large amounts of dust. It indicated a loss of material, air pollution and reasonability of using a closed system. Accordingly, changing the composition of pellets involves to select the appropriate mode of technological equipment. Humidity of sample C, CK30 and K was 6.9, 9.0 and 9.5 percent respectively, while the ash content was 0.38, 2.5 and 3.5% respectively. From this data, we can see that wood pellets, made of bark, had the highest ash content.

The benefit of biofuel for electricity generation is that wood pallets do not create an ash waste-disposal problem since ash can be spread in the forests or fields to recycle nutrients and not be directed to landfills as is ash from burning coal. [3]. In nowadays usage of ecological soil applications also is of the most immediate interest.

Good strength properties of the pellets are essential for the handling at the production plant due to the risk of dust explosions. Fine particles are more hygroscopic and have a larger relative surface area, which permits more microbial growth than the unbroken pellets. This means a higher risk for temperature development in the pile, especially if the pellets are not properly cooled and dried before being transported to the storage pile. In small-scale handling, the dust is problematic, especially due to health risks. The durability of the pellets is dependent on the chemical and physical properties of the raw material as well as on the process variables during drying, milling, pelleting and cooling [9]. The relationship between raw materials and process variables is still poorly understood [10].

Figure 1 presents the results for the average value of cross-breaking strength and its measurement error. What is interesting in this data is that there were no significant differences in strength value of samples C and K. From this data, we can see that the partial introduction of the bark in wood pellets reduces their strength. This result may be explained by the fact that sample K had the least amount of fines that were lost during the milling (grinding) of raw materials. In fact fine content in pellets led to their destruction under mechanical efforts.

Conclusions. The current study found that bark is perspective raw material for making wood pellets, while introducing additional components is not necessary. Another important finding was that there were no significant differences in mechanical strength value of pellets made of pine bark and pellets made of pine sawdust.

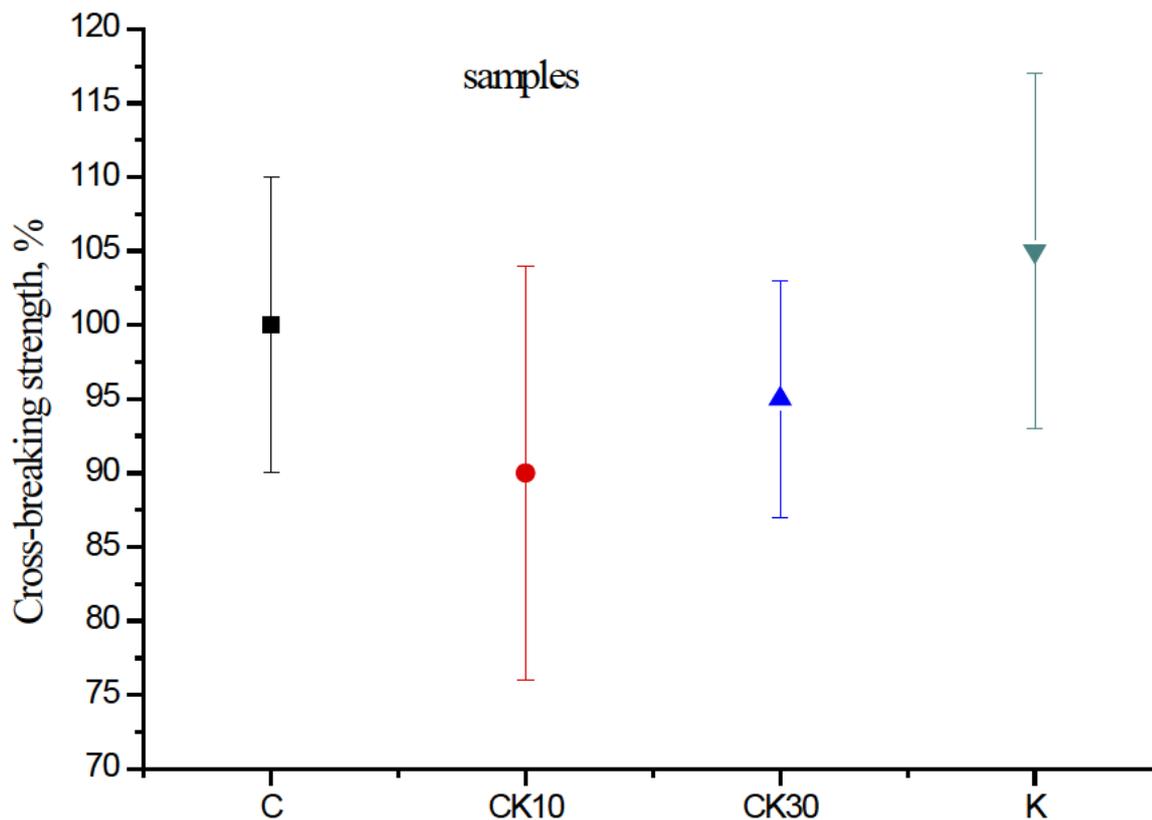


Fig. 1 Dependence of the cross-breaking strength on the pellets composition

Further research should be undertaken to investigate the certain processing modes, namely the feed rate of raw materials, steam temperature during extrusion etc.

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Bober A.V.

ALPHA-ACIDS IN AROMATIC AND BITTER VARIETIES OF HOPS UKRAINIAN SELECTION

National University of Life and Environmental Sciences of Ukraine

Kyiv, Heroyiv Oborony, 13, 03041

Abstract. The content of alpha acids in aromatic and bitter hops varieties Ukrainian selection. Influence of varietal characteristics on the formation of this indicator. Calculated in terms of its stability aromatic and bitter varieties of hops and weather conditions of vegetation.

Key words: Sort, hops, alpha acid, hops cones, aromatic and bitter varieties, stability, vegetation conditions.

Hops - a unique plant with the ability to use all of its parts: cones, stems, branches and leaves in various sectors of the economy [4]. We know that the main raw material for the production of beer is barley and hops. Barley can partially replace corn crops such as corn, wheat, millet and others. But hops until recently no substitutes [3]. It hops, with its small number of raw materials in the composition (1% by weight of grain) largely determines the specific characteristic of beer.

Qualitative and quantitative content of individual components is determined mainly by selective sort hops harvesting times, weather conditions, technology, post-harvest handling and storage [5]. Bitter substances contained in hop cones, by its chemical structure, physico-chemical and organoleptic properties not found in other plants. So hop cones and still is the indispensable raw material for beer production.

The most valuable part of brewing hops are bitter substances α -acid content which, depending on breeding varieties of hops, range from 1.0 to 16.0 % [10]. In process of hopping fresh wort hop α -acids play a major role in the formation of bitterness in beer, providing about 90% of bitterness [1].

Soil and climatic conditions in Polissya and forest-steppe zone comply with the conditions of growing hops and allow to grow high-quality raw materials. The existing plantations of hop varieties available, taken from zoning, and new ones are not yet widely spread. Hop varieties domestic breeding differ in the duration of the growing season, productivity, quality indicators and other cones. [6,7,9,16,17]. The lack of a comprehensive assessment of aromatic and bitter hops varieties zoned in Ukraine promotes the cultivation of non-competitive domestic varieties, which weakens the internal market and hinders access to the outside. In this regard, there is a problem in-depth study of the state test questions.

The aim of research was to study emerged varietal characteristics, vegetation weather content and stability of alpha acids in aromatic and bitter varieties of hops.

Material and methods of research. The study was conducted at the Department of storage technology, processing and product standardization Ya. prof. B.V. Lesik NUBiP Ukraine and certified laboratory in the Department of Biochemistry hops and beer Institute of Agriculture Polissia NAAS of Ukraine. For this purpose, multi-hop data department of biochemistry and beer Institute of



Agriculture Polissia NAAS, State sortoispytaniya data, scientific literature and our own research (2003-2013 gg.) [2, 6,7,9, 11-13, 15]. Alpha acid was determined by the standard method EBC - 7.4 [14]. Lewis stability factor (K_{sf}) was determined by the formula given in Zhuchenko A.A. [8] $K_{sf} = HE / LE$ where, HE and LE respectively high and low value characteristics depending on the weather conditions of the growing season.

Results. The content of alpha acid hop is one of the most important characteristics that determine the value of the raw hops. Acids contained in hops have a certain level of bitterness. This level depends on the varietal characteristics, weather and climate, the timing of collection, storage and others.

As a result of studies found that alpha-acids in hop cones domestic varieties of aromatic and bitter types varies widely and depends on the characteristics of the variety of vegetation and weather conditions (tab. 1–2).

Aromatic varieties have a sweet scent, but, unlike the bitter, contain much less the main components – alpha acids, which are the main pricing factors evaluation hops and hop preparations and for which hops used in brewing. According to Table. 1, aromatic varieties alpha-acids is from 3.1 to 9.8 %. A characteristic feature of these varieties is that in addition to the high content of bitter substances, especially in Zhytomyrs`kyi 75 varieties, Natsional`nyi, Pyvovar, Slavyanka, Triumf, in the proportion of bitter substances beta acids is significantly higher than the proportion of alpha acids. In aromatic hop varieties Ukrainian selection of high-quality warehouse bitter substances combined with subtle delicate flavor inherent to the best European varieties.

Table 1

The content of alpha-acids in hops aroma varieties Ukrainian selection

Sort	Alpha-acids, %				Deviations from the mean, ±	Lewis stability factor, (K_{sf})
	average value	max value	min value	max deviation		
Violas	5.5	5.8	4.5	1.3	- 0.7	1.29
Fenixs	5.4	6.0	4.0	2.0	- 0.8	1.50
Vydybor	5.6	6.2	5.0	1.2	- 0.6	1.24
Zhytomyrs`kyi 75	7.0	9.7	6.5	3.2	- 0.8	1.49
Zahrava	6.1	9.0	4.5	4.5	- 0.1	2.00
Zlato Polissia	5.0	5.7	3.5	2.2	- 1.2	1.63
Klon 18	3.1	4.0	2.5	1.5	- 3.1	1.60
Natsional`nyi	9.8	10.8	7.6	3.2	+ 3.6	1.42
Oskar	6.0	6.8	5.2	1.6	- 0.2	1.31
Pyvovar	5.9	9.5	6.3	3.2	- 0.3	1.51
Polisianka	6.8	8.5	5.7	2.8	+ 0.6	1.49
Regent	5.4	7.0	4.1	2.9	- 0.8	1.71
Slavianka	6.0	7.0	4.0	3.0	- 0.2	1.75
Starovolyns`kyi	7.0	8.2	5.6	2.6	+ 0.8	1.46



aromatychnyi						
Triumf	8.0	9.5	6.0	2.5	+ 1.8	1.58
Khmeleslav	6.2	7.0	5.8	1.2	±0.0	1.21
Haidamats'kyi	6.5	7.1	4.4	2.7	+0.3	1.61
Average for the varieties	6.2	7.5	5.0	2.5	–	1.52

The highest content of alpha acids (above average) among aromatic hop varieties detected in a variety of national, Triumf, Starovolyns'kyi aromatychnyi, Polisianka and Haidamats'kyi. Slightly lower content of alpha acids was observed in Zahrava varieties, Slavianka and Oskar. The lowest yields of alpha acid varieties characterized Klon 18, Zhytomyrs'kyi 75, Regent, Fenixs and Violas.

Comparison of aromatic varieties of hops suggests varying degrees of stability (Table. 1). Among the aromatic varieties of the highest stability alpha acid varieties have Khmeleslav, Vydybor, Violas, Oskar. This shows the high adaptability of varieties to soil and climatic conditions. The least stable for years of research Zahrava was sort of stability coefficient 2.0, which is 0.48 more than the average of the group of aromatic varieties.

Bitter hop varieties type characterized by a sharp flavor and a higher content of bitter substances and alpha acids. As the study (Table. 2), the content of alpha acids in hops these varieties ranges from 7.4 to 14.2%. Number of beta acids is much lower than the aromatic varieties of hops.

Table 2
The content of alpha acids in hops bitter varieties Ukrainian selection

Sort	Alpha-acids, %				Deviations from the mean, ±	Lewis stability factor, (K _{sf})
	average value	max value	min value	max deviation		
Al'ta	13.1	13.5	9.0	4.5	+ 3.7	1.50
Zhytych	7.4	8.4	6.4	2.0	- 2.0	1.31
Zmina	9.5	10.5	7.0	3.5	+ 0.1	1.50
Ksanta	9.0	11.0	9.1	1.9	- 0.4	1.21
Kumyr	14.2	14.8	10.0	4.8	+ 4.8	1.48
Nadia	7.8	9.0	7.0	2.0	- 1.6	1.28
Nazariy	8.9	10.0	7.0	3.0	- 0.5	1.43
Obolons'kyi	9.0	11.0	8.0	3.0	- 0.4	1.37
Poliskyi	8.0	10.1	6.7	3.4	- 1.4	1.51
Promin	10.2	12.0	7.0	5.0	+ 0.8	1.71
Ruslan	10.1	11.0	9.0	2.0	+ 0.7	1.22
Granit	7.4	8.4	6.4	2.0	- 2.0	1.31
Potiyivskyy	10.0	10.5	7.0	3.5	+ 0.6	1.50
Fakel	7.6	8.0	5.0	3.0	- 1.8	1.60
Chaklun	9.3	10.0	7.5	2.5	- 0.1	1.33
Average for the varieties	9.4	10.5	7.5	3.0	–	1.42



The highest content of alpha acids (above average) among bitter hop varieties detected in a variety of Alta, Kumyr, Promin, Ruslan, Potiyivskyy. Slightly lower content of alpha acids was observed in varieties Chaklun, Zmina, Ksanta, Obolons'kyi. The lowest yields of alpha acid varieties characterized Zhytych, Granit, Fasel, Nadia.

Bitter hop varieties such stability characterized by higher content of alpha acids in contrast to the aromatic varieties (Table. 2). Factor of stability in them was 1.42, which is 0.1 less than the aromatic varieties. This indicates a better adaptability bitter varieties to soil and climatic conditions. The most stable for years of research were varieties Ksanta and Ruslan stability coefficients of 1.21 and 1.22 respectively, which is less than 0.21 and 0.20 from the average of bitter varieties.

Conclusions

1. After examining the content of alpha acids aromatic and bitter varieties of hops, it can be argued that the formation of hop cones as domestic varieties of the aromatic type as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. Depending on the particular variety and agro-climatic conditions in aromatic varieties of hop cones accumulated alpha acids from 3.1 to 9.8% in bitter varieties of 7.4 to 14.2%.

2. Stability alpha acid content depends on the varietal characteristics and weather conditions of vegetation. Absolute values of stability indicate the level of adaptation to specific varieties of hops growing conditions, and their growth means more risk in their cultivation.

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Bober A.V., Bober O.O.

OF TOTAL POLYPHENOLS IN AROMATIC AND BITTER VARIETIES OF HOPS UKRAINIAN SELECTION*National University of Life and Environmental Sciences of Ukraine**Kyiv, Heroyiv Oborony, 13, 03041*

Abstract. The content of total polyphenols in aromatic and bitter hops varieties Ukrainian selection. Influence of varietal characteristics on the formation of this indicator. Calculated in terms of its stability aromatic and bitter varieties of hops and weather conditions of vegetation.

Key words: Sort, hops, total polyphenols, hops cones, aromatic and bitter varieties, stability, vegetation conditions.

One of the decisive factors that determine the productivity, quality and safety of products to nutrients consumer is using its breeding variety. In every culture, entered in the Register of Plant Varieties of Ukraine, in several varieties, and some of them amount exceeds reasonable limits.

Based on the fact that hops are the most specific, irreplaceable and most expensive type of raw material for beer production, high-quality products can be obtained only if the use of certain breeding varieties of hops, due to the peculiarity of their biochemical composition.

Along with bitter substances and essential oil contained in the cones of hop polyphenolic compounds. Polyphenolic substances – a compound of a secondary source, but they play a very important role in the metabolism of plants. Established that the phenolic compounds involved in the processes of growth and development of plants in breathing, promote resistance against diseases, and is the material energy [5, 6]. The content of polyphenolic compounds in different varieties of hop cones ranges from 2 to 6%, depending mainly on the area of cultivation of hops, the timing of its collection and the meteorological conditions, the [7,18,19]. In cones hop polyphenolic substances are distributed as follows: the petals - 79.0%; veretentsyah - 13.0; lupulinovyh glands - 8.0% [15].

Polyphenolic compounds hop cones, in addition to performing various physiological and biochemical functions in the cell, are important in the production of beer. Hop phenolic compounds differ from malt polyphenol composition varied considerably better soluble in water, more reaktsiyezdatni and therefore less stable [9]. A lighter oksylenist and large renewable capacity polyphenolic substances α -acid oxidation and theohops "protect" bitter substances, mainly formation of complexes. They also precipitated proteins wort and thus contribute to its lighting, and participate in shaping the taste of beer. Always gets better assessment beer made from hops, containing at least 4.5% of polyphenols [14].

Polyphenols are proantotsianidynamy hop, catechins, flavonolhlikozydamy, coumarin, substances such as chlorogenic acid and phenol carboxylic acids [17]. Given the importance of polyphenolic compounds in the life of the plant organism and to obtain high-quality beer, you need technological quality cones estimate based



on the content of these compounds in breeding varieties, the development of complex agronomic measures on growth, during post-harvest handling and processing, and storage hop cones and its products.

The aim of research was to study emerged varietal characteristics, weather and vegetation on the content of total polyphenols stability in aromatic and bitter varieties of hops.

Material and methods of research. The study was conducted at the Department of storage technology, processing and product standardization Ya. prof. B.V. Lesik NUBiP Ukraine and certified laboratory in the Department of Biochemistry hops and beer Institute of Agriculture Polissia NAAS of Ukraine. For this purpose, multi-hop data department of biochemistry and beer Institute of Agriculture Polissia NAAS, State sortoispytaniya data, scientific literature and our own research (2003-2013 gg.) [1, 2,3,8, 10-12, 16]. Quantitative determination of total polyphenols was carried out by modified method of Folin [10]. Lewis stability factor (K_{sf}) was determined by the formula given in Zhuchenko A.A. [4] $K_{sf} = HE / LE$ where, HE and LE respectively high and low value characteristics depending on the weather conditions of the growing season.

Results. In order to obtain high quality beer must take into account qualitative and quantitative composition of the polyphenolic substances. Elevated levels of polyphenols in hops, used to ohmelinnya wort promotes a higher content of hopped wort and beer [13].

As a result of studies found that the content of total polyphenols in hop cones domestic varieties of aromatic and bitter types varies widely and depends on the characteristics of the variety of vegetation and weather conditions (tab. 1-2).

Table 1

Total polyphenol content in aromatic varieties of hops

Sort	Total polyphenols, %				Deviations from the mean, ±	Lewis stability factor, (K_{sf})
	average value	max value	min value	max deviation		
Violas	4.8	5.6	4.0	1.6	-1.2	1.40
Fenixs	7.2	8.1	6.3	1.8	+1.2	1.29
Vydybor	5.0	6.0	4.0	2.0	-1.0	1.50
Zhytomyrs`kyi 75	5.9	7.1	4.7	2.4	-0.1	1.51
Zahrava	6.5	8.8	5.2	3.6	+0.5	1.69
Zlato Polissia	6.4	8.0	4.8	3.2	+0.4	1.67
Klon 18	6.6	7.8	5.4	2.4	+0.6	1.44
Natsional`nyi	6.2	7.9	4.5	3.4	+0.2	1.76
Oskar	6.0	7.7	4.3	3.4	±0.0	1.79
Pyvovar	6.4	7.7	5.1	2.6	+0.4	1.51
Polisianka	4.0	5.0	3.0	2.0	-2.0	1.67
Regent	3.8	4.2	3.4	0.8	-2.2	1.24



Slavianka	5.7	6.6	4.8	1.8	-0.3	1.38
Starovolynskyyi aromatychnyi	6.2	6.8	5.6	1.2	+0.2	1.21
Triumf	5.8	6.8	4.8	2.0	-0.2	1.42
Khmeleslav	7.5	9.4	5.6	3.8	+1.5	1.68
Haidamats'kyi	7.4	8.8	6.0	2.8	+1.4	1.47
Average for the varieties	6.0	7.2	4.8	2.4	–	1.51

According to table. 1, aromatic varieties of total polyphenols is from 3.8 to 7.5%. The highest total polyphenol content of aromatic varieties of hop varieties detected in Khmeleslav, Haidamats'kyi, Fenixs. Slightly lower rates of total polyphenols content was observed in Zahrava varieties, Klon 18 and Zlato Polissia. The lowest rates of total polyphenols characterized varieties Regent, Polisyanka and Violas.

Comparison of aromatic varieties of hops suggests varying degrees of stability (table. 1). Among the aromatic varieties of the highest stability of total polyphenols have Starovolynskyy aromatic varieties, Regent, Fenixs. This shows the high adaptability of varieties to soil and climatic conditions. The least stable for years of research was sort of Oscar stability factor of 1.79, which is 0.28 more than the average of the group of aromatic varieties.

Bitter hop varieties type characterized by a sharp flavor and a higher content of bitter substances and alpha acids. As the study (table. 2), the total polyphenol content in these varieties of hops ranging from 4.0 to 7.3%.

The highest total polyphenol content (above average) among bitter hop varieties found in a variety Ruslan, Nazariy, Ksanta. Slightly lower rates of total polyphenols content was observed in varieties Alta, Obolons'kyi, Nadia. The lowest rates of total polyphenols varieties characterized Kumyr, Zmina, Granit.

Bitter hop varieties such stability characterized by lower content of total polyphenols in contrast to the aromatic varieties (table. 2). Factor of stability in them was 1.62, which is 0.11 more than in aromatic varieties. This indicates that the bitter varieties are less adaptable to soil and climatic conditions regarding the accumulation of polyphenols. The most stable for years of research were varieties Promin and Potiyivskyy stability coefficients of 1.86 and 1.80 respectively, which is 0.24 and 0.18 less than the median of the bitter varieties.



Table 2

The content of total polyphenols in bitter varieties of hops

Sort	Total polyphenols, %				Deviations from the mean, ±	Lewis stability factor, (K _{sf})
	average value	max value	min value	max deviation		
Al'ta	6.3	7.9	4.7	3.2	+0.7	1.68
Zhytych	5.9	7.4	4.4	3.0	+0.3	1.68
Zmina	4.9	5.9	3.9	2.0	-0.7	1.51
Ksanta	6.7	8.4	5.0	3.4	+1.1	1.68
Kumyr	4.0	4.7	3.3	1.4	-1.6	1.42
Nadia	6.2	7.9	4.5	3.4	+0.6	1.76
Nazariy	7.1	8.6	5.6	3.0	+1.5	1.54
Obolons'kyi	6.3	7.6	5.0	2.6	+0.7	1.52
Poliskyi	5.6	6.8	4.4	2.4	±0.0	1.55
Promin	5.3	6.9	3.7	3.2	-0.3	1.86
Ruslan	7.3	8.5	6.1	2.4	+1.7	1.39
Granit	5.2	6.2	4.2	2.0	-0.4	1.48
Potiyivskyy	5.6	7.2	4.0	3.2	±0.0	1.80
Fakel	5.7	7.2	4.2	3.0	+0.1	1.71
Chaklun	5.8	7.4	4.2	3.2	+0.2	1.76
Average for the varieties	5.6	7.2	4.5	2.7	–	1.62

Conclusions

1. Examining the content of total polyphenols aromatic and bitter varieties of hops, it can be argued that the formation of hop cones as domestic varieties of the aromatic type as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. Depending on the particular variety and agro-climatic conditions in aromatic varieties of hop cones accumulated total polyphenols from 3.8 to 7.5% in bitter varieties of 4.0 to 7.3%.

2. The stability of total polyphenols depends on the varietal characteristics and weather conditions of vegetation. Absolute values of stability indicate the level of adaptation to specific varieties of hops growing conditions, and their growth means more risk in their cultivation.

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Bober A.V.

CONTENT OF ESSENTIAL OIL IN AROMATIC AND BITTER VARIETIES OF HOPS

National University of Life and Environmental Sciences of Ukraine

Kyiv, Heroyiv Oborony, 13, 03041

Abstract. The content of essential oil of bitter and aromatic hop varieties Ukrainian selection. Influence of varietal characteristics on the formation of this indicator. Calculated in terms of its stability aromatic and bitter varieties of hops and weather conditions of vegetation.

Key words: Sort, hops, essential oil, hops cones, aromatic and bitter varieties, stability, vegetation conditions.

Cones hop is a unique raw material due to the presence of biologically active compounds that give beer a bitter taste and specific flavor, improve stability and light beer and also have pronounced antibiotic and healing properties.

Inherent hop aroma is caused by the presence of specific and essential oil composition. The content of hops in the range from 0.1 to 3.2% [13]. Despite the fact that 80-90% essential oil evaporates during boiling the wort with hops, it determines the flavor and aroma of beer. The essential oil is a volatile substance formed in the cones of hops and has a pleasant fragrance. Aromatic substances like bitter, concentrated mainly in lupulini. Formed essential oil only during the ripening hops, and it gradually increases the amount of [8-12]. The composition of the essential oil is very diverse and represented by different classes of organic compounds [7].

Based on the fact that hops are the most specific, irreplaceable and most expensive type of raw material for beer production, high-quality products can be obtained only if the use of certain breeding varieties of hops, due to the peculiarity of their biochemical composition.

Currently preferred varieties that can provide quick profit, high profitability and demand in the foreign market. Competitive variety of hops must be at least 2.0-2.5 t / ha yield stable raw material to be at least 7-10% alpha acids, collected mechanized, have resistance to pathogens. Also recently raised interest are varieties with a high content of essential oil and xanthohumol, which lets you use these varieties in other sectors of the economy, fragrance, pharmaceutical, liquor and others. [5,18,19,21,22].

The aim of research was to study emerged varietal characteristics, vegetation weather content and stability of essential oils in aromatic and bitter varieties of hops.

Material and methods of research. Investigation performed at the Department of storage technology, processing and product standardization Ya. prof. B.V. Lesik NUBiP Ukraine and certified laboratory in the Department of Biochemistry hops and beer Institute of Agriculture Polissia NAAS of Ukraine. For this purpose, multi-hop data department of biochemistry and beer Institute of Agriculture Polissia NAAS, State sortoispytanija data, scientific literature and our own research (2003-2013 gg.) [1, 2,3,6, 14-16, 19]. The total amount of essential oil calculated by Ginsberg. [14] Lewis stability factor (K_{sf}) was determined by the formula given in Zhuchenko A.A.



[4] $K_{sf} = HE / LE$ where, HE and LE respectively high and low value characteristics depending on the weather conditions of the growing season.

Results. An important factor in the presence of hopfen flavor in beer is a quantitative and qualitative composition of essential oil. [17] The content of essential oils in aromatic hop varieties Ukrainian selection ranges from 0,4-2,5 ml / 100 g (Fig. 1-2).

As seen from Fig. 1, only 7 varieties of aromatic essential oil content have a higher average. The highest oil content of aromatic varieties of hop varieties found in Triumf, Slavianka, Zahrava and Oskar. Slightly lower rates of essential oil content was observed in varieties Khmeleslav, Polisianka and Vydybor. The lowest yields of essential oil varieties characterized by Klon 18 and Regent.

Comparison of aromatic varieties of hops suggests varying degrees of stability (Fig. 1). Among the aromatic varieties of the highest essential oil content stability are aromatic varieties Starovolynskiy aromatychnyi, Slavianka, Fenixs. This shows the high adaptability of varieties to soil and climatic conditions. The least stable for years of research was sort of national stability factor of 4.00, which is 2.40 more than the average of the group of aromatic varieties.

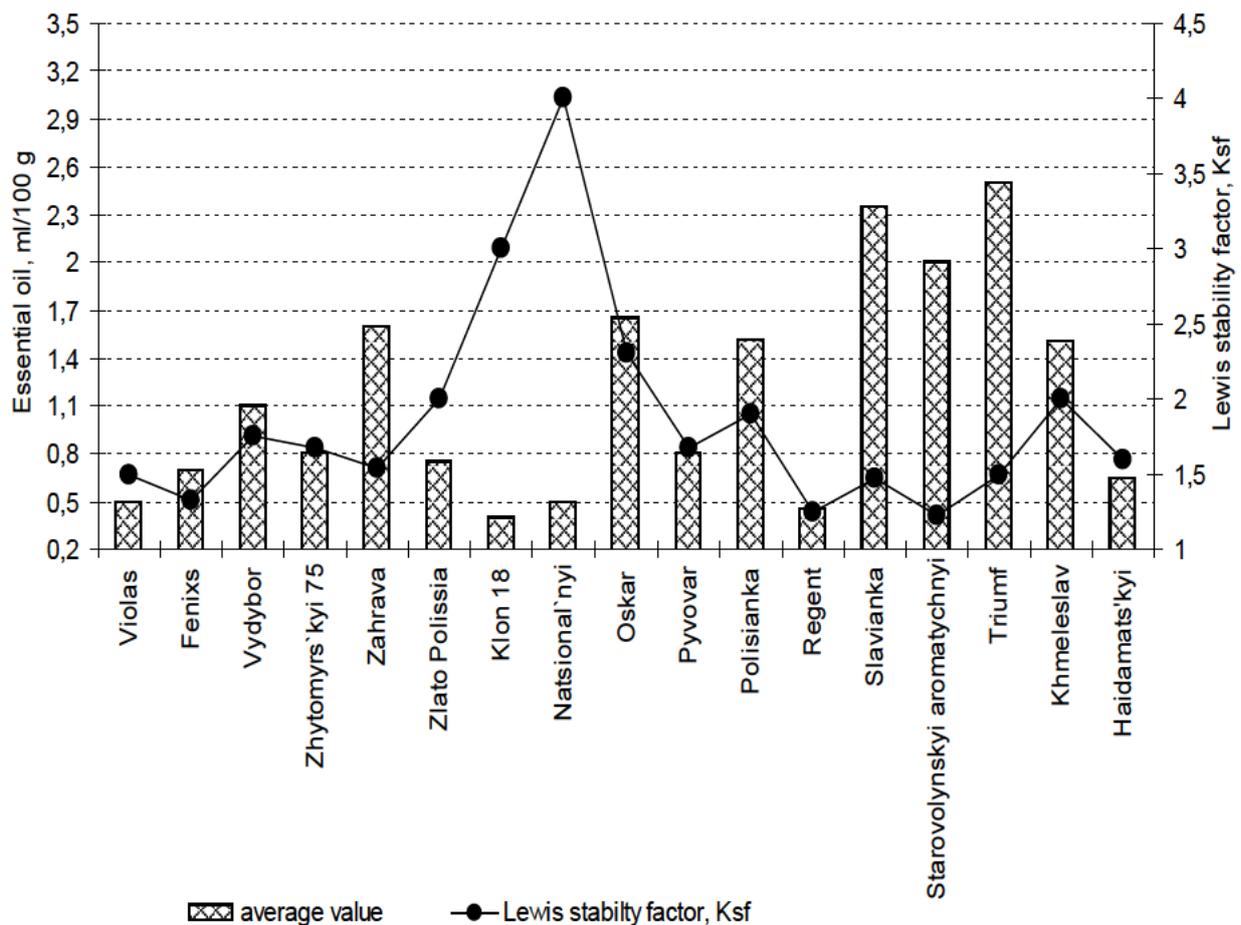


Fig. 1. Dynamics of essential oil content (ml / 100 g) and stability coefficient (K_{sf}) in aromatic varieties of hops



Bitter hop varieties type characterized by a sharp flavor and a higher content of bitter substances and alpha acids. As the study (Fig. 2), the essential oil content in these varieties of hops ranging from 0.5 to 2.5 ml / 100 g.

The highest essential oil content (above average) among bitter hop varieties found in a variety Ruslan, Promin, Obolons'kyi. Slightly lower rates of essential oil content was observed in varieties Al'ta, Zmina, Promin. The lowest yields of essential oil varieties characterized Chaklun, Ksanta, Zhytych.

Bitter hop varieties such stability characterized by lower content of essential oil in contrast to the aromatic varieties (Fig. 2). Factor of stability in them was 2.05, which is 0.19 more than in aromatic varieties. This indicates that the bitter varieties are less adaptable to soil and climatic conditions regarding the accumulation of essential oil. The most stable for years of research were varieties Ruslan, Ksanta and Chaklun of stability coefficients respectively 1.50, 1.40 and 1.50, which is 0.55, 0.65 and 0.55 less than the median of the bitter varieties.

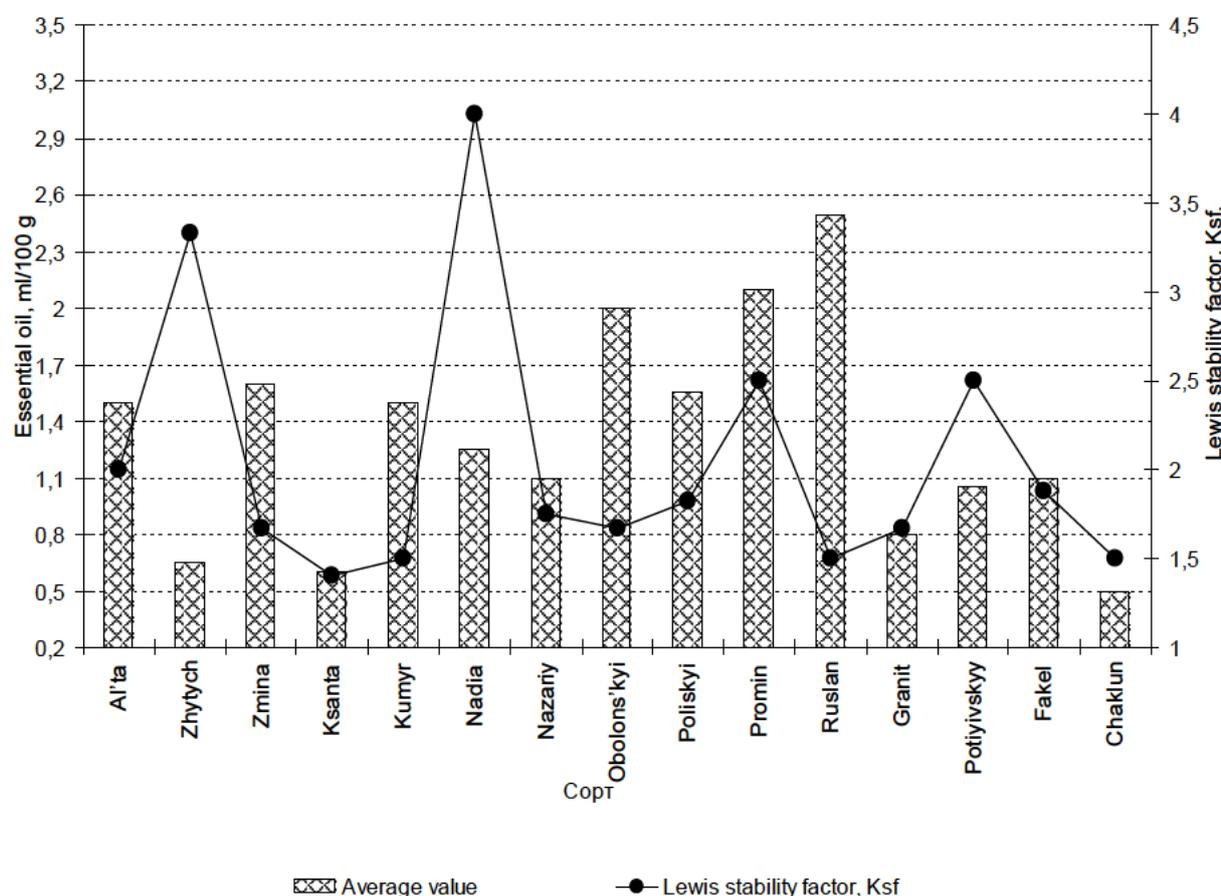


Fig. 2. Dynamics of essential oil content (ml / 100 g) and stability coefficient (K_{sf}) in bitter varieties of hops

Conclusions

1. Analyzing the content of essential oils in aromatic and bitter varieties of hops, it can be argued that the formation of hop cones as domestic varieties of the aromatic type as raw materials for beer production, is based on the characteristics of the variety and weather conditions of vegetation. Depending on the particular variety and agro-



climatic conditions in aromatic varieties of hop cones accumulate essential oil of 0,4-2,5 ml / 100 g, bitter varieties from 0.5 to 2.5 ml / 100 g.

2. Stability content of essential oil depends on the varietal characteristics and weather conditions of vegetation. Absolute values of stability indicate the level of adaptation to specific varieties of hops growing conditions, and their growth means more risk in their cultivation.

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Zavadzka O., Hrabovenko V.

**THE QUALITY OF FRESH AND DRIED ONIONS (ALLIUM CEPA)
DIFFERENT VARIETIES***National University of Life and Environmental Sciences of Ukraine**Kyiv, Heroyiv Oborony, 13, 03041*

Abstract. The results of the study of trade, biochemical and organoleptic indexes of fresh and dried onions, which has been grown up in conditions of Ukraine's Forest-steppe, depending of varieties. Allocated varieties, whose onions have the highest marketability, accumulate most dry matter, sugars, vitamin C etc. Select the most suitable for long term storage and processing (drying).

Key words: onions, varieties, processing, drying, quality, biochemical, technological parameters, marketability

Introduction. Onions are cultivated and used around the world. As a food item, they are usually served cooked, as a vegetable or part of a prepared savory dish, but can also be eaten raw or used to make pickles [1,2]. They are pungent when chopped and contain certain chemical substances which irritate the eyes. The pungent juice of onions has been used as a moth repellent and can be rubbed on the skin to prevent insect bites [2,4].

Most onion cultivars are about 89 % water, 4 % sugar, 1 % protein, 2 % fiber and 0.1 % fat. Onions contain low amounts of essential nutrients, are low in fats, and have an energy value of 166 kJ (40 kcal) per 100 g (3.5 oz) [3]. They contribute their flavor to savory dishes without raising caloric content appreciably. Yellow onions have the highest total flavonoid content, an amount 11 times higher than in white onions. Red onions have considerable content of anthocyanin pigments, with at least 25 different compounds identified representing 10% of total flavonoid content [2,4].

In Ukraine onions – one of the main vegetable crops, which store for a long time and drying [1]. Dried products the onions is widely used for cooking soups, so research the suitability of different varieties to this method of processing is important [3,7].

Suitability for drying and storage time determined by number factors cultivation, including the crucial varietal characteristics, ripeness, the quality of raw materials and so on. Known that most suitable for long term storage and drying is the standard onion is high in biochemical parameters [7]. For formation of optimal chemical composition of onion and for quality dry products are important conditions of mineral nutrition of plants during the vegetation period and varietal characteristics. The objectives of our study was to evaluate different varieties of fresh onion and dried production on a set of indicators – biochemical and organoleptic, trade – in order to highlight most suitable for long term storage.

Material and methods research. The study was conducted during 2011–2013 years in National University of Life and Environmental Sciences of Ukraine. For experiments selected 9 varieties and hybrids of onion recommended for cultivation



in the conditions of Ukraine's Forest-steppe. Standards were determined variety of Ukrainian origin Skvyrska, used Ukrainian, registered in 1947 [5].

Onions grown in the experimental field NUBiP Ukraine, which placed in the northern part Forest-steppe of Ukraine. Biochemical, commodity and organoleptic tests were performed in laboratory of storage, processing and product standardization by the generally accepted methods [6]. For drying samples selected medium onions 2 kg of each option. For drying to use dryer "Sadochok-2M" (TU 23061103.001-98), which refers to convective air dryer chamber type dried (Figure 1).

Results of research. Results marketable onions assessment shown in Table. 1.

The mass of bulbs research the options varies 52.2-69.5 g. The largest mass marketable bulb was in sorts Harmony (69.5 g) and Skvyrska (control) (66.5 g). The smallest onions formed plant a variety of Mavka (52.2 g) and Gospodynia 53.8 g) – 14.3 and 12.7 g less compared with the control.



Fig. 1. General view of the dryer "Sadochok 2M" from research products

One of the important indicators that normalized standart is the diameter of the bulb. This indicator, according to our study, affect the profitability of the dried product. The first commercial grade include bulbs with a diameter of at least 50 mm [6]. The diameter of the bulb varieties Skvyrskyi (control), Bronze de Amposta, Harmony, Hrandyna, hybrids Arenal F₁ and Sherpa F₁ meet the requirements of standards and the results of estimates the commodity were assigned to the first commercial grade.

Suitability of roots for drying significantly depends on the contents of the main biochemical parameters. The highest content of dry matter found in bulbs varieties Harmony and Skvyrska (control) – 12.8% and 13.9 % respectively and the lowest sort Bronze de Amposta – 9.4 %. Most sugars found in onion sorts Skvyrska



(control) Harmony and Hrandyna – 7.8, 7.3 and 7.2 %. Most vitamin C accumulated onions grades Skvyrska (control), Harmony and Hrandyna – more than 5 mg%.

Table 1

**Biometric, biochemical, commodity parameters assortment of onions,
average of the years 2011-2013**

Name of the variety	Biometric parameters of onions		Contents in onions			Marketability, %
	weight of bulbi, g	diameter of bulbi, mm	dry matter, %	sugars, %	vitamin C, mg%	
Skvyrska (control)	66.5	52	13.9	7.8	5.4	93.0
Arenal F ₁	63.4	50	11.5	6.2	3.8	89.3
Bronze de Amposta	64.3	55	9.4	6.4	4.4	94.0
Buran	57.7	47	11.3	7.0	4.4	90.0
Harmony	69.5	53	12.8	7.3	5.4	93.2
Gospodynia	53.8	43	12.2	6.2	5.0	89.0
Hrandyna	64.4	53	12.0	7.2	5.1	91.9
Mavka	52.2	48	11.5	5.2	4.5	89.7
Sherpa F ₁	55.5	42	10.6	5.6	3.1	88.0

Marketability assortment of bulbs was quite high and varies within the 88-94%. Most commodity of bulbs formed varieties Bronze de Amposta and Harmony – 94 and 93.2% respectively. As a result of the correlation analysis found a significant direct relationship between the mass of bulbs and their marketability ($r=0.79\pm 0.18$).

Important indicators when assessing the suitability of products for drying is the quantity of waste and quantity dry products from purified material. During the study established the most important technological characteristics of the studied varieties of onions for drying (Table. 2).

The least amount of waste during the preparation for drying had onions varieties of Bronze de Amposta – 11.0%, which is 1.3% less compared to the control. Bulbs it was the same type, regular shape, without damaging pests and diseases of defeat. Few wastes were also in grade Harmony (11.5%). Significantly higher of waste, compared with the control, had onions of hybrid Sherpa F₁ and varieties Mavka and Gospodynia.

With the quantity dry products from purified material distinguished varieties Harmony and Skvyrska (control) – 17.1 and 16.8% respectively. The least amount of dry product received during the processing of onions varieties Bronze de Amposta and Mavka – 14.0 and 13.6% respectively.



Table 2

**Technological parameters assortment of onions,
average of the years 2011-2012**

Name of the variety	Quantity of waste, %	Quantity of dry products from purified material, %			Quantity of dry products from unprepared material, %	Quantity kg of fresh material to produce 1 kg of dry
		2011	2012	the average		
Skvyrska (control)	12,3	15,6	18,0	16,8	14,7	6,8
Arenal F ₁	12,1	13,6	15,0	14,3	12,6	7,9
Bronze de Amposta	11,0	12,9	15,1	14,0	12,5	8,0
Buran	14,6	14,7	16,5	15,6	13,3	7,5
Harmony	11,5	15,2	17,0	17,1	15,1	6,6
Gospodynia	20,5	16,4	17,8	16,1	13,6	7,4
Hrandyna	15,5	14,8	16,0	15,4	13,0	7,7
Mavka	20,7	13,0	14,2	13,6	10,8	9,3
Sherpa F ₁	22,1	13,1	15,3	14,2	11,1	9,0
NIR* ₀₅		1,6	0,84			

*the least essential difference

The largest yield of dry products from unprepared material is installed in a sorts Harmony and Skvyrska (control) –15.1 and 14.7 % on average over three years. According to this indicator established essential difference compared with the control in all the years of research.

To produce 1 kg of dry of products had an average to remake 6.6-9.3 kg of fresh onions (including in the waste). Least of all they is spent if used for drying grades Harmony and Skvyrska – 6.6 and 6.8 kg.

Quite effectively used for this type of processing roots of the varieties Gospodynia and Buran. Considering least amount of waste for the production of dry of products had to remake 7.4 and 7.5 kg of fresh onions.

As the dried onion are eaten only after cooking, the importance of having their culinary qualities that primarily depends on the contents of the main biochemical parameters (Table 3).

Dry onion production is characterized by a high content of dry matter (86.9-90.8 %) and sugars (30.9-41.4%). Compared with fresh raw amount them increased at 9.10 times.

The content of dry matter in the dry of products essential difference between the variants has been identified. The largest amount of sugars in the samples was sorts Harmony and Bronze de Amposta – 41.4 and 40.5 %

Dry onion production characterized by a high biological value – vitamin C content varies 15.1-20.7 mg% and is dominated by fresh produce. But after terms of Initial raw materials, it was found that during drying loss of this element significant



and range between 55-64 %. The smallest loss of vitamin C during drying established onion in the variety Harmony.

Table 3

Biochemical composition and tasting score dried products of onion depending on variety, average of the years 2011-2013

Name of the variety	The content of dry of products, %			Vitamin C, mg%	Tasting estimate*
	dry matter	titrated acids	sugars, %		
Skvyrska (control)	86.9	2.4	38.4	19.3	7.0
Arenal F ₁	88.4	2.5	37.3	15.5	5.4
Bronze de Amposta	86.1	3.4	40.5	15.1	6.4
Buran	86.6	3.3	32.1	15.2	6.0
Harmony	86.6	3.4	41.4	20.7	7.0
Gospodynia	87.7	3.9	36.5	15.7	5.8
Hrandyna	88.0	2.9	30.9	16.9	6.8
Mavka	87.1	3.3	32.8	16.3	6.8
Sherpa F ₁	90.8	3.8	29.6	18.4	5.2

*9-point scale

The highest scores during tasting the dry product got varieties Harmony and Skvyrska (control) – 7.0 points for 9-point scale. Production of have bright evenly color, pleasant characteristic aroma and taste, elastic consistency. Samples dried and resumed production best and worst grades are presented Figure 2.

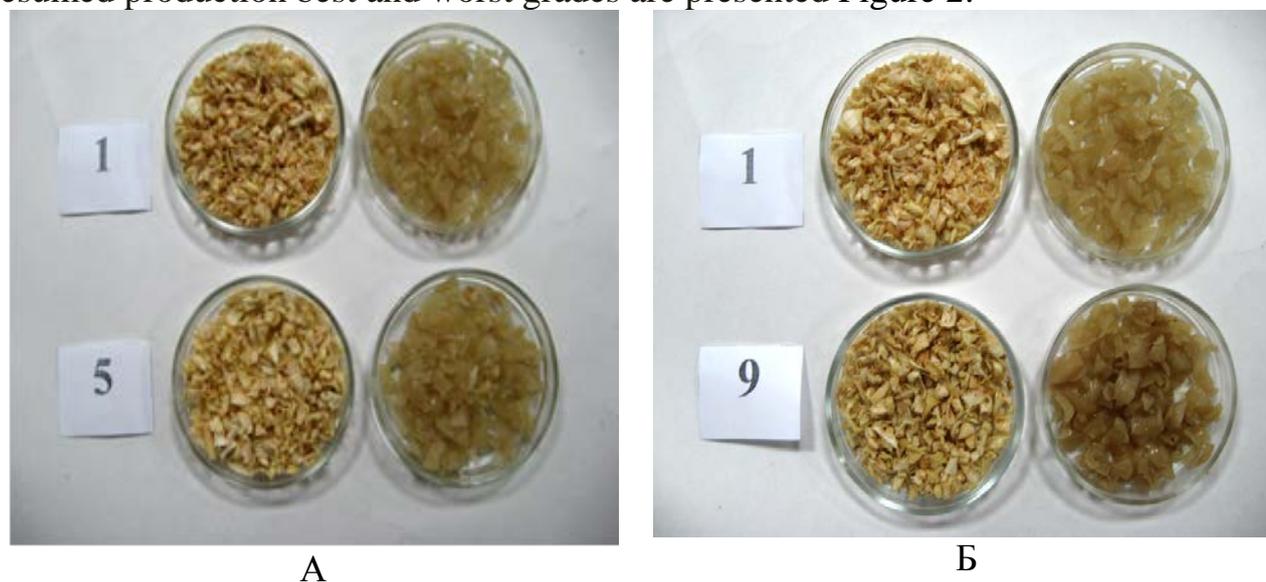


Fig.2. Samples dried and resumed production:

A: 1 – sort Skvyrska (control), 5 – sort Harmony
 B: 1 – sort Skvyrska (control), 5 – hybrid Sherpa F₁

Conclusions. Most commodity of bulbs formed varieties Bronze de Amposta and Harmony – 94.0 and 93.2% respectively. Established direct correlation interrelation between the mass of bulbs and their marketability ($r= 0.79\pm 0.18$).



The largest amount of sugars in the samples was sorts Harmony (41.4 %), Bronze de Amposta (40.5 %) and Skvyrska (38.4 %). To produce 1 kg of dry of products had an average to remake 6.6-9.3 kg of fresh onions (including in the waste). Least of all they is spent if used for drying grades Harmony and Skvyrska – 6.6 and 6.8 kg.

For organoleptic characteristics were best onions sorts Harmony and Skvyrska (control) – 7.0 points for 9-point scale. Established direct correlation interrelation between the taste of roots and amounts of sugar.

For complex parameters defined in the fresh and dried products onion were most suitable for drying bulbs sorts Harmony and Skvyrska.

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¹Slobodyanik H., ²Voytsekhivskiy V.

PRODUCTIVITY OF PERENNIAL ASPARAGUS FOR INFLUENCE OF MODERN BIOPREPARATS

¹ Uman national university of horticulture, Ukraine²National university of life and environmental sciences of Ukraine, Kiev¹Слободяник Г.Я., ²Войцеховский В.

ПРОДУКТИВНОСТЬ МНОГОЛЕТНИХ НАСАЖДЕНИЙ СПАРЖИ ПОД ВЛИЯНИЕМ СОВРЕМЕННЫХ БИОПРЕПАРАТОВ

¹ Уманский национальный университет садоводства, Украина² Национальный университет биоресурсов и природопользования Украины, г. Киев

The investigation results of microbiological agents on performance of introduced varieties of asparagus the article are presents. The use of microbiological agents improves productivity at 0,54-1,19 t/ha.

Key words: asparagus, productivity, microbiological preparations

В статье представлены результаты исследований влияния микробиологических препаратов на производительность интродуцированных сортов спаржи. Применение микробиологических препаратов способствует повышению урожайности на 0,54-1,19 т/га.

Ключевые слова: спаржа, ржавчина, толерантность, микробиологические препараты

World production of asparagus currently exceeds 1 million tons. More than 25 % of these products are grown and consumed in European countries. In Ukraine, industrial plantations of asparagus with minor areas, increasingly grown in gardens, farms and collection sections [2, 3, 8].

Culture asparagus consumption in Ukraine is limited and we can say exotic. But consumption in the early spring period of the diet diversify production rights. Eat shoots 12-22 cm in length, cutting off their April - June.

Nutritional asparagus low 70-80 kJ / 100 g, but it has a rich chemical composition. Young shoots contain sugar (1,1-4,6%), protein (2,0-3,3%), fat (0,8-1,1%), ascorbic acid (120 mg / 100 g). First asparagus was isolated from asparagine - an essential amino acid, aspartic acid amide, which is in animal and vegetable proteins, regulates water-salt metabolism in the body. Asparagine activates the kidneys and regulates water metabolism in the body. The content of potassium asparagus is 160-198, phosphorus 17-80 mg/100g. Asparagus shoots are boiled and used as a separate dish with various sauces, in soups and salads and as a garnish, used in the canning industry. Therefore, the introduction of highly productive varieties and hybrids of asparagus will provide the competitive and profitable products [1, 4, 5, 6].

The purpose of research. When laying perennial plants asparagus important to select those varieties and hybrids that have high adaptive features to the soil-climatic growing conditions. In the absence of of the list of pesticides, fungicides approved for protection asparagus topical use for this purpose microbiological agents. This will get high-quality organic products. Therefore, the aim of our research was to



identify the impact of microbiological preparations on productivity and quality of introduced varieties.

Research methodology. Research conducted during the 2014-2016 biennium. In terms of educational, scientific and production department Uman National University of Horticulture. Perennials varieties Mary Washington (USA) - control, Darian and Tsipes (France) from June 10 and will continue every 20 days four times sprayed solutions of microbiological agents Biocomplex-BTU and Biocomplex-BTU (2 l / ha) + Fitotsyd (2 l / Ha). As used prylypach Liposam (BTU production centers, Ladyzhyn, Ukraine). Collected crop green shoots of asparagus from late April to 5 June 2015-16 biennium. Accounting yield and quality assessment was carried out by conventional methods [7, 9].

Results of investigation . Productivity asparagus plantations in our study substantially dependent on the varietal characteristics. Despite the low resistance to rust, a plant variety Tsipres harvest due to higher genetic potential biological productivity, a more above-ground mass and storing kidneys. The structure of crop varieties smallest custom shoots, on average, two years were only 8.9% in the untreated sections study drug. By making Biocomplex-BTU and Fitotsydu the previous year crop growing season next year contain 4,6-5,7% custom shoots (table).

On average, two years most unusual in the structure of crop shoots were from raw biological products plantations Mary Washington class - 17.4%. Through spraying vegetating plants of this variety in 2014 and 2015-BTU Biocomplex Fitotsyd share and non-standard crop was 7,4-9,5%, which 7,9-10,0% less control.

Productivity asparagus varieties depending on the application of biological products

Sort (A)	* Use biological products (B)	The proportion of non-standard products, %				Yield, t / ha			
		2015	2016	average	+ to control	2015	2016	average	+ to control
Mary Washington	No treatment (control)	16,5	18,3	17,4	-8,0	3,12	3,14	3,13	-
	Biocomplex-BTU	12,3	6,6	9,5	-10,1	3,45	3,88	3,67	+0,54
	Biocomplex-BTU + Fitotsyd	10,5	4,2	7,4	-8,6	3,51	3,95	3,73	+0,60
Tsipes	No treatment	8,2	9,5	8,9	-11,7	3,16	2,95	3,06	-0,07
	Biocomplex-BTU	6,1	5,3	5,7	-12,8	3,87	4,30	4,09	+0,96
	Biocomplex-BTU + Fitotsyd	5,5	3,7	4,6	-2,0	4,05	4,44	4,25	+1,12
Darianf	No treatment	14,7	16,2	15,5	-6,8	2,11	2,72	2,42	-0,72
	Biocomplex-BTU	11,9	9,4	10,7	-9,0	3,23	4,16	3,70	+0,57
	Biocomplex-BTU + Fitotsyd	10,3	6,6	8,5	-8,0	3,02	4,18	3,60	+0,47
<i>LSD_{05AB}</i>						0,18	0,23	-	-

* Spraying in 2014 i 2015.



In a variety of raw Dariana lots of unusual products collected 15.5%, and background spraying microbiological agents in their number is less than 1.4-1.8 times. Regardless of variety, less innovative crop shoots were in 2016 subject to making co-BTU Biocomplex and Fitotsyd. Yields biological products raw asparagus plantations was higher in 2015, especially varieties of Mary Washington - 3,12 t / ha Tsipres - 3.16 t / ha and Darian - 2.72 t / ha. The following year, the yield of these options less respectively 0.02 t / ha, 0.21 and 0.61 t / ha, partly due to worse as pest plants. Mostly lower yield grade Dariana - an average of two years without making biologics shoots harvest obtained 2.42 t / ha. According to the analysis of variance in 2015 and 2016 productivity untreated plots grade biological products Darian significantly lower than control - at 1.01 and 0.42 t / ha, respectively.

Also stored pattern mostly higher productivity planting asparagus subject to joint introduction investigated microbiological agents during the last year of vegetation. On average two years against the backdrop of sprays Biocomplex-BTU + Fitotsyd yield varieties Mary Washington Tsipres and Darian under 1.2; 1.4 and 1.5 times higher compared to their untreated plants. The maximum yield was obtained in 2016 Tsipres grade version compatible Biocomplex-making Fitotsyd BTU + - 4.44 t/ha. The average yield of two years, this variety was 4.25, which is 1,12 t/ha more control. Compatible biological products processing plants Mary Washington class on average provide premium yield of 0.6 t / ha and its level of 3.73 t / ha. Only Dariana grade for joint introduction of microbiological agents obtained shoots yield of 0.1 t / ha less compared to use only Biocomplex-BTU.

The average premium for two years, crop varieties Mary Washington and Tsipres against the background of sprays only Biocomplex-BTU was 0.54 and 0.96 t / ha compared to the control. In plantations grade Tsipres making Biocomplex-BTU for the two-year data increases the yield by 1.03 t / ha, compared with its rough areas and combined use with Fitotsydom - by 1.19 t / ha. According to analysis of variance introducing studied biologics provides substantial premium harvest asparagus.

Conclusions. The use of microbiological agents Biocomplex-BTU and Fitotsyd to 4-fold spraying assimilating stalks of asparagus improves the phytosanitary status of plantations, as obtained shoots and increase crop yield (at 0,54-1,19 t / ha) in the years of cultivation. As a result, predictably maintain plantings on intensive high performance for 18-20 years. The results expedient to consider when creating perennial plantations and efficient care for them to obtain high-quality and competitive products.

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Havris` I. L.

HARVEST CUCUMBERS DEPENDING ON PATTERNS OF PLANTS FORMATION

National University of Life and Environmental Sciences of Ukraine

Introduction.

Cucumber is one of the most valuable fruit vegetables. The fruits of this crop are valuable raw material for the food industry; they are widely used in dietetic nutrition as a source to replenish the body with vitamins and minerals. For cultivation in greenhouses cucumber hybrids must meet the following requirements: high productivity, taste and trade qualities; high photosynthetic and transpiration capacity of leaf apparatus; resistance to low temperature and lighting; ability of fruits to store biochemical and technological qualities, as well as marketable condition for nine days [4].

The level of cucumber yield in greenhouses depends on the growing season, abundance by all parameters of the medium in which plants grow and develop, and the scheme of their formation. Formation of the stem is an important agrotechnical measure regulating the growth and fruiting of cucumber. Proper formation provides optimal fruit amount and provides strong plants with well-developed root system [1, 4]. Ignoring the rules of stem forming can lead to inhibition of plants caused by condensation, shading and appearance of stem rots.

Formation of plants is divided into several stages: blinding of leaf axils of bottom of the plants, pruning of side shoots, regulation of fruits on the main stem, and forming the apex of the main stem. Parthenocarpic cucumber hybrids are characterized by more powerful plant habitus when compared to mellitophilae and their formation defines the dynamics of yield income and value [4, 5].

The formation of cucumber becomes really important when it is grown in the spring, when even minor changes in technology affect the cost and profitability of production [6]. Therefore, in the studies it was determined the effect of various plant forming schemes on the dynamics of income, market quality and yield of cucumber fruits.

The aim of the research is to determine the productivity of parthenocarpic cucumber in terms of various ways of stem forming while growing in spring and summer greenhouses.

Material and methods of the research.

Experiments were carried out in 2013-2014 in spring greenhouses of PE "Barannik", Dnipropetrovsk region, Pokrovskiyi district, village Oleksandrivka (fig. 1). The material was Barvina F1 parthenocarpic cucumber hybrid of Nunhems selection (the Netherlands), a subdivision of the Bayer group (Germany).



Fig.1 Greenhouses PE “Barannik”

Until the stem got the trellis, all plants were formed in the same way. The control variant was the scheme by which were formed the cucumber plants in greenhouses: blinding of six leaf axils, up to the height of 1 m side shoots were pruned over the second leaf, higher – over the third one. The apex of the main shoot was pruned over the fourth node after growing out of trellis. After tipping over trellis they were formed two shoots, each of which was normalized to one fruit and one leaf. In another variant, after growing out of trellis wire two side shoots were released, pruning them in every 50 cm. The third variant – after hitching over the trellis there was left one shoot. Up to 1.5 m over the substrate it was formed the shoot with three fruits and three leaves, and lower (0.5 m over the substrate) – with one fruit and one leaf.

The study was conducted according to the methods of research in vegetable and melon growing, and methods of field experiment [2, 3]. The variants were placed by the method of complete randomization. Tire was three times. The number of plants in tire was 15 pcs. The seedling planting scheme was 130 x 35 cm. The number of plants per 1 m² was 2.2 pc. In the experiment they were applied basic research methods: experimental, calculation, analysis and comparison.

Results. On average, for two-year studies they were observed changes in the dynamics of income of cucumber fruits (fig. 2).

Cucumber productivity in March and April was not significantly different; the difference between researched variants was 0.1 - 0.3 kg / m². Since May there was a significant increase in yield of the variant number 2, in which after tipping over the trellis they were released two side shoots, pruning them in every 50 cm.

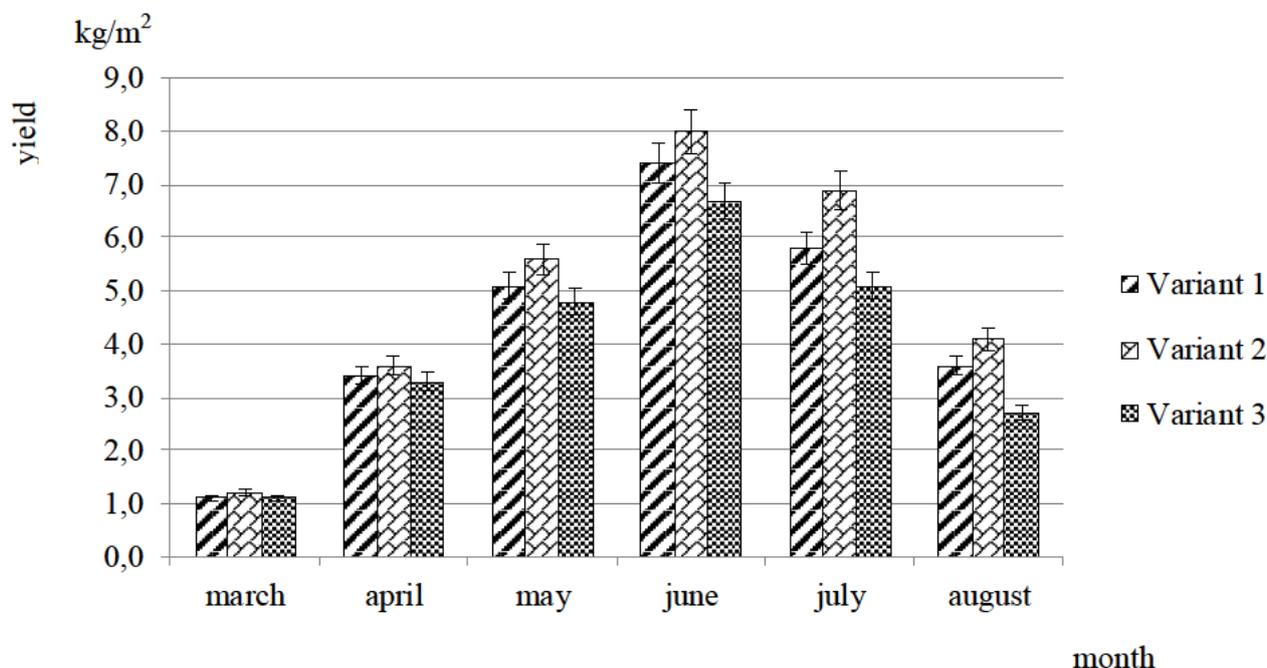


Fig. 2 Dynamics of cucumber income under different schemes of plant forming, average for 2013-2014

The peak of hybrid yield was observed in June. The best result had the variant number 2, the yield of which increased from 5.6 kg / m² to 8.0 kg / m², exceeding the control by 0.6 kg / m². The lowest yield was obtained from plants of the variant number 3 – 6.7 kg / m², which is less than the control by 1.3 kg / m². Such tendencies in yield formation lasted for the following months. By the end of fruiting it was sharply decreased the yield of the crop – 2.7 - 4.1 kg / m², which is explained by physiological aging of plants, and consequently a decrease in processes of assimilation and metabolism, as well as the emergence of diseases.

Experimental data suggest that a significant increase of the total cucumber yield when compared to the control was the variant number 2 (tab. 1). Its figure exceeded the control by 3.0 kg / m².

Table 1

The yield and fruit quality of cucumbers, the average for 2013-2014

Hybrid	Cucumber yield, kg/m ²			Marketability, %
	total	including		
		cash	non-cash	
Variant 1 (control)	26.4	24.9	1.5	94.5
Variant 2	29.4	27.5	1.9	93.7
Variant 3	23.7	22.3	1.4	94.1
HIP ₀₅	2.8	2.1	0.8	–

According to the research the percentage of marketable products in cucumber fruits of studied variants ranged from 93.7 to 94.5%. In plants of all variants the index of non-cash part of yield ranged from 1.4 to 1.9 kg / m² and was not significantly different from the control. Despite the lowest percentage of marketability (93.7%) and that of non-cash yield – 1.9 kg / m², the number of



products for implementation in the variant number 2 was significantly higher than that of the other variants and was 27.5 kg / m². Thus it was found that renewal of shoots in every 50 cm without limitation of vegetation and generative mass allowed obtaining the highest yield of cucumber, especially in the last months of fruiting.

So, the greatest impact on formation of general cucumber yield was obtained in the variant number 2, in which after tipping over the trellis they were released two side shoots, pruning them in every 50 cm.

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¹Slobodyanik H., ²Voytsekhivskiy V.**PRODUCTIVITY OF PERENNIAL ASPARAGUS FOR INFLUENCE OF
MODERN BIOPREPARATS**¹ Uman national university of horticulture, Ukraine²National university of life and environmental sciences of Ukraine, Kiev¹Слободяник Г.Я., ²Войцеховский В.**ПРОДУКТИВНОСТЬ МНОГОЛЕТНИХ НАСАЖДЕНИЙ СПАРЖИ ПОД
ВЛИЯНИЕМ СОВРЕМЕННЫХ БИОПРЕПАРАТОВ**¹ Уманский национальный университет садоводства, Украина² Национальный университет биоресурсов и природопользования Украины, г. Киев

The investigation results of microbiological agents on performance of introduced varieties of asparagus the article are presents. The use of microbiological agents improves productivity at 0,54-1,19 t/ha.

Key words: asparagus, productivity, microbiological preparations

В статье представлены результаты исследований влияния микробиологических препаратов на производительность интродуцированных сортов спаржи. Применение микробиологических препаратов способствует повышению урожайности на 0,54-1,19 т/га.

Ключевые слова: спаржа, ржавчина, толерантность, микробиологические препараты

World production of asparagus currently exceeds 1 million tons. More than 25 % of these products are grown and consumed in European countries. In Ukraine, industrial plantations of asparagus with minor areas, increasingly grown in gardens, farms and collection sections [2, 3, 8].

Culture asparagus consumption in Ukraine is limited and we can say exotic. But consumption in the early spring period of the diet diversify production rights. Eat shoots 12-22 cm in length, cutting off their April - June.

Nutritional asparagus low 70-80 kJ / 100 g, but it has a rich chemical composition. Young shoots contain sugar (1,1-4,6%), protein (2,0-3,3%), fat (0,8-1,1%), ascorbic acid (120 mg / 100 g). First asparagus was isolated from asparagine - an essential amino acid, aspartic acid amide, which is in animal and vegetable proteins, regulates water-salt metabolism in the body. Asparagine activates the kidneys and regulates water metabolism in the body. The content of potassium asparagus is 160-198, phosphorus 17-80 mg/100g. Asparagus shoots are boiled and used as a separate dish with various sauces, in soups and salads and as a garnish, used in the canning industry. Therefore, the introduction of highly productive varieties and hybrids of asparagus will provide the competitive and profitable products [1, 4, 5, 6].

The purpose of research. When laying perennial plants asparagus important to select those varieties and hybrids that have high adaptive features to the soil-climatic growing conditions. In the absence of of the list of pesticides, fungicides approved for protection asparagus topical use for this purpose microbiological agents. This will get high-quality organic products. Therefore, the aim of our research was to identify the



impact of microbiological preparations on productivity and quality of introduced varieties.

Research methodology. Research conducted during the 2014-2016 biennium. In terms of educational, scientific and production department Uman National University of Horticulture. Perennials varieties Mary Washington (USA) - control, Darian and Tsipes (France) from June 10 and will continue every 20 days four times sprayed solutions of microbiological agents Biocomplex-BTU and Biocomplex-BTU (2 l / ha) + Fitotsyd (2 l / Ha). As used prylypach Liposam (BTU production centers, Ladyzhyn, Ukraine). Collected crop green shoots of asparagus from late April to 5 June 2015-16 biennium. Accounting yield and quality assessment was carried out by conventional methods [7, 9].

Results of investigation . Productivity asparagus plantations in our study substantially dependent on the varietal characteristics. Despite the low resistance to rust, a plant variety Tsipres harvest due to higher genetic potential biological productivity, a more above-ground mass and storing kidneys. The structure of crop varieties smallest custom shoots, on average, two years were only 8.9% in the untreated sections study drug. By making Biocomplex-BTU and Fitotsydu the previous year crop growing season next year contain 4,6-5,7% custom shoots (table).

On average, two years most unusual in the structure of crop shoots were from raw biological products plantations Mary Washington class - 17.4%. Through spraying vegetating plants of this variety in 2014 and 2015-BTU Biocomplex Fitotsyd share and non-standard crop was 7,4-9,5%, which 7,9-10,0% less control.

Productivity asparagus varieties depending on the application of biological products

Sort (A)	* Use biological products (B)	The proportion of non-standard products, %				Yield, t / ha			
		2015	2016	average	to control	2015	2016	average	to control
Mary Washington	No treatment (control)	16,5	18,3	17,4	-8,0	3,12	3,14	3,13	-
	Biocomplex-BTU	12,3	6,6	9,5	-10,1	3,45	3,88	3,67	+0,54
	Biocomplex-BTU + Fitotsyd	10,5	4,2	7,4	-8,6	3,51	3,95	3,73	+0,60
Tsipes	No treatment	8,2	9,5	8,9	-11,7	3,16	2,95	3,06	-0,07
	Biocomplex-BTU	6,1	5,3	5,7	-12,8	3,87	4,30	4,09	+0,96
	Biocomplex-BTU + Fitotsyd	5,5	3,7	4,6	-2,0	4,05	4,44	4,25	+1,12
Darianf	No treatment	14,7	16,2	15,5	-6,8	2,11	2,72	2,42	-0,72
	Biocomplex-BTU	11,9	9,4	10,7	-9,0	3,23	4,16	3,70	+0,57
	Biocomplex-BTU + Fitotsyd	10,3	6,6	8,5	-8,0	3,02	4,18	3,60	+0,47
<i>LSD_{05AB}</i>						0,18	0,23	-	-

* Spraying in 2014 i 2015.



In a variety of raw Dariana lots of unusual products collected 15.5%, and background spraying microbiological agents in their number is less than 1.4-1.8 times. Regardless of variety, less innovative crop shoots were in 2016 subject to making co-BTU Biocomplex and Fitotsyd. Yields biological products raw asparagus plantations was higher in 2015, especially varieties of Mary Washington - 3,12 t / ha Tsipres - 3.16 t / ha and Darian - 2.72 t / ha. The following year, the yield of these options less respectively 0.02 t / ha, 0.21 and 0.61 t / ha, partly due to worse as pest plants. Mostly lower yield grade Dariana - an average of two years without making biologics shoots harvest obtained 2.42 t / ha. According to the analysis of variance in 2015 and 2016 productivity untreated plots grade biological products Darian significantly lower than control - at 1.01 and 0.42 t / ha, respectively.

Also stored pattern mostly higher productivity planting asparagus subject to joint introduction investigated microbiological agents during the last year of vegetation. On average two years against the backdrop of sprays Biocomplex-BTU + Fitotsyd yield varieties Mary Washington Tsipres and Darian under 1.2; 1.4 and 1.5 times higher compared to their untreated plants. The maximum yield was obtained in 2016 Tsipres grade version compatible Biocomplex-making Fitotsyd BTU + - 4.44 t/ha. The average yield of two years, this variety was 4.25, which is 1,12 t/ha more control. Compatible biological products processing plants Mary Washington class on average provide premium yield of 0.6 t / ha and its level of 3.73 t / ha. Only Dariana grade for joint introduction of microbiological agents obtained shoots yield of 0.1 t / ha less compared to use only Biocomplex-BTU.

The average premium for two years, crop varieties Mary Washington and Tsipres against the background of sprays only Biocomplex-BTU was 0.54 and 0.96 t / ha compared to the control. In plantations grade Tsipres making Biocomplex-BTU for the two-year data increases the yield by 1.03 t / ha, compared with its rough areas and combined use with Fitotsydom - by 1.19 t / ha. According to analysis of variance introducing studied biologics provides substantial premium harvest asparagus.

Conclusions. The use of microbiological agents Biocomplex-BTU and Fitotsyd to 4-fold spraying assimilating stalks of asparagus improves the phytosanitary status of plantations, as obtained shoots and increase crop yield (at 0,54-1,19 t / ha) in the years of cultivation. As a result, predictably maintain plantings on intensive high performance for 18-20 years. The results expedient to consider when creating perennial plantations and efficient care for them to obtain high-quality and competitive products.

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Kutovenko V.B., Gavrylyuk A.S.

**AGROBIOLOGICAL EVALUATION OF RADISH VARIETIES IN A
NORTHERN FOREST STEPPE UKRAINE***National University of Life and Environmental Sciences of Ukraine,**Kyiv, Heroiv Oborony 15, 03041*

Кутовенко В.Б., Гаврилюк О.С.

**АГРОБІОЛОГІЧНА ОЦІНКА СОРТІВ РЕДИСКИ В УМОВАХ
ПІВНІЧНОГО ЛІСОСТЕПУ УКРАЇНИ***Національний університет біоресурсів і природокористування України, м. Київ,
вул. Героїв оборони 15, 03041*

Annotation. The results of the study assortment of radish in a northern forest steppe Ukraine. Found that the formation of early harvest potatoes radishes and commodity quality is largely dependent on the varietal characteristics. Key words: radish, variety, root crops, production, productivity, marketability.

Анотація. Наведено результати вивчення сортименту редиски в умовах Північного Лісостепу України. Встановлено, що формування раннього врожаю коренеплодів редиски та їхні товарні якості істотно залежать від сортових особливостей.

Ключові слова: редиска, сорт редиски, коренеплоди редиски, урожайність редиски, товарність редиски.

Introduction. Radish - one of earliness maturity vegetables. It opens the season of early spring vegetables. High cold resistance and a short vegetation period make it possible to make profit for growers cultivating it in April. Radish helps to reduce the shortage of vitamins in the spring when the body is unbalanced after the winter period, and there is no outdoor growing vegetables in domestic markets. Therefore, properly selected assortment of radish allows you to get up early and high quality yield of roots [2,5,7].

Radish has great food and medicinal value. The flash consist of a lot of fiber, minerals, pectin, essential oils, vitamins C, B1, B2, PP. It normalizes cholesterol level and removes toxins and waste products from the body, contains phytoncids - natural antibiotics that increase immunity. The radish is recommended for using in atherosclerosis prevention, for diseases of the blood vessels and the heart. Essential oils of roots give them pleasant sharp taste, so they are appetitive and digestive [1, 2].

Assortment of radish has more than 50 varieties and hybrids listed in the State Register of Plant Varieties Suitable for Dissemination in Ukraine. Beside this, it is always changing and renewing. To orient on the current stage in varietal diversity, studying new varieties and hybrids will help the producer. Implementation of assortment in production will give the opportunity to receive early production with high yield and taste properties of root crops.

The research aim - to choose the most early and high-yielding varieties with high taste and quality indexes for the Kyiv region conditions.



Materials and methods. Experimental researches of earliness and productivity of radish varieties was performed in 2014-2015 on collection plots of the scientific and industrial laboratory «Test new varieties of plants and environmental technology assessment of growing fruit, vegetables, herbs and flowers and ornamental crops» of NULES, Ukraine, which is located in the northern part of Forest-Steppe of the Ukraine on sod-mediumpodzolic soils. The study was conducted in four replicates according to the procedure of research case in vegetable and melon growing [3] and Guidelines of state variety testing of agricultural crops (potatoes, vegetables and melons)/ ed. V.Volkodav [4].

The research subject was six varieties of radish domestic and foreign breeding - Basys, Kseniya, Krakowianka , White Breakfast, Crimson and Rodos. For the control it was set native variety Basys. The size of record plot was 5 m². Forty plants were sampled – 10 for each repetition. Seeds sowing was performed as soon as possible enter to the field. To protect from crucifer flea beetle the plot was covered by agrofibre immediately after sowing the seeds. All trials were carried out phenological observations, plant biometric measuring, records of harvest, biochemical analysis and tasting rate of roots. Biometric measurements were performed before the harvest: the number of leaves on the plants was counted, plant height and area of leaf surface was measured. Agriculture technique of radish growing was acceptable in production environment [5, 6].

Harvesting was doing in two-three times. Recording of yield was performed on all the options and repeatability. Harvested roots sorted on marketable and unmarketable fractions and were weighed separately. The unmarketable were sorted for disease affected, damaged by pests, cracked and ugly. Each fraction was weighed and calculated separately.

RESULTS AND DISCUSSION

As a result of the trials were founded that in the early plant vegetation periods, there were no differences in phenological phases passage between the trial variants. Significant changes taken place during the formation of the fifth true leaf (Table 1). The earliest appearance of the fifth leaf was observed in varieties Crimson and Rodos - 2-3 days before the control variant. Phase of technical maturity occurred earlier in the varieties Crimson and Rodos in 21-23 days from sprouts occurring, which is 3-5 days earlier than Basys variety.

According to trial results were founded that the studied assortment was characterized by early ripening terms. The results of the conducted research found that the duration of the interphase periods of the radish varieties was different. Assortment characterized by the early period of ripening. Formation of marketable Crimson and Rodos roots was marked by the shortest duration of phenophase and vegetation period 21-23 days.

According to results of trials were founded that radish varieties were forming different vegetative mass. In accordance with the biometric measurements, leaves height of radish varieties varied and ranged from 12.4 cm (White Breakfast variety) to 19.4 cm (Krakowianka variety). The number of leaves ranged from 5.7 to 7.6 pieces/plant. Leaf surface area was the smallest in White Breakfast variety 13.3 cm² and the largest in the Krakowianka variety - 168.6 cm².

**Table 1****Duration of radish interphase periods**

Variant	Interphase periods, days			
	sowing – seedlings	seedlings – the first leaf appearance	seedlings –the fifth leaf appearance	seedlings - technical maturity
Basys (k)	5	5	15	26
Kseniya	4	5	14	25
Krakowianka	5	5	15	26
White Breakfast	5	5	14	24
Crimson	4	5	12	21
Rodos	4	5	13	23

Marketable yield of varieties that was investigated ranged 18,2-29,1 t/ha (Table 2). Significant differences on the yield were found between the control variety Basys and Crimson, Rodos and Krakowianka varieties. The highest yield 29.1 t/ha was characterized Crimson variety, that is 9,78 t/ha more than in the control variant. Moreover, the average weight of roots of this variety was the largest and was 30g. It should be also noted Rodos variety, whose average root weight was 28g of and yield - 25.22 t/ha, it is 5.9 t/ha over control . Varieties Kseniya and White Breakfast was not found significant difference with the control variant Basys.

Table 2**Agronomic indices of radishes assortment**

Variety	Yield (t/ha)			Marketability of roots, %	Average weight of root, g	Marketable yield, t/ha
	First time	Second time	Third time			
Basys (k)	10,5	6,3	4,2	92	21	19,32
Kseniya	10,0	7,0	0,3	91	20	18,20
Krakowianka	11,5	5,8	5,7	94	23	21,62
White Breakfast	16,5	5,5	-	91	22	20,02
Crimson	22,5	7,5	-	97	30	29,10
Rodos	22,4	5,6	-	97	28	25,22
HIP ₀₅	1,5					

According to trial results were founded that the studied assortment was characterized by early ripening terms. With the formation of roots friendliness should be noted varieties White Breakfast, Crimson and Rodos, gathered for the first time of 75-80 % of roots, which is indication of earliness of the variety and adaptability to



growing conditions. Varieties Basys, Kseniya and Krakowianka had longer harvesting period (three times).

During harvesting were founded ugly, cracked, rotten, and damaged by dew worm roots. Founded that the most sensitive to cracking were the roots of the Krakowianka variety. Varieties Basys and Kseniya had 7-8% of ugly roots. The most rotten tendentious had roots of White Breakfast variety, as the result their marketability was 91%. High resistance to cracking and deformity showed Crimson and Rodos varieties with marketability of roots of 97 %.

Conclusions. As a result of the conducted research was founded that the formation of early yield of radish roots and their marketable figures significantly depends on the varietal peculiarities. The earliest with friendly returns are White Breakfast, Crimson and Rodos varieties with the shortest phenophases duration and vegetation period 21-23 days. A high marketable yields of roots characterized varieties Crimson and Rodos, which provided yields of roots 29.10 and 25.22 t/ha.

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Kudriawytzka A.N.

AGROECOLOGICAL GROUND OF TOP-DRESSING UNDER SPRING WHEAT

National University of Life and Environmental Sciences of Ukraine

Kyiv, street of Heroes of defensive, 17, 03041

A harvest of grain of furious wheat and his quality are basis agroecological estimation of the that or other system of fertilizer, that is applied in separate ground-climatic terms. Aim of researches of study of influence of different doses and correlations of mineral fertilizers on a background the afteraction of organic on a harvest and quality of grain of the districted sort of furious wheat Mironivska furious. Research methods: the field, laboratory researches, the standard chemical, agrochemical, instrumental and statistical methods of researches were also used.

On black carbonate soil it is set researches, that the protracted application of mineral fertilizers is on a background the afteraction of organic, the Mironivska furious provides the increase of harvest of grain of the districted sort of furious wheat on 1,73 т/ha. The productivity and quality of grain of furious wheat rise at bringing of one-and-a-half norm of mineral fertilizers on a background the afteraction of organic, from accordingly by the high indexes of quality : of collection of albumen of 0,64 т/ha to collection of "raw" gluten of 1,36 т/ha.

Key words: wheat, productivity, fertilizers, dose, albumen, "raw" gluten, sort, soil, crop rotation.

The rational use of fertilizers promotes the productivity of soil and creates favourable terms for a height and development of plants of furious wheat. Top-dressing is a basic factor that stipulates the accumulation of nutritives in soil and use of them in the process of forming of harvest of furious wheat [1-2].

A harvest of furious wheat is the result of difficult cooperation of plant with the terms of environment and determined mainly by correlation of two sizes are numbers of плодonoсних stems on unit of area and mass of grain from one colossus. Each of these sizes in turn depends on other elements of structure of harvest [3-4].

Therefore question about influence of terms of growing, biological features of sort, agroecological ground, in relation to establishment of optimal doses of mineral and organic fertilizers on a harvest and quality of grain of furious wheat the practical.

The results of researches testify that the protracted application of fertilizers in a crop rotation positively influenced on the height of plants of furious wheat Mironivska furious. It is set that middle length of plants of furious wheat in a variant control (without fertilizers) of - a 65,4 cm, on the fertilized variants this index hesitated - a 68,3-84,5 cm (table.1).

The analysis of data on the structure of harvest of furious wheat the Mironivska furious testifies that the index of general bushyness on control equaled 2,5, productive - 2,4.



Higher were indexes of hall and productive bushyness on the fertilized variants and presented according to 2,6-3,0 general bushyness and 2,5-2,8 productive bushyness (table. 1).

The harvest of furious wheat depends on length of ear and his gap-fillingness grain. Top-dressing assists the improvement of diet of plants, promotes.

Length of ear on a 0,5-1,9 cm was anymore on the fertilized variants comparatively with control, where she presented a 5,9 cm. The results of researches testify that most length of - a 7,8 cm, amount of - 16,3 шт and amount of grains i- 32,7 th in the plants of furious wheat marked at bringing of one-and-a-half norm of mineral fertilizers ($N_{110}P_{120}K_{120}$) on a background the afteraction .

These can explain the most high harvest of grain on this variant that presented 3,79 т/and, at a harvest on control - 2,06 т/he (table.2). On the fertilized variants considerably mass rose 1000 grains and presented 42,3-45,1 gs, at mass 1000 grains on- 40,2 gs, that assisted the receipt of higher harvest of grain of furious wheat on the fertilized variants (table.1).

1. Influence of the protracted application of fertilizers on the structure of harvest of furious wheat of sort Миронівська furious (2010-2012 years.)

Variant of experience	of plants, cm	The bushyness		The bushynes			The bushyne ss 10 plants	The bushyness 1000 plants
		gener al	Genera tive	genera length, cm	genera tive, cm	Genera tive length , c		
Control (without fertilizers)	65,4	2,5	2,4	5,9	12,5	19,4	13,9	40,9
Afteraction of 30t/he - FON	68,3	2,6	2,5	6,4	13,5	21,7	15,6	42,3
Background+of P_{80}	68,3	2,5	2,4	6,5	13,8	23,3	17,0	42,4
Background+of $P_{80}K_{80}$	75,8	2,7	2,6	6,8	14,1	26,9	19,1	43,4
Background+of $N_{80}P_{80}K_{80}$	83,0	2,9	2,8	7,2	15,5	30,5	20,6	44,5
Background+of $N_{110}P_{120}K_{120}$	84,5	3,0	2,8	7,8	16,3	32,7	22,0	45,1
$N_{80}P_{80}K_{80}$	80,1	2,7	2,6	6,8	14,8	30,3	19,9	44,0

The results of researches are set that systematic application of mineral fertilizers on a background the afteraction of 30t/he assists a pus to the increase of harvest of grain of furious wheat on 0,61-1,73 т/he, at a harvest on control according



to 2,06 t/he (table. 2). The most high harvest is got at bringing of $N_{110}P_{120}K_{120}$ on a background the afteraction of 30 t/he leave to rot - 3,79 t/he grains of furious wheat.

The least increase of harvest is got on variants, where phosphoric and phosphoric-potassium fertilizers were brought in on a background the afteraction of organic, that presented according to 0,99, 0,81 t/he (table. 2).

2. Influence of the protracted application of fertilizers is on the productivity of grain of furious wheat and indexes of his quality (2010-2012 years)

Variant of experience	Productivity, t/he	Increase, t/he		Content					
		before control	to the background	Albumen %			Raw" gluten %		
				%	collection is a squirrel, τ/he	increase to control τ/he	%	collection of "raw" gluten τ/and	increase to control τ/he
afteraction of 30τ/and - FON	2,06	-	-	14,8	0,3	-	31,9	0,66	-
Background+of P80	2,67	0,61	-	16,1	0,43	0,13	33,7	0,89	0,23
Background+of P80K80	3,05	0,99	0,38	15,6	0,47	0,17	32,4	0,98	0,32
Background+of N80P80K80	2,87	0,81	0,2	16,1	0,46	0,16	33,8	0,96	0,30
Background+of N110P120K120	3,45	1,39	0,78	16,3	0,56	0,26	34,6	1,2	0,54
N80P80K80	3,79	1,73	1,12	16,8	0,64	0,33	36,1	1,36	0,70
Variant of experience	3,21	1,15	0,54	16,2	0,52	0,22	34,4	1,09	0,43

HIP_{05} , t/he

0,24

S_x , %

0,12

Content of albumen and "raw" gluten in grain of wheat depends on the size of the productivity of furious wheat.

Most content of albumen is got in a variant, where the one-and-a-half norm of mineral fertilizers was brought in on a background the afteraction of 30 t/he - 16,8 %, with the corresponding index of collection of - 0,64 t/he (table. 2). The obtained data testify that most content of "raw" gluten in grain of furious wheat is marked at bringing of $N_{110}P_{120}K_{120}$ on a background the afteraction of 30 t/he to the pus that presented according to -36,1%, from according to high the index of collection of "raw" gluten - 1,36 t/he. (table.2).

Some less content of "raw" gluten is marked in a variant, where the single dose of mineral fertilizers was brought in on a background the afteraction of organic- a 34,6 %, collection of "raw" gluten presented accordingly - 1,2 t/he, at content on control of "raw" gluten - 31,9 % and by the index of collection of "raw" gluten - 0,66 t/he.

Conclusions.

For the receipt of stable harvests of grain of furious wheat of sort Mironivska furious (3,5-4,0 t/he) from accordingly by the high indexes of quality of grain on middling provided with nitrogen, phosphorus and potassium black carbonate soil in



grain - to the beet crop rotation agroecological - reasonable is application in the basic fertilizer of $N_{80}P_{120}K_{120}$ on a background the afteraction of 30 t/he leave to rot.

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Honchar L., Shcherbakova O.

EFFECT OF SEED TREATMENT ON THE GERMINATING CAPACITIES AND STANDING PLANT DENSITY

National University of Life and Environmental Sciences of Ukraine,

Kyiv, Heroyiv Oborony st. 13, 03041

Л. Гончар, Е. Щербакова

ВЛИЯНИЕ ПРЕДПОСЕВНОЙ ОБРАБОТКИ СЕМЯН НА ПОЛЕВУЮ ВСХОЖЕСТЬ И ГУСТОТУ СТОЯНИЯ РАСТЕНИЙ ПУТА

Национальной университет биоресурсов и природопользования Украины,

Киев, ул. Героев Оборонь, 13, 03041

Abstract. Studies had been conducted at the SS "Agronomic Research Station" during the 2012-2014 on the typical black soils. It had been found that treating seeds with nodule bacteria and molybdenum solution is an effective technique for improving garbanzo bean seeds germination capacities by activating redox processes in seeds. It had been established that the survival of garbanzo bean plants during the growing season considerably depends on weather conditions and growing preplant treatment of seeds. Inoculation of seed and its treatment with molybdenum colloidal solution enhances plant resistance to stress and survivability of plants during the growing season by 6,5-10,5 %; inoculation without the use of colloidal solution of molybdenum by only 1,9-2,5 %.

Key words: variety, garbanzo bean, colloidal solution of molybdenum, inoculation of seeds, germination capacities of seeds.

Problem statement. A significance for high performance of garbanzo bean has the initial intensity of growth processes. One of the methods to solve the problem is the selection of the optimum complex for treating seeds with the use of microelements and bacterization before sowing, which is the basis for healthy, dense standing, and improves the quality of seeds sowing qualities [1].

Analysis of last achievements and publications. Garbanzo bean seeds swell slowly in a soil; it needs water for germination in the amount of 140 – 160 % of its mass. For lack of moisture, the seeds stay in a state of rest, the lack of oxygen and low temperature of the soil also negatively affects on the process of seed germination. For sufficient moisture and favorable conditions, metabolism in seeds activates, so it increases respiration rate (which is an indicator of seed germination) [2].

Germination capacities of seeds affect on the planting density and stem number density distribution. Germination capacities of seed are formed in the process of growing and largely depends on the soil and climatic conditions, growing technology, preplant treatment of seeds [1, 3].

Germination capacities of seeds from laboratory do not always give good results. Low germination capacities of seeds cause not only the thinning, but also the weakening of seedling, which reduces the yield capacities of plants [4].



The aim of the study is to study the effect of preplant treatment on germination capacities and biochemical features of garbanzo bean seeds' germination; establish the biological characteristics; study and develop agrocenoses of high performance and resistant to stress; establish the measures for a constant performance of garbanzo bean at the territory of the Right-Bank Forest-Steppe of Ukraine.

Materials and methods of research. The experimental part of the study had been conducted in 2012-2014 years at the SS "Agronomic Research Station" (v. Pshenychne, Kyiv region) and in the laboratory of the analytical research of the Department Plant of Science of the NULES of Ukraine. Soil research area - a typical black soil with a low content of humus.

Barley preceded had garbanzo bean. The total area - 42 m², accounting area – 28,8 m²; four-time repetition of the experiment.

Two varieties of garbanzo bean – Rosanna and Triumph – were selected for the research. Seeding rate – 500 thousand seeds/ha. The rate of colloidal solution of nanoparticles of molybdenum was 1 liter of solution per ton of seed, working solution meets metal concentration of 0,8 mg / l.

Variety, factor A:	Preplant seed treatment, factor B
Rosanna (standard) Triumph	<ol style="list-style-type: none"> 1. Treatment of water (control) (C) 2. Inoculation "Ryzobofitom" (IR) 3. Inoculation <i>M. ciceri</i> strain ST 282 (ST) 4. Treatment of colloidal a solution of molybdenum (CSM) 5. Treatment of CSM+ IR 6. Treatment of CSM+ strain ST 282 (CSM+ ST)

The rate of ryzobofit and ST 282 strain in liquid form per hectare was 100 ml; 1 ml contained 6,7 billion nodule bacteria. On the day of sowing, the treatment chemicals were diluted in 1,7 l of water, and then seeds were treated with this solution.

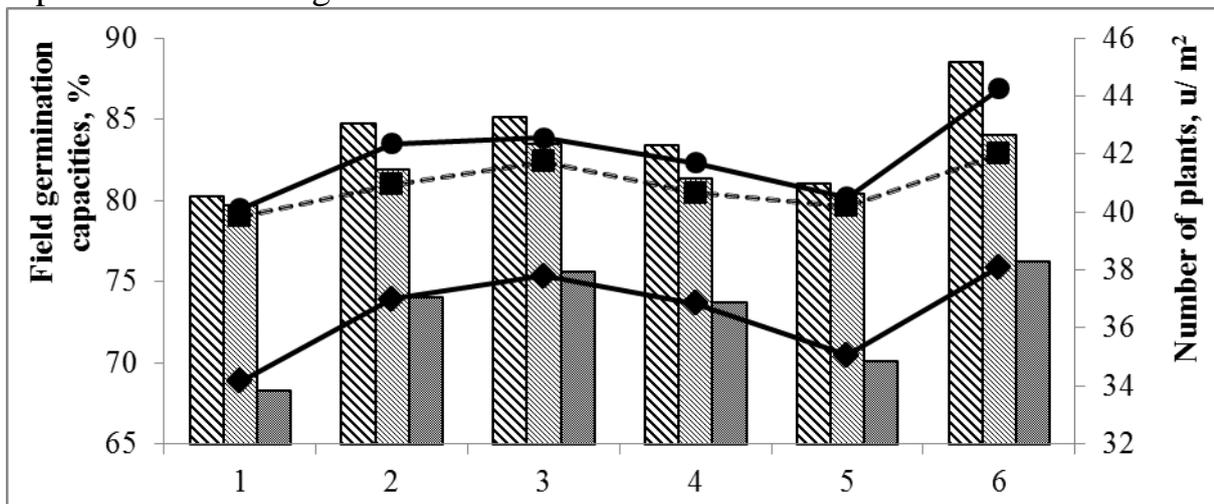
During the main cultivation, one had added granular superphosphate (P₂ O₅ – 19,5 %) and potassium salt (K₂ O – 40,0%) at a rate of 60 kg / ha s. d., Ammonium nitrate (N – 34,4 %) – 30 kg / ha in the spring.

The results of the study. In the field, all methods of preplant treatment of seeds had positively influenced the field germination capacities of seeds of garbanzo beans. Field germination capacities in control was 69,7–71,1 % depending on the variety (Fig. 1). Triumph variety showed the highest percentage of germinating seeds; their number varied depending on the factors studied.

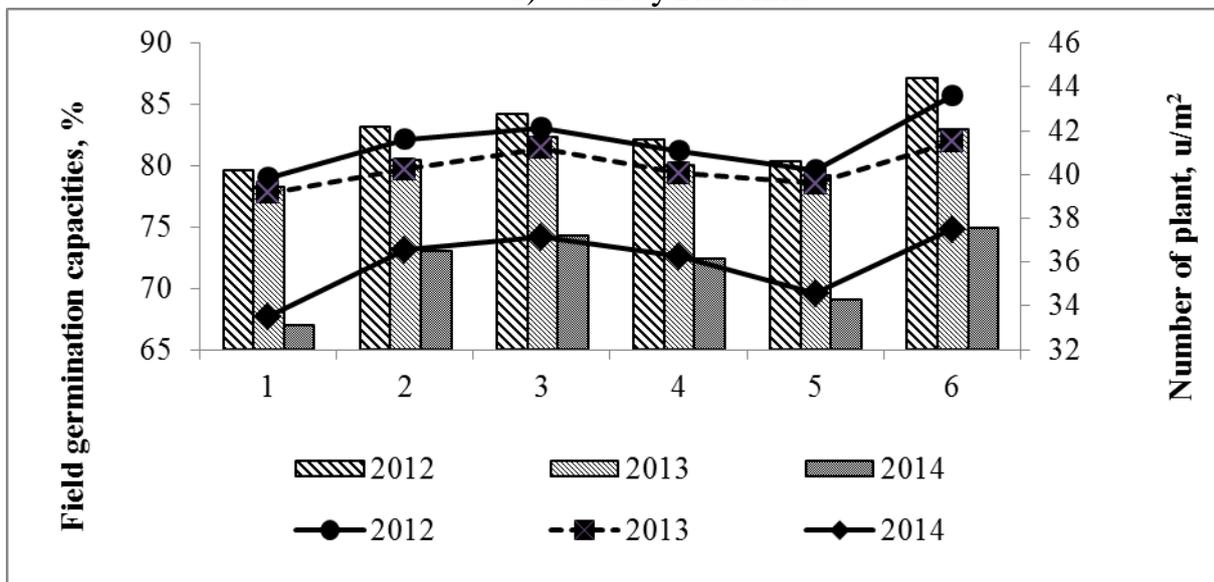
The maximum number of germinating seeds was observed during preplant treatment of seeds with MRC + ST 282 strain – by 1,4 % higher than while treating with MRC + Ryzobofit (by 12,0 % compared with the control). Favorable conditions for dense plant standing were formed in 2012. The field germination capacities were of 80,4–87,2 %, while in 2014 the absence of rainfall during seedling period this indicator was of 69,1–75,0 %. In control, they observed the reduction in field



germinating capacities. The reasons was the shortening in the seedling periodat 14–18 days depending on the variety. Prolonged period of germination days reduced the germination capacities percentage by 2,5–5,0 % depending on the variety and preplant treatment of garbanzo bean seeds.



a) Variety Rosanna



b) Variety Triumph

Note*: 1.Treatment of water (control); 2.Inoculation "Ryzobofitom" (IR); 3.Inoculation M. ciceri strain ST 282 (ST); 4.Treatment of colloidal a solution of molybdenum (CSM); 5.Treatment of CSM+ IR; 6.Treatment of CSM+ strain ST 282 (CSM+ ST)

Fig. 1. Standing plant density in the period stairs and field germination capacities by seed treatment, 2012-2014

Triumph’s maximum number of germinating seeds was observed while preplant treatment of seeds with CSM +282 ST strain, which was by 1,5 % higher than while treating CSM + Ryzobofit, and 11,8 % compared with the control. Favorable conditions for dense seedling were in 2012, the field germination capacities were of 81,0–88,5 %; while in 2014 the absence of rainfall during seedling period this indicator was of 70,1–76,2 % depending on the method of preplant seed treatment.



Preplant seed treatment increased germination capacities of garbanzo bean seeds by 10–15 %, and yield – 0,5–0,6 t / ha.

While cultivating garbanzo bean seeds it is important the survival of plants during the whole growing season because this index affects the future performance of its yield.

It was found that the highest percentage of plant survival was observed during preplant treatment of seeds with CSM + ST 282 strain. Triumph variety standing of plants was 91,7– 93,5 % depending on preplant treatment of seeds, Rosanna variety – 89,5–92,2 %. Preplant treatment of seeds increased survivability of plants during the growing season by 6,5–10,5 % depending on the factors studied.

In the phase of full ripeness, the number of plants in the control was 31,1 – 32,0 u/ m², depending on the variety. Seed inoculation with Ryzobofit increased this figure up to 4–5 u/ m², while treating seeds with CSM – 3 u / m². The maximum number of plants per 1 m² was for preplant treatment of seeds with CSM + ST 282 strain and it was 37,7 – 38,8 u / m². Seed treatment with ST 282 strain helped to preserve the plants, so the number of plants was more than 5 – 6 u/m² compared with the control. During CSM + Ryzobofit treatment, the survival rate was 91,8 % (Rosanna) and 92,4 % (Triumph).

It had been found that the highest seed germination capacities and plant survival showed the Triumph variety; it is proved by the data.

Conclusions. Treatment of seeds with nodule bacteria and molybdenum solution is an effective technique for improving garbanzo bean seeds germination by activating redox processes in seeds. Increased activity of peroxidase in 1,8–2,0 times helps to reduce seeds stress and enhance seed germination. This method of the treatment provided garbanzo bean seeds germination capacities increase by 96 % and 99 % respectively. Preplant treatment with only nodule bacteria or colloidal solution provided smaller percentage of germinating seeds (85–91 %).

Survival of garbanzo bean plants during the growing season considerably depends on weather conditions and preplant treatment of seeds. Inoculation of seed and its treatment with molybdenum colloidal solution enhances plant resistance to stress and survivability of plants during the growing season by 6,5–10,5 %, inoculation without the use of colloidal solution of molybdenum by only 1,9–2,5 %. The influence of the concentration of the colloidal solution of molybdenum on the survivability of plants was negligible.

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Yashchuk N., Shambara J.

DYNAMICS OF PHYSICAL INDICATORS GRAIN OF CORN DEPENDING ON HOW HARVESTING AND POSTHARVEST HANDLING

National University of Life and Environmental Sciences of Ukraine

Kyiv, Heroyiv Oborony, 13, 03041

Ящук Н., Шамбара Ю.

ДИНАМИКА ФИЗИЧЕСКИХ ПОКАЗАТЕЛЕЙ ЗЕРНА КУКУРУЗЫ В ЗАВИСИМОСТИ ОТ СПОСОБА УБОРКИ УРОЖАЯ И ПОСЛЕУБОРОЧНОЙ ОБРАБОТКИ

Национальный университет биоресурсов и природопользования Украины

Киев, Героев Обороны, 13, 03041

Abstract. The change nature and weight of 1000 grains of corn hybrids different depending on the way of harvest and postharvest handling was researched. It is established, that highest nature and weight of 1000 grains corn harvesting provides the variant to collecting corn cobs followed by drying it, processing and purification on air-sieve machines.

Key words: grain, corn, harvesting, postharvest handling, nature, 1000 grain weight

Аннотация. Исследованы изменения показателей природы и массы 1000 зерен кукурузы разных гибридов в зависимости от способа уборки урожая и послеуборочной обработки. Установлено, что самую высокую природу и массу 1000 зерен кукурузы дает вариант - сбор початков кукурузы, их последующая сушка, обрушка и очистка на воздушно-ситовой машине.

Ключевые слова: зерно, кукуруза, сбор урожая, обработка послеуборочная, натура, масса 1000 зерен

Postharvest handling of maize held to bring corn to the condition that the industry will ensure the supply of good-quality raw materials. Corn is dispensed to consumers in the form of grain humidity no higher than 15 %, the presence of foreign material no more than 1-5 % of impurities and grain no more than 3-15 %, depending on the group to use.

Proceeding from current trends, technologies of collection and processing corn are consistent with each other in order to fully preserve the harvest and to ensure its quality. Also, the technology should be built on the basis of savings, since the collection and processing associated with the significant costs of energy.

On grain receiving enterprises can be used three of principle scheme current lines for receiving and processing corn.

The most common is first scheme. The gist of it is that corn comes at the start of the humidity to 30 %. The process of processing corn threshing thus provides its raw state and drying kilns mine. The second scheme involves the reception and processing of corn grain with humidity above 30 %. In this case starts dried to dryness, then dried to thresh or intermediate humidity (18-25 %), and then threshed and finally dried grain at fixed or mobile grain dryers. The third scheme provides income to the company threshed corn [1-7].



Materials and Methods. The research is based on the laboratory of department technology of storage, processing and standardization of plant products after prof. B.V. Lesik of NULES of Ukraine and Scientific production subsection “Ukrelitcentr” village of Motovylyvska Slobidka, Fastiv district, Kiev region. In the research are used 4 corn hybrids: 2 of Ukrainian selection (Holosiiivskiy 260 CB and Solonyanskiy 298 CB) and 2 of French (Louis and Techny). Types of corn post-harvest improvements were studied with the sees humidity of 20-27% and 28-30%: 1. harvesting of grain + sieve-air separation + grain drying (control); 2. harvesting of grain + aerodynamic separation + grain drying; 3. harvesting of grain + sieve-air separation + ventilation; 4. harvesting of grain + aerodynamic separation + ventilation; 5. collecting corn cobs + drying + processing + sieve-air separation; 6. collecting corn cobs + drying + aerodynamic separation; 7. collecting corn cobs + ventilation + processing + sieve-air separation; 8. collecting corn cobs + ventilation + processing + aerodynamic separation.

Results. Our research confirmed the pattern - corn grain of impurities has a lower nature compared to more cleanly. This figure is in our studies and much depended on the varietal characteristics and technology of harvesting and postharvest handling. The highest nature of grain was derived from hybrids Luigi – 807-831, and the lowest – Holosiiivskiy 260 SB – 705-736 g/l (table 1).

When postharvest handling of corn changing nature mainly under postharvest handling options and to a lesser extent on the initial moisture content of grain.

The best, in terms of forming a high rate nature, was a variant in the early to collecting corn cobs followed by drying it, processing and purification on air-sieve separation. In these embodiments figure was the highest and varied range of 15-20 units.

Dispersion analysis of indicator by nature of corn grain postharvest handling different technologies showed a statistically significant effect on the studied parameters of hybrids especially for in humidity of grain 28-35 %: $F_{\text{calc}} = 760.75 > F_{\text{crit}} = 3.07$; and somewhat less than 20-27 % moisture, $F_{\text{calc}} = 48.29 > F_{\text{crit}} = 3.07$. Negligible impact the studied index had the technology postharvest handling for moisture 20-27% and in hybrids Holosiiivskiy and Solonyanskiy. However, a significant impact of technology was at 28-35 % moisture – $F_{\text{calc}} = 8.57 > F_{\text{crit}} = 2.49$ and hybrid Luigi – $F_{\text{calc}} = 15.53 > F_{\text{crit}} = 3.79$ and Tecno – $F_{\text{calc}} = 11.37 > F_{\text{crit}} = 3.79$. Also, statistically significant effect on the nature of grain moisture was different technologies, but only in hybrids Luigi – $F_{\text{calc}} = 24.91 > F_{\text{crit}} = 5.59$ and Tecno – $F_{\text{calc}} = 9.68 > F_{\text{crit}} = 5.59$.

Weight of 1000 grains and natura enables to determine the magnitude and size of the grain. High nature and weight of 1000 grains show preferences not only large but also small grains. Low nature and weight of 1000 grains has a large, poorly poured, immature grain.

Changing the weight of 1000 grains of test samples presented in table 2.

After the corn postharvest handling was relatively high weight of 1000 grains and varied range of options from 201.1 to 318.9 g. The lowest weight of 1000 grains found in samples of corn hybrid Holosiiivskiy 260 ST harvested with moisture content 28-35 % direct combine harvesting of ventilation and aspiration cleaning grain



Table 1

The impact methods of harvesting and postharvest handling of corn on nature of grain, g/l

№	Variants	Hybrids							
		Holosiivskiy 260 CB		Solonyanskiy 298 CB		Luigi		Techny	
		Hymidity, %							
		20- 27	28- 35	20-27	28-35	20- 27	28- 35	20- 27	28- 35
1	Harvesting of grain + sieve-air separation + grain drying (control)	731	727	761	758	821	820	800	792
2	Harvesting of grain + aerodynamic separation + grain drying	721	718	657	750	822	814	795	798
3	Harvesting of grain + sieve-air separation + ventilation	727	710	760	754	820	811	801	793
4	Harvesting of grain + aerodynamic separation + ventilation	729	705	754	748	816	808	791	788
5	Collecting corn cobs + drying + processing + sieve-air separation	736	734	764	762	831	827	811	807
6	Collecting corn cobs + drying + aerodynamic separation	730	728	761	757	827	823	803	801
7	Collecting corn cobs + ventilation + processing+ sieve-air separation	728	726	763	760	820	818	798	794
8	Collecting corn cobs + ventilation + processing + aerodynamic separation	724	727	759	756	815	807	795	790



Table 2

The impact methods of harvesting and postharvest handling of corn on 1000 grain weight, g

№	Variants	Hybrids							
		Holosiivskiy 260 CB		Solonyanskiy 298 CB		Luigi		Techny	
		Hymidity, %							
		20- 27	28- 35	20-27	28-35	20- 27	28- 35	20- 27	28- 35
1	Harvesting of grain + sieve-air separation + grain drying (control)	202.3	201.8	317.3	316.8	225.5	225.1	205.1	204.8
2	Harvesting of grain + aerodynamic separation + grain drying	202.0	201.6	316.7	316.2	225.0	224.7	204.7	204.4
3	Harvesting of grain + sieve-air separation + ventilation	201.7	201.4	317.0	316.6	224.7	224.4	204.9	204.7
4	Harvesting of grain + aerodynamic separation + ventilation	201.3	201.1	316.8	316.4	224.3	223.9	203.8	203.5
5	Collecting corn cobs + drying + processing + sieve-air separation	202.8	202.4	318.6	318.2	226.3	225.8	206.3	205.8
6	Collecting corn cobs + drying + aerodynamic separation	201.8	201.5	318.0	318.9	226.1	225.5	206.0	205.4
7	Collecting corn cobs + ventilation + processing+ sieve-air separation	202.6	202.0	317.8	317.4	225.7	225.2	206.2	205.6
8	Collecting corn cobs + ventilation + processing + aerodynamic separation	201.5	201.0	317.0	316.6	225.3	224.8	205.7	205.4



weight – 201.1 g highest 1000 grain weight was noted in this hybrid version with corn in starts with drying, processing and cleaning for air-sieve machine when cleaning them with humidity 20-27 % – 202.8 g.

In general, grain received by such postharvest handling in all versions studies had higher weight compared to other techniques were used where to process and going with higher rates of humidity.

Analysing the impact of varietal hybrids to measure the mass of 1000 grains should be high enough to note its importance in hybrid Solonyansky 298 ST. On average, its values were within 316.4-318.9 g and varied among the only options within the experiment and initial moisture content of grain.

Mathematical treatment (by dispersive analysis) mass of 1000 grain corn in various postharvest handling technologies identified a statistically significant effect on the study index of all factors. The biggest impact on the index weight was hybrids, especially humidity 20-27 %.

Conclusions

The highest nature was in the variant in the corn harvesting provides the variant to collecting corn cobs followed by drying it, processing and purification on air-sieve separation. It varied in the range of 15-20 units. The main factors influencing the index nature is how postharvest handling and less influential ways of gathering and initial grain moisture.

Most options weight of 1000 grains after post-harvest processing performance for various initial moisture fell within the 0.8-2.7 g. According to the standard error of this index is 1.75 grams, so a significant decrease in grain installed obtained by technologies corn harvesting provides the variant to collecting corn cobs followed by drying it, processing and purification on air-sieve machines for all options (1,8-2,7 g).

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Yashchuk N., Trityak M.

QUALITY OF BARLEY FOR BREWING DIFFERENT PARTIES AND THEIR COMPLIANCE WITH THE REQUIREMENTS OF STANDARD*National University of Life and Environmental Sciences of Ukraine**Kyiv, Heroyiv Oborony, 13, 03041*

Ящук Н., Тритяк М.

КАЧЕСТВО ЯЧМЕНЮ ПИВОВАРЕННОЕ РАЗНЫХ ПАРТИЙ И ИХ СООТВЕТСТВИЕ ТРЕБОВАНИЯМ СТАНДАРТА*Національний університет біоресурсов и природопользования України**Київ, Героїв Оборони, 13, 03041*

Abstract. The possibility of using grains of barley as different parties for beer production. It is established that grain is 1 parties can be used for brewing for 1st class quality. Grain parties 2 can be used for malt production and brewing. It is necessary that a grain of barley of the parties passed post-harvest ripening.

Key words: grain, barley, party, quality, brewing.

Аннотация. Показана возможность использования зерна ячменя разных партий для производства пива. Установлено, что зерно 1 партии может быть использовано для пивоварения 1-им классом качества. Зерно 2 партии не может быть использовано для производства солода и пивоварения. Необходимо, чтобы зерно ячменя исследуемых партий прошло послеуборочное созревания.

Ключевые слова: зерно, ячмень, партия, качество, пивоварения.

Grain and seeds of various crops have many beneficial properties that contribute to their versatile use. Therefore, a comprehensive assessment of the quality of grain used set of indicators. The significance of these quality indicators varies. Many are very specific, they describe technological features of individual batches of grain of a culture. However, there are universal figures, which are representations of food, fodder and technological purity of any party grain of its stability during storage. Depending on the importance of quality grain divided into three groups.

1. Mandatory for all parties grains and seeds every culture used for any purpose. These values determine at all stages of the grain, starting with the formation of parties at harvest. These include: signs of maturity and freshness grain (appearance, smell and taste) contamination by pests of grain stocks, moisture and impurities (debris). They are included in state standards, followed by the set restrictive conditions (quality standards). Given these parameters prepared batch of grain for sale, storage and processing.

2. Mandatory in the evaluation of parties of grain of some culture or parties of grain for a particular purpose. Examples of these indicators can serve as nature wheat, barley, rye and oats. In the grain used for the production of groats, determine the size, content of kernels and flower husk. In barley for brewing normalized germination and ability to germinate must be. Important role with specific quality of wheat have



glassiness, quantity and quality of crude gluten. These indicators also normalized standards.

3. Additional quality indicators. They check depending on the need arisen. Sometimes define a complete chemical composition of the grains, detected features of the species and size of the microflora. A very important indicator is the content in the grain mycotoxins, residues of fumigants after aeration, heavy metals, radionuclides, as it affects the safety for human health and ecological purity of the product.

The quality of grain and seeds every culture is normalized on all indicators established standards. In the case of non-compliance requirements of at least one of the indicators considered substandard batch of grain or from better commodity class translates into poorer class. Each quality score has technological and economic importance. Quality party of grain established by commodity secondary analysis of samples taken from it by certain rules [1-8].

Materials and methods. Tests to determine the quality of barley were conducted with samples of spring barley varieties Dacha as the two parties: the first batch of high initial indicators of quality class 1 brewing (control) and the second batch of low initial rates as unsuitable for brewing. Grain of barley of investigated parties was grown on the fields society with limited "Hof Van Ukraine Ltd." village Paskivschyna, Kyiv region. Studies conducted in the laboratory of department technology of storage, processing and standardization of plant products after prof. B.V. Lesik of NULES of Ukraine for 2014-2016 years.

Analyses were carried out by methods state standards.

Results. Performing research on our topic involved the definition of general and commodity-technological quality parameters of barley immediately after the post harvest handling, before laying on storage. In particular define such indicators of grain quality: organoleptic (color, smell, taste), moisture content of foreign material and grain impurity, nature, protein content, the mass of 1000 grains, husk, ability to germinate and vitality. Results representation in table 1.

Table 1

**The initial quality indicators of barley different parties
(Average for 2014-2015 years)**

Parties	Humidity, %	The content of impurities of foreign material, %	The content of impurities of grain, %	Nature, g/l	The content of protein, %	Mass of 1000 grains, g	Husk, %	Size of grain, %	Ability to germinate, %	Viability, %
1	13.1	0.4	1.5	660	10.7	45.4	8.3	91	95	98
2	14.2	1.5	2.4	625	11.3	43.7	8.5	83	90	96



The color, smell and taste of barley investigated parties were inherent in a healthy grain, free of foreign odors and flavors. In grain mass of barley were no pests, allowing acceptance of grain for further handling, storage or processing for various purposes.

Moisture is decisive indicator storage of grains of barley. Free moisture has all the characteristics of water (specific gravity, dielectric constant, the ability to be solvent), so it is easily movable. Free moisture increases the activity of enzymes barley, which leads to loss of dry matter during storage. Linked water physiological processes is not involved; barley grain that contains it is stored for a long time with small losses. Moisture beyond which there is grain moisture free, is called critical. Its value depends on the chemical composition of grain. So for grains of barley it is about 14.0 %.

The highest humidity, samples grains of barley were 2 parties – 14.2 %, compared to standard lower by 0.3 %. And well below the requirements of the standard and therefore below the critical moisture parameters were 1 Party – 13.1 %, which allows long-term storage grains of barley without compromising process quality.

Comparing the quality indicators grains of barley different parties with the requirements of these indicators, we set the appointment of grain.

Foreign material content of 0.4 % and 1.5 % grain impurities in the grain mass party number 1 allows to use it for various purposes, including for beer production 1st class quality. Foreign material content of 1.5 % and 2.4 % grain impurities in the grain mass party number 2 also allows to use it for various purposes, but the brewing only second class quality.

Nature of grain is a mass of some of its volume. Depending on the characteristics and conditions of cultivation of grain varies nature. Numerical experiments indicate that the mass of one liter of grain associated with its intended use as a grain of nature less than 600 g/l, typically does not go for food purposes.

Analyzing the data, we can note that barley grain samples had nature 660-625 g/l, which determined the suitability of grain for beer production, use for food, feed and malting purposes. It should be noted that the samples of grain figure 2 party nature was 35 g/l less than 1 party. Overall rate nature of investigated parties barley grains allows the production of malt and food purposes.

Standards for malting barley assumed its harvesting in areas where growing conditions are favorable for the formation of endosperm grains are high in starch. On the chemical composition grains of barley affects many factors, including high protein content reduces the value of its brewing.

A crop of malting barley should have low protein content. Is a high-quality malting barley grains in which the protein is in the range of 9 to 11% on a completely dry basis. Negative is also the protein content of less than 8%, which is sufficient for normal development of yeast foam formation and establishment of taste and "bouquet" of beer.

The data suggest that the protein content in grains of barley samples for the various systems of parties ranged 10.7-11.3 %. Samples grains of barley 1st batch contained 10.7 % protein, which again allows its use for brewing the first class



quality. A 2 party characterized protein 11.3 %, which also allows the use of grain in brewing, but only the second class.

An important indicator for grains of barley, which is used to produce cereals is its husk. Husk – a relative content of flower husk or membranes in cereal seed shells, expressed as a percentage. It depends on the weed-infested crops. Express this ratio mass flowering selected films to mass barley grain husk should have a low (less than 7.10 %).

In the studied parties of grains of barley husk was 8.3-8.5%, which is not sufficiently high indicator and provides a high yield of groats.

Analyzing the data investigated parties should note the high indicators of mass 1000 seeds – 43.7-45.4 g, which exceeds the requirements of standard (40 g for 1 class) respectively 3.7-5.4 g. Weight 100 large seeds grain size the good grain and an opportunity to get a high yield of cereals, malt and date in the future growth of a healthy plant.

At the same time grain barley investigated parties characterized by high particle size: the 1 party – 91 %; 2 – 83 %. That first party again allows to realize on brewing the first class, and the second – the second class quality.

One of the most important indicators of quality, evaluating grain barley as raw material for brewing, is the ability to germinate and vitality. The ability to germinate 1 party was 95 % and accordingly the first class for brewing and 2 party – 90 % (with a minimum of 92 %) – does not allow grain barley for brewing. Viability was 96-98 % (standard 95 %), which allows the use of grain for the production of malt and brewing.

Conclusions.

1. Much better quality grain is characterized by the 1 party. Grains of the party can be used for various purposes and basic that it is suitable for brewing and can be implemented first class quality.

2. Grain of second party having low rates of capacity for germination can be used for malting and brewing. It is necessary that a grain of barley of the party passed post-harvest ripening and improved quality indicators, including the ability to germinate.

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CONTENTS

<p><i>j1109-001 Rakoid O.O.</i> ASSESSMENT OF N₂O DIRECT EMISSIONS FROM CULTIVATED SOILS AT THE REGIONAL LEVEL.....</p>	3
<p><i>j1109-002 Kudriawytzka A.N.</i> STUDY OF INFLUENCE MINERAL FERTILIZERS ON THE PRODUCTIVITY OF WINTER WHEAT.....</p>	7
<p><i>j1109-003 Natalia V. Bogdanova</i> AGE VARIABILITY OF EFFICIENCY OF STU D RAMS OF TAURIAN INSIDE BREED TYPE OF ASCANIAN FINE-WOOL SHEEP.....</p>	11
<p><i>j1109-004 Koreyba L.V., Suslova N.I., Makeyeva N.S., Golub A.A.</i> BIOCHEMICAL BLOOD PROFILE OF PREGNANT COWS WITH OSTEODYSTROPHY.....</p>	15
<p><i>j1109-005 Ponomarenko N., Goncharik O.</i> AGE FEATURES OF REPRODUCTIVE QUALITIES OF HENS OF EGG CROSSES.....</p>	19
<p><i>j1109-006 Boroday V.V.</i> EFFICIENCY OF THE APPLICATION BY PLANRIZ WITH RIDOMIL GOLD MZ COMBINATION FOR INCREASE OF THE POTATO TUBERS COMMERCIAL QUALITY AND YIELD.....</p>	23
<p><i>j1109-007 Zavadska O.V., Kolisnyk E.M.</i> VARIABILITY OF BIOCHEMICAL PARAMETERS IN POTATO TUBERS DURING LONG TERM STORAGE.....</p>	27
<p><i>j1109-008 Bober A.V.</i> FORMATION OF ESSENTIAL OIL CONTENT IN HOP CONES DEPENDING ON THE VARIETAL CHARACTERISTICS AND GROWING SEASON TERMS.....</p>	33
<p><i>j1109-009 Bober A.V., Lotovskyy V.V.</i> FORMATION OF CONTENTS POLYPHENOLS IN HOP CONES DEPENDING ON THE VARIETAL CHARACTERISTICS AND GROWING SEASON TERMS.....</p>	37
<p><i>j1109-010 Yashchuk N., Chemerskyy A.</i> SUITABILITY GRAIN OF BARLEY DIFFERENT PARTIES QUALITY BREWING GOALS DEPENDING ON HOW STORAGE.....</p>	41



<i>j1109-011 I. Bobos, V. Lopata</i>	
AN INFLUENCE OF PLANTING TERMS FOR THE WINTER GARLIC VARIETIES' PRODUCTIVITY IN THE CONDITIONS OF KYIV REGION.....	46
<i>j1109-012 Pikovska O.V.</i>	
DEHUMIFICATION OF CHERNOZEM AND WAYS OF RESTORATION SOIL ORGANIC MATTER.....	49
<i>j1109-013 Opryshko O. O., Pasichnik N. A.</i>	
ASSESSMENT OF THE ENERGY VALUE OF PINE BARK AS A RAW.....	53
<i>j1109-014 Bober A.V.</i>	
ALPHA-ACIDS IN AROMATIC AND BITTER VARIETIES OF HOPS UKRAINIAN SELECTION.....	58
<i>j1109-015 Bober A.V., Bober O.O.</i>	
OF TOTAL POLYPHENOLS IN AROMATIC AND BITTER VARIETIES OF HOPS UKRAINIAN SELECTION.....	63
<i>j1109-016 Bober A.V.</i>	
CONTENT OF ESSENTIAL OIL IN AROMATIC AND BITTER VARIETIES OF HOPS.....	68
<i>j1109-017 Zavadska O., Hrabovenko V.</i>	
THE QUALITY OF FRESH AND DRIED ONIONS (ALLIUM CEPA) DIFFERENT VARIETIES.....	73
<i>j1109-018 Slobodyanik H., Voytsekhivskiy V.</i>	
PRODUCTIVITY OF PERENNIAL ASPARAGUS FOR INFLUENCE OF MODERN BIOPREPARATS.....	79
<i>j1109-019 Havris` I. L.</i>	
HARVEST CUCUMBERS DEPENDING ON PATTERNS OF PLANTS FORMATION.....	83
<i>j1109-021 Kutovenko V.B., Gavrylyuk A.S.</i>	
AGROBIOLOGICAL EVALUATION OF RADISHR VARIETIES IN A NORTHERN FOREST STEPPE UKRAINE.....	91
<i>j1109-022 Kudriawytzka A.N.</i>	
AGROECOLOGICAL GROUND OF TOP-DRESSING UNDER SPRING WHEAT.....	95



j1109-023 Honchar L., Shcherbakova O.
EFFECT OF SEED TREATMENT ON THE GERMINATING
CAPACITIES AND STANDING PLANT DENSITY.....99

j1109-0024 Yashchuk N., Shambara J.
DYNAMICS OF PHYSICAL INDICATORS GRAIN OF CORN DEPENDING
ON HOW HARVESTING AND POSTHARVEST HANDLING.....104

j1109-0025 Yashchuk N., Trityak M.
QUALITY OF BARLEY FOR BREWING DIFFERENT PARTIES AND
THEIR COMPLIANCE WITH THE REQUIREMENTS OF STANDARD.....109