SUMMARIES

Soil erosion control techniques: history of the scientific views in the 19th- mid-20th centuries
I. Prymak, M. Voytovik

The history of scientific views on the causes of water and wind erosion in Ukraine and the evolution of the theoretical and practical bases of technology of soil erosion control techniques have been studied. The attention was paid to the historical background of mechanical tillage minimization and the problems of the shallow and surface tillage introduction into agriculture of the day. The paper considers the progress and establishment of emergency tillage. The role of the scientists in establishing the theoretical basis of soil erosion control practices.

In the second half of the 19th century, most scientists considered low humidity level to be the cause of soil erosion, which could be treated by deep tillage. The fundamentals of emergency tillage were developed by I. Ovsinsky at the end of the 19th century.

During the first period of the development of the national agriculture science in the 19th century, the direct link between the level of the human transformation of steppe land and the negative effects accompanying the process was established. In this period, the agriculturalists pointed to the need in limiting the black soil steppe plowing practice. Once the irreversibility of the process became apparent, it was recommended to enhance afforestation and strip sowing practice to protect the exposed field areas. The issue of rational tillage management did not seem to be of the priority, as long as the amount of the plowed steppe land was low. At the end of the 19th century, this problem became urgent due to the beginning of the period of intensification in agriculture, particularly in tillage modes.

The intensive erosion processes in the black soil regions of Russia in the first half of the 19th century were prevented not only by insignificant areas of plowed steppe lands, but also by virgin and fallow cropping system practices.

However, most native agronomists in the19th – early 20th centuries vigorously promoted the fallow system of farming for the black soil regions of the country as they did not see any other alternative to it.

In the 19th century fallow practices were the only effective measure of tall weed control, as well as the means of short-term field "rest". It was particularly important in practicing the repeated grain sowing widely spread at that time.

Moldboard plowing in the late 19th century that replaced the primitive wooden plows and processing plows was considered (and this is true to a certain extent) synonymous to the intensification in farming. Its first phase was the intensification of the rapid nutrient mobilization to increase yields. The problem of the preservation of the valuable soil properties was of less importance, though it began to attract the attention of the specialists.

P.A. Kostychev, correctly pointing out the advantages of shallow plowing and underlining its importance, did not realize, like the rest of his contemporaries, that the plant residues left in the soil and mixed together with thin layers of soil prevented blowing off. This was due to the prevailing contemporary understanding of erosion as the consequence of soil dehydration. Obviously, it was this erroneous understanding that prevented P.A. Kostychev from creating the foundations of emergency tillage. It was I.E. Ovsinsky who did it.

One of the main reasons of low introduction of the surface and subsurface tillage into production was the high weed contamination rate. And on the plots which were relatively void of weeds, shallow and superficial cultivation led to better conditions for crops growing and provided increased yields in the early years. Later, however, the weed contamination rate became high, and farmers had to return to deep plowing. That is why the verification of the results of I.E. Ovsinsky's system in the late 19th and early 20th centuries was not completely evident.

Further development of the ideas on erosion control farming practices was in the works of V. Rotmistrov. The method he proposed in 1911 was designed especially for the climatic conditions of the southern Ukraine, where the snow cover is insignificant and unstable, and is reduced to the maximum preservation of the stubble in the field. He considered the plowing depth of more than 9 cm to be unnecessary and economically unprofitable.

The scientists proved that the solution of the main problems of steppe land farming – conservation, saving and rational use of water – can be achieved not only by afforestation and irrigation as V.V. Dokuchaev considered, but also by the appropriate erosion control tillage.

Key words: erosion, tillage, soil, farming system, fallow, technique, yield.

The impact of the biological preparations on the epiphytic microflora of potato tubers during the storage period
V. Koltunov, V. Boroday, T. Danilkova

The potato disease pathogens are one of the main factors that reduce the marketability of tubers and cause great losses during transportation and storage. The placement of nonstandard products in storage in autumn leads to significant losses in spring. Therefore, the reducing of the number of pathogenic organisms on potato tubers during the growing season is an important problem.

The use of microbiological preparations in the modern technologies not only increases the plants resistance to phytopathogens, their productivity and quality, but also contributes to the recovery of the agrocoenosis from the harmful effects of the chemicals. The fixation of atmospheric nitrogen, the production of biologically active substances, activation of root ability to absorb the nutrients, biocontrol of phytopathogens and the induction of the systemic plant resistance are the mechanisms of the positive influence of the associative rhizosphere and endophytic bacteria on plants. The impact of the microbiological preparations on the potato contamination by the pathogens during the potato (*Solanum tuberosum* L.) tubers storage has been understudied. The study of the special aspects of the microbial community activities during the storage of the potato tubers, grown in the western forest-steppe zone, the impact of abiotic and agrotechnical factors, use of Planryz and combination of Planryz + Diazofit + FMB was the aim of research. The comparative ratio assessment of bacteria, actinomycetes, phytopathogenic and saprophytic fungi of the epiphytic microflora on the potato tubers in case of biological preparations use was the task.

The study was conducted during 2009-2013 at Zhovkivskyi district (western forest steppe zone in Lviv region). The following biological preparations were studied: Planryz, based on *Pseudomonas fluorescence* strain AR-33 (2.0 l/ha),

Diazofit (the active ingredient - bacteria *Agrobacterium radiobacter*, 0.2 l/ha), Fosforoenteryn – a biological preparation based on phosphorus bacteria *Enterobacter nimipressuralis* 32-3 (FMB- fosforomobilizator 0.2 l/ha). Fitotsyd (based on *Bacillus subtilis*, 1.0 l/ha) was used as the biological control, Rydomil Gold MTS68 WG, 2.5 l/ha – as the chemical one. The tubers were treated by the preparations before planting, storage and the plants themselves during the budding. The trials were conducted on the 1st term (27-30 April), 2nd (12-15 May). The method of consequent suspension dilutions (off-washings from the tuber surface), cultivation for the elective nutrient medium, consequent enumeration of the colonies that grew on them, the study of the morphological and cultural properties of the selected isolates were used to study the tubers microflora at the beginning and end of the storage period. The statistical analysis of the data obtained was processed with the help of the computer program Excel.

Analysis of potato tubers at the beginning and end of the storage period showed that the use of Planryz and Planryz +Diazofit + FMB reduced the level of the tuber contamination with the pathogens *Fusarium* and *Alternaria* sp. compared to the control group. At the beginning of the storage in the first planting period in the breed Lileya the control figures were 4.2-4.8; under the biological preparations treatment – 1.2-3.6; under the chemical fungicide Ridomil Gold treatment – 3.8-4.3 × 10^3 CFO/ sm^2. At the end of the storage period they were 6.4-7.3; 2.7-3.8 and 5.9-6.1 × 10^3 CFO/ sm^2 respectively. The similar tendency was observed in the tubers of Skarbnytsia breed (at the beginning of the storage period – 1.2-1.5; 0.4-0.7 and 1.0-1.3 × 10^3 CFO/ $sм^2$, and at the end – 2.1-8.7; 0.7-3.6 and 1.1-4.8 × 10^3 CFO/ sm^2). The pathogen contamination level increased at the second term of planting the tubers and treatment with the biological preparations contributed to the reduction of the diseases during the storage period in comparison with the control group. The number of pathogens *Fusarium* and *Alternaria* sp. Being reduced in 1.5-4.7 times was observed at the beginning and the end of the storage period in the tubers epiphytic microflora of relatively resistant breed Skarbnytsia in comparison with the relatively susceptible Lileya (on the average relatively 0.7-3.0 × 10^3 CFO/ sm^2 against 3.3-4.5 × 10^3 CFO/ sm^2). This can be explained by the fact that in the relatively resistant plants, the secondary plant metabolites (phenolic compounds, alkaloids, terpenes, etc.), the protective stress-relieving components can modify metabolism, induce the changes of the plasticity breeds and their level of resistance to pathogens. The combined use of Ridomil Gold and Planriz was more effective than the use of the fungicide (on the average the number of pathogens reduced in 1,1-1,3 times in the tubers epiphytic microflora during the storage in comparison with one- fungicide treatment).

Bacteria, which are the basis of biopreparations, produce phytohormones, have the ability to nitrogen fixation, improvement of hydro-mineral plant nutrition, inhibit the development of pathogens due to the bactericidal or fungicidal production of the substances, and their immune-stimulating activity has a prolonged effect, helping to preserve the protective potential in potato tubers during the storage period.

The pre-planting tuber treatment, further plant spraying during the vegetation period and pre-storage treatment with the biopreparations Planryz, Diazofit, Fosfoenteryn reduce the population density of the pathogens *Fusarium* and *Alternaria* in the tubers epiphytic microflora in 1.9-2.8 times compared to the controlgroup. The reduction in 1.5-4.7 times of the pathogen number in the tubers epiphytic microflora in the relatively resistant breed Skarbnytsia at the beginning and end of the storage period in comparison with the relatively receptive Lileya was established. The combined use of Ridomil Gold and Planriz contributed to the fungicide effect. In the future, we plan to continue the study of the induced resistance of the plants *Solanum tuberosum* L. against the pathogens under the treatment with microbiopreparations.

Key words: *Solanum tuberosum* L., epiphytic microflora, biopreparations, storage.

Productivity of sugar beet depending on hydrothermal conditions of the growing season

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Sugar beet is the most productive and economically advantageous crop of field rotation in the Forrest-steppes of Ukraine. However, they are among the most finical to growing conditions and require high level of soil fertility and fields culture, primarily to its sanitary condition. Thus, other harmful factors can destroy the crop yield. One of the features of sugar beet is its long germination period, soil surface shooting before the roots molt, which occurs in the second phase and is completed in third phase of true leaf pairs), can last from 16–26 to 18–29 or more days depending on several reasons.

During this period of plants growth and development sugar beet is the most vulnerable and exposed to all pests and diseases. To create productive sugar beet crops it is necessary to reach on the optimal parameters and biological optical density which depends on field seed germination, plant loss, duration of the phases and the phytosanitary condition. Thus, sugar beet crops monitoring is topical in relation to specific areas of sugar beet sowing.

Comprehensive system of monitoring and evaluation of sugar beet crops was conducted during the 2009-2014 on the farm of Yarmolynetskiy district, Khmelnytskiy region. The sugar beet productivity was determined depending on the weather conditions of the growing season. Laboratory analyzes and accounting of the plants samples were conducted in the laboratory of soil agrochemical analysis in Bila Tserkva NAU.

The plot total area was 16.2 m^2, accounting area – 13.5 m^2, repetition – quadruple. Sugar beet diploid pelleted seed hybrid: Ukrainian ChS 72 was used for the research.

Phenological observations and biometric accounting was carried out in accordance with the conventional method of field experiment and methodical instructions of the Institute of Sugar Beet of UAAS.

Soil and climatic conditions of Khmelnytskiy region are generally favorable for sugar beet growing. Thus, it has long been renowned for its high yields of this crop and occupied its rightful place in the region for the gross yield of raw sugar. However, in recent years, the economic crisis that struck the agricultural sector has resulted in a sharp decline in sugar beet and sugar production. Reducing the sugar beet sowing areas, insufficient provision of material resources in the sector, inadequate relationship between sugar beet producers and processors, as well as violation of growing technology have made the industry unprofitable.

In 2009–2013, on the average, the area of sugar beet growing was 2 thousand ha in Yarmolinetskiy district, the crop average billet was 91thousand tons. It should be mentioned that for 2001–2005 these indexes were 4.5 thousand/ha and 197.1 thousand tons, and for the 1991–1995 – 6.3 thousand ha and 257.7 thousand tons respectively.

The sugar beet crops productivity was different during the 2009–2014.

The highest productivity in sugar beet crops for a 6-year period were in 2012 and 2014. Area moistening, phytosanitary status of the growing season (cercosporosus infestation was 40 %) contributed to a fuller using of the system of farming practices in createing high-productivity crops. The average yield in 2012 was 51.6 t/ha, for example. The lower yields of sugar beet is marked in 2009 (41.3 t/ha) and 2011 (42.0 t/ha), as compared to other years.

To establish the relationship between the studied traits of plant productivity and climatic conditions we have conducted correlation and regression analysis.

The obtained mathematical models are of linear character and describe the experimental data with rather high precise measurement (approximation coefficients respectively at 0.85, 0.81 and 0.69). Thus, plant density before harvesting, yield and sugar yield can be predicted according to the GTC index for sugar beet growing season the by the graphs or regression equations:

$y = 13,37x + 93,174,$

$y = 12,266x + 31,178$ and

$y = 2,1902x + 4,713.$

It has been found out that the most informative indicator for predicting the field germination and density of plants at the time of the full shoots phase is the GTC for the period of sowing-shoots. Developing mathematical models with this index allows to get the maximum rate of approximation (i.e., the model describes experimental data the most accurately) and high correlation coefficients.

Key words: sugar beet, hydrothermal conditions, growing season, yield, sugar content, sugar yield.

Post storage quality of domestic and foreign selection sugar beet roots

V. Hlevaskiy

High poductivity and technological quality of modern hybrids roots become apparent due to the heterosis effect and high genetic potential of the original parental forms. Much has been done in this area by the breeders who select the source material, taking into account not only the roots yield and the sugar content as well as all the elements and features of the crop the formation.

Due the economic crisis in Ukraine, sugar beet growing volumes as well as the volume of raw materials harvesting reduced dramatically, which resulted in decrease in the processing season length from the optimal of 90 to that of 15-40 days. The storage duration has decreased as well. However, total losses of the raw materials and sucrose at factories are high (3.8 and 1.12 % relative to the beets weight), and at some enterprises they are very high (5.10 and 2.45 %).

Sugar beet crops examination during the growing season shows that roots rotting, their scab infestation are mostly found on the fields where hybrids of foreign origin were sown. Thus, in Vinnitsa region (Lyulynetska-settled Experimental Breeding Station) the amount of decayed roots in Sonia, Extra, Pearl and Gala hybrids amounted to 10-15 %. The examination of fields of several farms in Kyiv region showed that scab infestation in Gala, Lena, Kiva hybrids reached 70 %, rot infestation rose up to 20-30 %. There was no rotten roots in the domestic hybrids and the amount of scab infestation there reached 25 %. Even under growing foreign hybrids on the basis of intensive technologies at research stations in different soil climatic zones of the Forest-steppe and the Northern Steppe, foreign hybrids were more infested.

Therefore, research was conducted to study the productivity of roots grown in similar agro-climatic conditions during the storage.

The research aimed at evaluating the productivity of domestic and foreign selections sugar beet hybrids during storage. The experiments were conducted in 2013-2014 on the experimental field of Educational Scientific Research Centre of Bila Tserkva National Agrarian University. In field experiments, discount land The accounted area of the field experiments was 25 m^{2e}, the repetition was quadruple.

Sugar beet hybrid seeds of domestic (Ramses, Pryz, Umansky, ChS90), joint (Vorsar) and foreign selections (German – Olesya KVS, Nastya KVS, Swedish – Hazeta, Attac) were used for the research.

The samples storage duration ranged from 32 to 70 days. The average daily losses in sugar were determined using the analytical data.

We have studied sugar beet hybrids productivity of domestic and foreign selections during storage.

Phytopathological examination of beet roots was conducted during the tests samples formation. It was established that hybrids in growing conditions were infested with common and surrounding scab, and some of them were infested with fusarium or root rot. German hybrids scab infestation in the growing season was 8-20 % and infestation with brown rot was 8 %. German hybrid Nasty KVS, Swedish Attac and Ukrainian Ramses were infested to a greater extent.

Thus, we can conclude that foreign selection hybrids are rather sensitive to the growing conditions during the vegetative period.

Therefore, infested storage roots were discarded during the storage during formation of grid sample to study the stability of sugar beet of various selections. As the studies show, the benefits of most hybrids of foreign origin have been lost in both technological quality and productivity, even under short-term storage, especially at high temperatures. That is why, it is better to harvest and process them without storage both at the beginning of the production season and in the period of beets mass harvesting.

Key words: sugar beet, hybrids, root, domestic breeding, foreign breeding, joint selection.

Productivity and technological qualities of sugar beet different biological forms

I. Boiko

One of the urgent tasks of experimental biology is the disclosure of the nature of internal factors determining the level of plant organism productivity, its ability to use the environmental conditions the most efficiently.

This problem turns particularly topical due to the success of biological selection science in creating a high yielding forms of plants and their biologically and economically valuable properties. i.e. high content in nutrients, high technological qualities of the roots.

Plant breeders have made the new hybrids on the basis of Ch.S on both diploid and triploid genome levels. The productivity potential of these hybrids is: yield – 55.0–65.0 t/ha, sugar content – 17–18 % and sugar yield – 9.12 t/ha. Yet, the comparative assessment of productivity and technological qualities of various biological forms, namely new diploid and triploid hybrids of sugar beet has not been carried out.

The research aimed at comparative assessment of roots productivity and technological qualities of various biological forms, namely new diploid and triploid hybrids of sugar beet.

Experiments on studying potential productivity of domestic sugar beet hybrids were carried out during 2010-2014 under conditions of unstable humidity on the experimental field of the Institute of Bioenergetic Crops and Sugar Beet in "Salyvinky" farm of Kyiv region.

It was established that the growth and development of sugar beet hybrids of different biological forms during the growing season was nearly the same, the sprouts germination was even which provided the recommended density of crops stand. Observing the dynamics of growth and development of the sugar beet diploid and triploid plants has showed that the intensity of their growth in the initial period was nearly the same.

The average yield of sugar beets diploid forms was 59.6 t/ha, triploid ones was 58.9 t/ha in 2011–2014. The was no significant difference in this indicator depending on biological forms of beets. The roots yield changed in the years depending on the hybrid. Thus, in 2011–2012 the highest yield of 60.5 and 63.2 t/ha had Vesto diploid hybrid, in 2013 the highest yield of 62.1 t/ha was in Bulava diploid hybrid, and in 2014 it was in diploid hybrid Ukrainian ChS 72 (62.1 t/ha).

Technological qualities of sugar beet roots are the complex of biological, physical and chemical features, which determine the origin of the technological processes at the enterprise and the crystal white sugar output. The main indicator of sugar beet roots technological quality is sucrose content.

The average for four years sugar content in sugar beet roots of diploid and triploid biological forms was almost equal and amounted to 17.4 % and 17.5 %.

The final evaluation under the sugar beet processing is a yield of sugar per area unit, which is directly dependent on the roots yield and sugar content. Since the research has not revealed a substantial increase in the roots yield and sugar content, there was no significant increase in the sugar yield per hectare in both diploid and triploid hybrids.

On average over 4 years the yield of sugar of both biological forms was the same and amounted to 10.25 t/ha. It was not significant fluctuations in hybrids.

Efficient controlling the technological process requires awareness of the quality of the processed raw materials not only in its sugar content but the in nonsugar contents as well as it influences on the storage and processing. The lower is the content of ash elements and alpha amine nitrogen, the higher is the purity of cell sap and the higher is the sugar yield.

With the standards content of 2–3 mmol/100 g of roots, it was 0.7715 mg/100 g, in the roots of diploid hybrids and 0.8353 mg 100 g in triploid ones. The lowest content of alpha amine nitrogen was in the roots of Anichka triploid hybrid, the highest was in Olzhych triploid hybrid.

It is established that the content of soluble or conductometric ash in the roots of both biological forms of sugar beet was the lower than in the permissible norm which is 0.5–0.6 %.

The indicators of technological qualities of domestic sugar beet hybrids fully meet the requirements of sugar producers. All the hybrids have optimal level of conductometric ash alpha amine nitrogen, potassium and sodium. Processing these hybrids on the sugar plants will help to get rather high sugar yields with its minor losses in.

Key words: sugar beet, productivity, technological qualities, diploids, triploids.

Productivity of foreign hybrids of sugar beet in the Central Forest-Steppe of Ukraine

A. Gorodetskiy, R. Kovalenko, A. Gorodetska

The biological basis of sugar beet production is a variety or hybrid. Therefore, the whole set of agricultural techniques is be directed to the maximal realization of its genetic potential. Today, in the Register of plant varieties of Ukraine there are more than 100 varieties and hybrids of sugar beet, many of them are owned and by foreign seed companies.

The present level of agriculture requires a comprehensive study of the advantages of the currently used hybrids of sugar beet. This will help to use more efficiently their biological potential in the production.

High performance, good technological properties of roots that characterize the modern hybrids are due to the effect of heterosis and high genetic potential of the original parental forms. Much work have been done by the plant selection breeders who in the process of singling out the starting material for breeding, consider not only the yield ability of the roots and sugar content indicator, but also all the elements and features of the yield formation.

Therefore, the aim of our research was to study of the peculiarities of yield formation of modern sugar beet hybrids of foreign origin in the given soil and climatic conditions.

The trial was conducted during 2014-2015 on the plots of the farm "Rasavske" (Kagarlyksky district, Kyiv region) on the typical clay loam black soil with low humus content. The humus content rate by Tyurin was 4.53-4.62 %, mobile phosphorus and exchange potassium by Chyrykov 157-160 and 142-185 mg/kg respectively.

The seeds of the foreign hybrids Daria, Carmelita, Hloriana, Sezariya, Olesya, Nastya, Acacia, Alyona, Lavinia and Korryda were given for the trial by the company KBC. The seeds had the same sowing qualities that corresponded to class I by ISO. The area of the planted plots was 201.6 m^2, recorded plots – 50 m^2, repetition – three times. The farming techniques of sugar beet growing were common for the right bank area of the central steppe zone of Ukraine.

Observations and recording demonstrated that the growth, development and productivity of sugar beets grown using the same agricultural techniques of cultivation significantly depend on the peculiarities of the hybrids that have been studied. The plant stand density rate before harvesting in the hybrids comprised 100,000 plants/hec.

The productivity analysis demonstrated that the highest root yield rate was observed in such hybrids as Daria (79.8 t/ha), Aliona (76.2 t/ha) and Acacia (75.0 t/ha). The hybrid Olesia had the lowest yield rate – 60.0 t/ha, but the highest sugar content – 21.4 %. Besides the hybrid Olesya, the highest sugar content of the roots was also observed in the hybrids Alyona (19.6 %), Cesaria (18.8 %) and Acacia (18.6 %).

The highest technological properties of the sugar beet hybrid during the trial period had the hybrid Aliona, as the qualitative suitability of the celular juice was 81.0 %, the content of soluble conductometric ash – 0.268 %, the loss of sugar in molasses – 1.01 %, MB factor – 11.4 and the calculated sugar yield – 17.69 %. In the hybrid Olesia, the technological qualities of the roots were at approximately the same level, but taking into consideration its overall sugar recovery rate per hectare, it was 1.83 t/ha less compared to the hybrid Aliona. The worst technological qualities of the roots were recorded in the hybrid Nastia, consequently the lowest overall sugar recovery rate was 9.68 t/ha.

The realization of the breeding and genetic potential of sugar beet depends on its hybrids as of one of the components of sugar beet production intensification. On average, during two-year trial, conducted in the given climatic conditions on the plots of the private farm "Rasavske" (Kagarlyksky district, Kyiv region) the most efficient were the hybrids Aliona, Acacia and Daria. The highest root yield rates were 76.2, 75.0 and 79.8 t/ha respectively, and sugar yield rate – 13.48, 12.32 and 12.05 t/ha. Further research is to be carried out, taking into consideration additional disease-resistant properties of the hybrids of both native and foreign selection. It will make possible to understand their adaptability to the conditions of the right bank of the central forest steppe zone of Ukraine.

Key words: sugar beet, hybrids, productivity, technological properties.

Planting seed production of sugar beet using drip irrigation

I. Morgun

Water is one of the important conditions for plant life, and crop plants need it in optimum amount to be able to form higher output yield. If water supply is insufficient, the fertilizers, used to batten the soil, will not produce the desired effect.

Due to the climate changes causing the tendency to the temperature rate increase and precipitation rate decrease, the achievement of regular high output yield of sugar beet seeds is possible only by applying the irrigation techniques. In recent years, agricultural producers have increasingly preferred sprinkler apparatus to drip irrigation, which primarily leads to considerable water savings. In the course of drip irrigation the limited part of the soil surface is moistened, water runoff and its filtering in deep soil layers are excluded. In addition, by using drip irrigation the decrease of evaporation from the soil surface is observed, as the part of the area remains dry. The efficiency rate of irrigation water absorption by plants is up to 85-95 %.

Nitrogen fertilizers and drip irrigation techniques have improved the plant habitus. The phenological observations of their development were carried out, from the shooting period till the seed maturation period.

In case of fertilizing throughout the growing season and using drip irrigation (option 3.4) the plant height increased from 130 cm on control to 145 cm and number of lateral canes increased from 41 to 50 pcs, the seed maturation rate decreased from 71 % to 60 %.

The trial established a clear pattern of the significant influence of drip irrigation as well the efficiency of the fertilizers in combination with irrigation on the output yield of sugar beet seeds.

The application of Nitrogen (20 kg/ha) and drip irrigation increases the output yield of sugar beet seeds by 51-73 %.

The mineral fertilizers (N_{20}) and drip irrigation improve the quality of the seeds obtained. The full seed output in case of applying fertilizers increases by 10.3 %, applying both fertilizers and drip irrigation by 16.4 %, and by extending irrigation period till the moment of seed harvesting by 20 %, which makes 0.11-0.17 t/ha.

The yielding capacity reduction of all the options in 2015 was caused by the negative impact of high temperature and low relative air humidity during the seed-setting and maturation.

While studying the size of the obtained seeds the output yield of the coarse fraction of about 5.5-4.5 mm in diameter increased from 16 % on control to 24 % in case of applying fertilizers and irrigation techniques. The extension of irrigation period up to the crop harvesting increased the yield of the coarse fraction seeds by 20 %, option 4, compared to the control.

As to the seed quality it is worth mentioning that in the fractional composition the content of the fruits sized 3.0-3.5 mm was almost the same in all the options, and the number of the fruits sized 4.5-5.5 mm increased in the options in which irrigation took place.

The seed fertility property was less dependent on growing conditions, and in general within the frames specified by the standard was following: the small fraction – 96-100 % of single-seed fruits, and the coarse fraction: 93.3-100 % respectively.

The simultaneous combination of irrigation and mineral fertilization increased the seed sprouting energy significantly. In addition, there was a trend, though insignificant, to the increase of other seed quality indicators such as germination and purity with their relatively high level (germination – 86-93 %, purity – 89-97 %).

The calculations of the efficiency of drip irrigation usage demonstrated that the cost of the purchase and use of the irrigation equipment will be repaid during the second year of its operation. Later, the farm is to obtain net profit.

Thus, the use of drip irrigation ensures the seed stand density of the plants during the growing season, high-quality formation of vegetative and generative organs, increases the seed yielding capacity and improves its seed sowing properties as well.

Key words: drip irrigation, sugar beet seeds, seed output yield, seed quality.

Energy assessment of the cultivation of different winter wheat varieties in the Right-Bank Forest-Steppe zone of Ukraine, dependence on the predecessors

A. Palamarchuk

In recent years, the whole world and Ukraine in particular have faced an energy crisis, which is accompanied by gradually increasing energy expenses in crop production. The production of an additional harvest unit requires ever-increasing investments of energy. The carriers of this energy are not only organic and mineral fertilizers, but also all the factors of soil fertility, which actively influence the crop growth and productivity formation. Therefore, the optimal energy use and its assessment in the context of

constantly growing rate of agricultural production is an urgent problem in today's farming practices.

In the three-factor field trial there were investigated the following predecessors of winter wheat (factor A): peas (control), silage corn, soybean (early ripening), buckwheat, winter rape; winter wheat varieties (factor B): Poliska 90 (control); Podolianka; Myronivska 65; Smuglianka and seeding rate of germinating seeds (factor C): 4; 4.5 (control); 5 and 5.5 *million pcs./ha*.

The area of seedling plots was 60 m^2 with the record area of 50 m^2, the repetition was treble. The trial was performed with the help of the split plot method. The technology of winter wheat growing used was the generally accepted one for the zone (ISO 3768: 2010).

The methodological basis of the ecological and technological energy balance assessment in winter wheat growing was the energy equivalents of agricultural products and the permanent and circulating assets of the crop production.

The aims and objectives of the research are in establishing the patterns of the energy efficient variation of winter wheat under different predecessors and varieties in the right-bank forest-steppe zone of Ukraine.

Energy efficiency of crop production is calculated by dividing the energy intensity of the grown products (Ep) on costs non-renewable energy for its production (Ec), GJ / ha, which is called the energy efficiency coefficient (Cee = Ep / Ec).

The results of the trial were assessing the various predecessors and winter wheat varieties on the energy efficiency impact rate in the course of its growth in the right-bank forest-steppe zone of Ukraine. It was found that the most energy-efficient predecessor for the winter wheat cultivation is buckwheat, which provides an indicator of Cee 3.44 at the control level.

The cultivation of the variety Smuglianka was accompanied by energy efficiency increase of grain production of winter wheat by 37.9 % compared to the control Poliska 90.

The summarized results of the analysis of the winter wheat energy balance, the average for all the sample plots have shown rather high energy efficiency rate which was Cee = 3.13.

The predecessors studied in the trial differed significantly in terms of energy efficiency. On the average during the period of the trial, the highest energy values were observed when winter wheat was grown after buckwheat (Cee = 3.44), but this was not statistically different from control variant – pea (Cee = 3.34). Winter wheat grown after silage maize was the worst producer of energy due to the lowest crop yield which in the context of increasing production costs led to Cee = 2,86 (-14,4 % of control).

The energy efficiency rate when growing wheat after winter oilseed rape and soybean was also significantly inferior to the control, which was proved by the decrease in Cee 6.3 and 11.7 %, due to the decreased energy production accumulated.

As to the winter wheat varieties studied in the trial the most energy efficient variety was Smuglianka. Its Cee was 3.71, which was significantly higher by 37.9 % compared to the control variety Poliska 90. On the plots with the varieties Podolianka and Myronivska 65 the energy efficiency coefficients of winter wheat cultivation were 3.05 and 3.11 accordingly, which were higher than in the control variant by 13.4 % and 15.6 %.

Assessing the effect of the combination of the studied factors, it should be noted that the highest energy efficiency rate Cee = 3.98 was established in the growth of the variety Smuglianka after buckwheat. The nearest results were observed in the same variety grown after peas, with Cee = 3.83.

Key words: energy efficiency, winter wheat, predecessor, variety.

Identification of the source material for winter wheat of Myronivka breeding by the electrophoretic spectra of the storage proteins

I. Sozinov, N. Kozub, V. Kyrylenko, O. Dergachov, S.Vasylkivskiy

The success in practical breeding largely depends on the latitude of source material genetic diversity.

At present, the methods of molecular-genetic markers are widely used for research dealing with the regularities in the formation of the gene adapted complexes of genes in selection process, detecting association of allele variants of clusters of storage proteins with the loci that control the level of the expression of quantitative traits, for the identification of genotypes and evaluation of varietal purity.

The loci of storage proteins are the convenient molecular genetic markers in wheat genetics and breeding. This is due to their peculiarities such as plurality of loci, cluster organization of genes in loci, high level of polymorphism, direct influence of storage proteins on properties of dough. Electrophoretic analysis of storage proteins of breeding samples allow to solve the following tasks: 1 – to identify genetic formula of the sample by loci of storage proteins; 2 – to determine homogeneity/heterogeneity of the sample by these marker loci; 3 – to reveal casual impurities; 4 – to identify the presence of rye translocations 1BL/1RS and 1AL/1RS; 5 – based on the analysis of genotypes by loci *Glu-A1, Glu-B1, Glu-D1* and considering the presence of translocation 1BL/1RS to make a preliminary prediction of grain quality of the specific sample.

The purpose of the research is to compare and identify the lines of soft winter wheat selected in the hybrid generations according to the morphological homogeneous traits and to analyze a new source material of winter wheat of Myronivka breeding by theelectrophoretic spectra of storage proteins.

The prospective lines of competitive strain test (2012-2015) and new varieties of soft winter wheat bred at V. M. Remeslo Myronivka Wheat Institute of National Academy of Agricultural Sciences (NAAS) of Ukraine were investigated in the laboratory of ecological plant genetics and biotechnology at the Institute of Plant Protection of NAAS (Ukraine, Kyiv).

The alleles of the main gliadin loci were identified with the help of E.V. Metakovsky Catalogue with additions. The alleles HMW of glutenin subunits were identified with the help of Payne and Lawrence Catalogue.

To determine the genotype of breeding samples by marker loci for each sample, 5–10 grains were analyzed. To identify some alleles the spectra of the sample were compared with the spectra of varieties or lines with the known alleles by the loci of storage proteins. *Gli-B1l* allele is a marker of rye 1BL/1RS translocation. *Gli-A1w* allele is a marker of rye 1AL/1RS translocation.

The potential mark of baking quality was determined according to the scale of P.I. Payne et al. (1987) based of genotypes by the loci *Glu-A1, Glu-B1, Glu-D1* and considering the presence of 1BL/1RS translocation.

From 5 to 11 individual caryopsis of each number were analyzed by the electrophoresis of gliadins in the acidic conditions and by SDS-electrophoresis. The genotype of each caryopsis was recorded by loci of *Gli-A1, Gli-B1, Gli-D1* gliadins and high molecular subunits of *Glu-A1, Glu-B1, Glu-D1* glutenins. While analyzing the electrophoretic spectra to detect the impurities, we took into account the spectra of protein components encoded with *Gli-2, Gli-A3* loci as well.

The genotypes of the new source material of soft winter wheat by the loci of *Gli-A1, Gli-B1, Gli-D1* gliadins and high molecular subunits of *Glu-A1, Glu-B1, Glu-D1* glutenins were identified.

Rye 1AL/1RS translocation was identified in the sample Erythrospermum 37038 (Expromt / Erythrospermum 52259) / Columbia. The winter wheat varieties Columbia and Expromt involved in pedigree of this hybrid combination as parental components are the carriers of this translocation.

The rye 1BL/1RS translocation that carries resistance genes *Pm8, Sr31, Lr26, Yr9* was identified in 15 genotypes, other three samples (Lutescens 36926, Ekonomka bulk population selection, Ekonomka) were heterogeneous by translocations.

It was revealed that *Gli-A1b, Gli-A1x, Gli-B1l* - marker of rye translocation, *Gli-B1b, Gli-D1b, Glu-A1 a, Glu-A1b, Glu-B1c, Glu-D1d* are dominant alleles.

The potential mark of baking quality for the investigated samples based on the genotypes by the loci *Glu-A1, Glu-B1, Glu-D1* considering the negative effect of presence of rye 1BL/1RS translocation on the dough quality was determined. Such samples as Erythrospermum 37189, Lutescens 37209, Ferrugineum 36258, Erythrospermum 36846, Erythrospermum 37157, Erythrospermum 37028 (Horlytsia Myronivs'ka), Lutescens 36832, 77558/05 bulk population selection, Ekonomka posess the highest quality mark of 9-10.

The samples with the alleles by *Gli-1* loci which we did not previously meet in the varieties of Myronivka breeding – Ferrugineum 36258 (*Gli-B1i*), Erythrospermum 36844 (*Gli-A1g*), Lutescens 37129, Lutescens 35354, Lyutestsens 36756 (*Gli-B1g*) – were identified. The biotype that carries *Gli-D1x (GLD 1D10)* was detected in 37028 Erythrospermum sample (Horlytsia Myronivs'ka).

Key words: winter wheat, genotype, variety, locus, allele, storage proteins.

Inheritance and transgressive variability of general and productive tillering of intraspecific hybrids of winter wheat

M. Lozinskiy

The paper highlights some features of common inheritance and productive tillering of F_1 hybrids. Analysis of F_1 hybrids showed the complex nature of genetic determination of total tillering. The degree of dominance (h_p) ranged from minus 3.2 to 8.0. Inheritance of productive tillering hybrids F_1 in most crossing combinations occurred on the type overdominance (h_p = 2,0-39,0). The degree of positive transgressions of total tillering in F_2 hybrids ranged from 16.7 % to 60.0 % with a frequency of 4,8-20,0 %. A significant influence on the parameters and frequency of transgression has the character of inheritance index in F_1. The highest rates of transgressive variation for grain weight with the main spike characterized the hybrids observed in F_1 heterosis. The studies found Missia Odeska / Vidrada, combination which had a degree of positive transgressions productive tillering at the level of 66.7 % with a frequency of 8.0 %.

An important task in the soft winter wheat breeding is to create varieties with high levels of productivity and adaptability to adverse environmental conditions.

Tillering is an important feature in natural evolutionary adaptation cereals tolerate adverse conditions in generating high yield of winter wheat. The basis of plant life is a dynamic process of autoregulation of ensuring the survival of a wide range of environmental changes. The adaptation of plants to environmental changes is active, providing a flow of adaptive responses that are dependent on the genotype and the complex operating factors.

Most of the varieties form 30-50 % of grain yields on the stems of other orders. On the thinned sown areas the share of productive crops stems of other orders in the formation of the grain reaches 60-70 %.

However, not all sprouts give spicewood stems, thus, the distinction is made between general and productive tillering.

Studying the nature of inheritance of quantitative traits of wheat plants is a prerequisite for the development of the strategy selection process and, in particular, sampling methods.

Most hybrids of the second generation in terms of general tillering and at its maximum value exceeds the parental forms.

Analysis of F_1 hybrids of winter wheat found the complex nature of genetic determination of total tillering. The degree of dominance (h_p ranged from minus 3.2 to 8.0. The most common type of inheritance is intermediate ($-0,5 \le h_p \ge 0,5$).

The degree of positive transgressions of total tillering in the studied F_2 hybrids ranged from 16.7 % to 60.0 % with a frequency of 4,8-20,0 %. A significant influence on the parameters and frequency of transgression has the character trait of inheritance in F_1.

Inheritance of productive tillering by F_1 hybrids in most crossing combinations took place by the type of positive superdominance (h_p = 2,0-39,0).

The studies found the combination of Mis. od/Joy, which had a degree of positive transgressions productive tillering at the level of 66.7 % with a frequency of 8.0%.

The prospect of further research is the selection and evaluation of the hybrids on a complex of economically valuable traits. Among the best combinations we have conducted selections aimed to create a new source material for breeding varieties with high levels of productivity and adaptability to adverse environmental conditions.

Key words: winter wheat, total and productive tillering, the combination of crossing hybrids, inheritance, the degree of dominance, the extent and frequency of the transgression.

Baking properties of spelt grain caused by carbohydrate-amylase complex

G. Hospodarenko, V. Lubich, I. Polyanetska, V. Vozyyan

One of the important factors affecting the quality of bakery products is the gas-holding capacity of flour which essentially depends on physical properties of dough and ranges between 250-550 cm^3/100g of dough. In wheat flour gas-holding capacity is caused by the number and quality of gluten that forms elastic and flexible frame in the dough.

Gluten is a protein complex that can form stable highly developed thin-walled spongy structure under the influence of carbon dioxide evolved during fermentation. In pores of this structure a large number of gases is kept loosening the dough well. The more flour contains gluten of good quality, the higher gas-holding capacity of flour is. Therefore, indicator of gluten content and its quality can be used to predict gas-holding capacity.

Water absorption ability characterizes potential of protein molecules absorb moisture. However, for flour of spelt grain there are almost no data on peculiarities of gas-holding and water absorption capacities that determines the relevance of this study.

Gluten content in spelt grain varied significantly depending on the variety. Thus, its content was the highest of the variety Zoria of Ukraine – 46,4 % which corresponded to a very high level. Gluten content corresponded to this level in grain of varieties Schwabenkorn, Australian 1 but it was lower and amounted to 36,4–38,4 %.

In lines LPP 1305, LPP 3132, LPP 1224 gluten content corresponded to the average level – 27,9–33,9 %.

Results of the studies found that the indicator of gas-holding capacity of flour was changing significantly depending on the variety and length of fermentation. This indicator reaches the greatest value after 90-minute fermentation. The most value was in flour of the variety Zoria of Ukraine – 575 cm^3, in flour of the rest of varieties this indicator was significantly lower and amounted to 420–451 cm^3 which was 21–27 % less compared to the standard. The lowest value of gas-holding capacity was after 30 minutes of dough fermenting – 120–224 cm^3 depending on the variety. With the continuation of the fermentation duration gas-holding capacity of flour decreased but varied depending on the variety like tendency of 90-minute fermentation.

According to levels-parameters of P.M. Zhukovsky a very high gas-holding capacity of flour is from the dough of the variety Zoria of Ukraine, flour of varieties Schwabenkorn, Australian 1, LPP 1305 and LPP 1224 is characterized by the high indicator and in flour of remaining varieties this indicator was average.

In the process of fermenting dough stability varied depending on the variety. Thus, in flour of varieties Zoria of Ukraine, Schwabenkorn and LPP 1305 gas-holding capacity decreased from 445–575 cm^3 during 90-minute fermentation to 358–400 cm^3 after 120 minutes of fermentation, whereas in the rest of varieties this indicator decreased to 250–305 cm^3 or by 24–37 % compared to standard.

Correlation analysis results between gluten content in grain and gas-holding capacity of flour based on the length of dough fermentation indicate that a very high relationship between indicators is determined after dough fermentation for 60 and 90 minutes.

Water absorption capacity of spelt grain flour varied from 44,9 to 56,5 % depending on the variety. All varieties except line LPP 1224 exceeded the standard by 3–23 % in which this indicator was 46 %.

The highest water absorption capacity was in grain of the variety Australian 1 – 56,5 % and the lowest one was of line LPP 1224 – 44, 9 %.

So, as a result of studies it is found that gas-holding capacity of dough from spelt flour and its stability during fermentation essentially depends on gluten content in grain defined by peculiarities of the variety. The highest indicator of gas-holding capacity is determined for flour of spelt grain of varieties Zoria of Ukraine, Schwabenkorn and Australian 1 after 90-minute dough fermentation.

Key words: spelt, gluten, gas-holding, water absorption capacity, variety.

The insect species composition of wheat field agrobiocenosis and their number control

A. Kryvenko, N. Shushkivska

The monitoring showed that the pest species formation on the winter wheat developed gradually during vegetation. In different periods of plants development, the phytophages complex consisted of the species that migrated from other biotops and those having wintered on the fields.

It was investigated that the biggest threat for the winter wheat was the com-bug, the bugs of Pentatomid family (Homoptera series), greenbugs (Aphididae family), flower thrips (Haplothrips tritici Kurd.), cereal chafer (Anisoplia austriaca Hrbst.), turnip dart (Agrotis segetum Schiff), frit flies (Cecidomyidae and Cloripidae families), leafhoppers: Deltocephalus striatus (*Psammotettix striatus* L.), Macrosteles sexnotatus (*Macrosteles laevis* Rib.), smaller brown plant hopper *(Laodelphax striatella* Fall.).

The following insects were always in the biocenosis of a wheat field: click beetles (genus Agriotes L.), bugs of Miridae family (Miridae), tarnished plant bugs (Lygus), corn ground beetle (*Zabrus tenebrioides* Goeze.), cereal leaf beetle *(Oulema lichenis* Voet.), striped flea beetle (*Phyllotreta vittula* Redt.), corn sawfly (*Cephus pygmaeus* L.).

The dominating entomophages were the following: seven-spot ladybird (*Coccinella septempunctata* L.) and two-spot (*Adonia dipunctata* L.); predatory thrips (*Aeolothrips intermedius* Bagn.), predatory ground beetles (Caradidae), common green lacewing *(Chrysoperla larnea* St.) and hoverflies (Syrphidae). The entomophages did not play any essential role in the limitation of pest number.

Each stage of crop formation is supplied by a certain pest insect species.

As our research shows, the most frequent on average during germination and stooling were the plant louse (17 insects per plant). The made up to 40 % of the total pest entomocomplex. In the same period, the leafhopper was observed with the density about 18 insects per m^2. They also wintered on the winter crop. In the stooling period, the number of plant louse and leafhopper did not exceed the threshold number.

The leafhoppers stayed on the field during the vegetation with the highest density during grain ripening – 49,4 insects per m^2 which is not higher then threshold (150 insects per m^2).

The migration of com bugs from their wintering places to the wheat fields was observed in the first decade of May. The bugs of the family Pentatomid (Bishop's Mitre Shieldbug, Aelia rostrate, Carpocoris fuscispinus, sloe bug) migrated from the perennial cereal

grasses to the winter wheat after the earing. The beginning of larvae rebirth was at the blossoming phase. In this period their density was 2,8 insects per m^2. The bug's larvae and imago of Pentatomidae family and com bugs were nourishing from the not rape grain. Their density however was 6,1 insect per m^2 and did not exceed the threshold of 8-10 insect per m^2.

During 2014 and 2015 the population of wheat by the Anisoplia austriaca coincided with the phase of wax ripeness. Thus the nourishing conditions were favourable for them. The insects populated the edges of the wheat field with the highest number of them. In general, the insects density was during two years in the phase of full ripeness about 4,2 insect per m^2 which was not higher than threshold. Population of cereal leaf beetle imago on the wheat fields started beginning of May, which coincided with the phase of stem elongation. The period of nourishment of cereal leaf beetle larvae lasted about one month and coincided with earing, blossoming and ripening. The highest density of the insect was during grain formation – 4,9 insects per m^2.

The first colonies of aphids on the winter wheat were observed at the end of stem elongation. Their number was not big. The weather condition was favourable for the aphid population growth. Their maximum number was observed in the period of milky ripeness (29,4 insects per stem). At the end of the first decade of July, the abrupt decrease of aphid population began, the masses of them died so that only single insects could be observed on the unripe ears before harvesting. The aphid death was due to the hardening of plants tissue, nourishment deterioration and activity of natural enemies.

The systematic observation of crops for pest population is prerequisite for decision about the need of pest control chemicals application. The main objects for chemical treatment in summer period were aphids and bugs larvae. Beginning second decade June 2014 and 2015, the winter wheat was sprayed against the pest. The efficiency of the following insecticides was studied: Actara 240 SC, s.c. (tiametoxam) 0,15 1/ha, Bi-58 new 40 % e.c. (diametoat) 1,5 1/ha, Karate 050 EC, e.c. (lambda-cyhalotrin) 0,20 1/ha in conditions of agricultural cooperative Rozaliivski.

Before the experiment, the aphid density was on average during two years 28,4 insects per plant. On the third day after spraying by Actara 240 SC, the insects density decreased by 84,5 % and after Karate 050 EC by 88,3 %. The high start efficiency showed Bi-58 new – 91,3 %. Further on the efficiency of Actara 240 SC and Karate 050 EC increased and exceed 90 % on the day 7.

The efficiency of Bi-58 new 40 % decreased after some time and went down to 85,3 % on the day 7. High technical efficiency was shown also by synthetic pyrethroid Karate 050 EC and neonicotinoid Actara, 93,1 and 89,3 % respectively. Thus, at aphid population on winter wheat with the density exceeding the threshold, it could be recommended to apply the following preparations: Actara 240 SC, s.c. (tiametoxam) 0,15 1/ha, Bi-58 new 40 % e.c. (diametoat) 1,5 1/ha, Karate 050 JEC, e.c. (lambda-cyhalotrin) 0,20 1/ha as the technical efficiency of these insecticides is ranging between 85,3 and 93,7 % on the day 7.

The industrial efficiency analysis of the above preparations showed that they reliably protect the winter wheat against aphid and favour the yield increase.

The yield obtained during two years ranged on average from 15,3 to 16,9 centner/ha. The highest yield was obtained by application of Actara 240 SC – 66,5 centner/ha. Good results and essential yield increase were achieved also by other preparations used. The check yield of winter wheat without application of insecticides was the lowest – 49,6 centner/ha.

Key words: winter wheat, monitoring, phytophages, cereal aphids, bugs, insecticides.

Crop productivity dependence on soil tillage systems

O. Panchenko

A proper use of tillage, fertilizer and their combination (interaction) play an important role in crop yields increasing. Indeed, under global warming and rainfall reduce traditional systems of primary tillage are not always justified. Therefore, the development and research of new primary tillage systems and their combination with the fertilization systems are topical.

Scientific and technological progress in modern agriculture has reached an unprecedented development. Potential opportunities to increase the agricultural land productivity is extremely large. In Ukraine, using only 2 % of photosynthetic active radiation (PAR) during the growing season can annually receive more than 125 kg of dry mass of organic matter per hectare. Agriculture systems in addressing this extremely important task is crucial. Favorable physical properties and soil modes regimes is one of the prerequisites display of soil fertility, obtaining high and sustainable yields of agricultural crops which necessitates constant maintenance of optimum soil conditions for plants. This is especially true for the black soil with the highest level of agriculture intensification. The issue of tillage and fertilization in cereals have not been studied properly by now. Indeed, in some cases crops weediness increases, in others – agrophysical soil fertility indicators get worse and productivity reduces. This depends on many factors that must be considered, i.e weather conditions, pre-crops in crop rotation, biological features of crops, soils, fertilization, soil pollution with weed seeds and others.

The aim of the research was to study and experimentally find out the most efficient interaction of mechanical tillage and fertilization and their influence on crop yields change under variable rotation.

The study of these issues was conducted on the experimental field of BNAU.

We have found that pea reacts negatively to subsurface tillage. The average yields reduce, as compared with the control, was 0.35 t of grain grain per hectare, which is primarily due to higher weediness, and therefore less efficient was using the nutrients and moisture from the soil per hectare, which is primarily due to higher weediness, and therefore due to less efficient use of the nutrients and moisture from the soil by legume plants. Replacement of subsurface tillage for differentiated and durable shallow ones reduces the grain yield, but this difference does not achieve statistically significant variables.

Winter wheat yields under durable plowing, differentiated and durable shallow cultivation was almost the same and amounted on experiment variants, respectively, to 4.61 ; 4.58 and 4.55 t/ha, and under loosened cultivation it was 4.02 t/ha, which is almost 13 % less than the control. Agrotechnical efficiency of fertilizers did not differ significantly under durable subsurface cultivation, under differentiated and durable shallow cultivation in crop rotation and it reduced under loosening subsurface cultivation.

The average spring barley grain yield in 2012-2014 on all variants of the experiment was: under durable plowing in crop rotation – 3.52 t/ha, under flat hoe loosening – 2.47 t/ha, under differentiated cultivation – 3.63 t/ha, durable disking – 3.77 t/ha. Thus, if there is an increase in grain yield under differential and durable shallow cultivation by 0.11 and 0.25 t/ha respectively

(3.1 and 7.1 %) as compared with the control, this indicator decreases by 1.05 t/ha or nearly 30 % under subsurface cultivation. Agrotechnical efficiency of fertilizers under differentiated soil cultivation is on the control level, it is higher under durable disking, and lower under flat hoe cultivation. Thus, spring barley grain yield increase under putting $N_{15}P_{15}K_{15}$, $N_{30}P_{30}K_{30}$ and $N_{45}P_{45}K_{45}$ was, respectively: under durable plowing in the crop rotation – 0.67; 1.42 and 1.96 t / ha, under falt hoe loosening – 0.63; 1.37 and 1.86 t/ha, under differentiated cultivation – 0.68; 1.43 and 1.98 t/ha, under durable disking – 0.71; 1.49 and 2.06 t/ha, compared with non-fertilized areas.

It has been found out that the highest yield of grain crops in the crop rotation was under combined tillage system. A significant decrease in the productivity was found under subsurface cultivation system. Increase in the fertilization levels resulted in significant increase in of winter wheat productivity under all cultivation systems.

Key words: productivity, crop rotation, crops, yield, cultivation, fertilization.

Immunological monitoring of spring barley for diseases in the Central Forest-Steppe zone of Ukraine

V. Sabadyn

One of the main elements of the crops productivity increase is breeding disease-resistant varieties. The success in breeding resistant varieties of spring barley is determined by the use of locally tested sources and donors resistant to the major diseases.

The most common and harmful in the forest steppe zone disease of barley is caused by *Erysiphe graminis f. sp. hordei* Em. Marchal, *Drechslera graminea* Ito, *Bipolaris sorokiniana* Shoem. and *Drechslera teres* Ito. In the years when *Erysiphe graminis f. sp. hordei* and *Drechslera graminea* were extremely harmful, the spring barley yield rate decreased by 30-40 %.

The purpose of the research was to carry out the immunological monitoring of the varieties from the global collection global collection of the National Centre for Plant Genetic Resources of Ukraine on the provocative background *Erysiphe graminis f. sp. hordei*, *Drechslera graminea*, *Bipolaris sorokiniana* and *Drechslera teres*, and identify new sources of resistance to pathogens in the conditions of the central forest steppe zone of Ukraine for further breeding for immunity.

The humidity and air temperature factors play a crucial role in the progress of the disease. The hydrothermal coefficient for April-July was recorded that indicated the level of the humidification period. This indicator was the following: in 2013 – 1.15 – optimal hydration level, and in 2014 – 1.97 – excess moisture level.

It was found that the populations of *Erysiphe graminis f. sp. hordei* and *Bipolaris sorokiniana* prevailed, and on average the progress of the diseases within two years was 20.2 % and 21.8 %. The disease progress of *Drechslera teres* and *Drechslera graminea* comprised 1.1 % and 4.1 %. As to *Puccinia hordei* it was 9.7 %.

As a result of the studies on the provocative background there were identified the sources of the set of the diseases. The varieties which were resistant and highly resistant to *Erysiphe graminis f. sp. hordei*, *Bipolaris sorokiniana* and *Puccinia hordei* were Dokaz, Parnas, Edem (UKR), Eunova (AUT), STN 115 (POL).

Highly resistant and resistant to *Erysiphe graminis f. sp. hordei* and *Bipolaris sorokiniana* were the following varieties: Dokaz, Parnas, Edem, Etiquette, Obolon, Hadar, South (UKR), Thorgall (FRA), Eunova (AUT), STN 115 (POL), Aspen (CZE), Bojos, Hanka (DEU).

High resistance and resistance to *Erysiphe graminis f. sp. hordei* and *Puccinia hordei* demonstrated such varieties as Dokaz, Etiquette, Obolon, Parnas, Hadar, Edem, South (UKR), Josefin, Thorgall (FRA), Ebson, Malz, Aspen (CZE), Barke, Bojos, Breemar, Brenda, Landora, Madeira (DEU), Vivaldi, Eunova (AUT), NS 001 (SRB).

High resistance and resistance to pathogens *Bipolaris sorokiniana* and *Puccinia hordei* were recorded in the following varieties: Aspect, Dokaz, Parnas, Edem (UKR), Skarlett (DEU), Manley (CAN), Eunova (AUT), STN 115 (POL), Triangel (NLD), Ataman (BLR).

On the provocative background there were selected the varieties with known resistance genes to *Erysiphe graminis f. sp. hordei*. Highly resistant and resistant were the varieties which are protected by resistance genes: Adonis, Barke, Bojos, Slass, Danuta, Breemar, Madeira (DEU), Eunova (AUT), Josefin (FRA), Prestige (GBR), Aspen (CZE).

While studying the efficacy of resistance genes to *Erysiphe graminis f. sp. hordei* it was found that the high efficiency rate against the pathogen populations was shown by the recessive genes mlo: mlo9, mlo11 and combination of genes: mlo + Mla13 + Ml (La), mlo + Mla12, mlo + Mla1. The variety Eunova (AUT) that is highly resistant to *Erysiphe graminis f. sp. hordei* showed resistance to *Bipolaris sorokiniana* and *Puccinia hordei.* The varieties Barke, Bojos, Breemar (DEU) and Aspen (CZE) showed resistance to *Puccinia hordei*.

There were identified the sources and donors involved in hybridization to breed new disease-resistant varieties of spring barley.

Key words: varieties of spring barley, immunological monitoring, *Erysiphe graminis*, *Drechslera graminea*, *Bipolaris sorokiniana, Drechslera teres*, *Puccinia hordei*, sources, donors.

Corn silage productivity, its dependence on plant stand density

M. Grabovskiy, T. Grabovska

This article presents the results of the studies carried out in the Central Forest-steppe area of Ukraine. The research focused on the impact of stand density of corn hybrids of different maturity groups on the photosynthetic plant activity, dry matter accumulation and green mass yield.

Introduction of new corn hybrids and their cultivation methods into production, identifying their optimal crop stand density will increase and stabilize maize yields, strengthen the Ukraine's fodder and food balance. The problem of establishing differentiated density for the new hybrids in certain soil and climatic conditions has been a very important issue which crop production has been facing recently.

Corn hybrids with different maturity degree do not equally response to the change in plant stand density under unstable conditions, and in some years due to low humidity as well. Therefore, the performance of the hybrids of different maturity groups can be identified correctly only in case of differentiated plant stand density for each hybrid according to the agro-environmental conditions of its growth.

Under favorable conditions, corn assimilation system is able to absorb the maximum amount of solar radiation which positively influences moisture and nutrition absorption level as well as the accumulation of the significant amount of the organic substances.

In the course of the research trial, the total area of the crop leaf surface per hectare increased due to its density, and reached its maximum when the highest plant stand density was achieved. The plant stand density significantly affected the leaf surface growth dynamics.

At the initial stages of their development, the early-maturing corn hybrids exceeded the middle- and middle-late maturing hybrids in their total leaf surface, although in the later vegetation periods the last two hybrids showed a significant advantage.

The maximum leaf surface area was marked at the panicles flowering stage with the density amount of 120,000 plants/ha which comprised 47.0, 49.6, 51.3 and 55.2 thousand m^2/ha, respectively in hybrids DP Pyvyha, DP Galatea, Monica 350 MV and Bystrytsia 400 MV, which exceeded the control variant (90,000 plants/ha) in 6.3, 5.7, 5.8 and 6.1 thousand m^2/ha.

The improved spatial plant allocation of plants ensured by sowing stand density stand at the level of 90,000 plants/ha, makes it possible to increase the rate of the net photosynthesis productivity in maize hybrids during the whole vegetation development of plants.

Obviously, it is linked to the improved use of soil moisture plant absorption and more efficient use of nutrients and solar radiation, especially in the second part of the vegetation development.

The dry matter content indicators in the corn hybrids increased as the crop density level rose. The increase in the quantity of the early- and middle-early maturing hybrids from 90,000 to 120,000 plants/ha resulted in the growth of this index in the wax ripeness phase in 0.6 % and 0.4 % and in the middle- and middle-late maturing in 0.5 % and 0.7 % respectively. The highest dry matter content in maize hybrids was observed in the grain wax ripeness phase. It should be noted that the dry matter accumulation in maize hybrids continued up to the wax ripeness phase.

The hybrid Bystrytsia 400 MV in all the periods of observation was marked by the highest dry matter content (28.4-29.1 % and 31.8-32.5 %).

The highest dry matter accumulation rate was observed during the phase of wax ripeness in the early-maturing hybrids DP Pyvyha and DP middle-early Galatea for the density versions of 110,000 and 120,000 plants/ha which comprised 13.5 and 13.7 tons/ha, 15.0 and 14.8 tons/ha; in the middle-maturing hybrid Monica 350 MV and middle-late maturing Bystrytsia 400 MV with density of 90,000 and 100,000 plants/ha – 15.9 and 16.2 tons/ha, 16.9 and 17.0 tons/ha respectively.

The green mass yield in the corn hybrids varied under the influence of the biological features of forms, the plant stand density rates and the prevailing weather conditions during the year when the trial was conducted.

On average during four-year research trial, the maximum green mass productivity in the hybrid DP Pyvyha was formed at the density rate of 120,000 plants/ha and comprised 47.3 tons/ha, exceeding the control figure in 4.1 tons/ha. At the density rate of 110,000 plants/ha the yield rate reduced in 0.8 tons/ha. The hybrid DP Galatea had the highest green mass yield rate at the density of 110,000 plants/ha (50.5 tons/ha), although the difference between 110 and 120,000 plants/ha during the trial years was insignificant.

The middle-maturing hybrid Monica 350 MV had the highest average green mass yield at the density 100,000 plants/ha – 51.9 tons/ha, increasing crop thickening to 110,000 and 120,000 plants/ha led to the decrease in productivity in 5.1 and 8.5 tons/ha. The middle-late hybrid Bystrytsia 400 MV provided the maximum green mass yield in the trial which comprised 53.1 tons/ha in the control variant (90,000 plants/ha). A further increase in stand density led to the decrease in the green mass yield.

Key words: corn silage, productivity, dry matter, plant stand density, green mass, harvesting, hybrid.

Economic evaluation of soybean growing under different technologies

M. Shevnikov, O. Milenko

Profit is a main objective for any industry. That is why scientific recommendations concerning improvement of growing crops technology must involve economic justification.

The purpose of our research was to analyze influence of variety characteristics, seeding rate and method of crops care on crop capacity of soybean plants and to determine economic evaluation of the experimented elements of soybean growing technology.

The scheme of the experiment had three factors:

1. Varieties: Romantyka and Ustya;
2. Method of crops care: without care, mechanical, chemical;
3. Seeding rates: 600, 700, 800 and 900 thousand/ha.

Soybean was sowed in the third ten-day period of May by the ordinary drill sowing method with 15 cm interrows space. The crops were treated differently on every variant, according to the terms of the experiment scheme. In the variant with before shoots appearing and two after appearing shoots harrowing have been done, mechanical method was applyied. On the variants of the experiment with chemical method of crops cultivation weeds were regulated by sprinkling crops in the phase of 3 the truel leaves with the mixture of insured herbicides Bazagran, 48 % aqueous solution (bentazon), in the doze of 2l/ha and Phuzylad Super, 12,5 % (phluazyfop-P-butyl), in the doze of 2l/ha.

The field experiment was performed during 2007 – 2009.

Economic evaluation of the results was made according to market prices of 2015 year.

Having analyzed the calculations of economic evaluation of research results we have to admit that Romantyka variety should be grown with seeding rate of 800 thousand/ha with applying mechanical method of crops cultivation. The level of profitability according to this technology was 157,44 %. A high index of 148,61 % was obtained on the variant with the seeding rate of 700 thousand/ha and with mechanical method of crops care.

The results of Romantyka variety growing using the chemical method reached the profitability level of 27,06-81,60 %. We got the lowest economic effect on the variant with seeding rate of 900 thousand/ha and of 800 thousand/ha. Seeding rate of 700 thousand/ha was the most optimal seeding rate on the crops with chemical method of crops care. Growing Ustya variety

using mechanical method of crops care also helped to get higher level of profitability than growing by chemical method of crops care.

The profitability level of 80,37–114,34 % was obtained using technology of soybean growing of Ustya variety involving mechanical method of crops care. The maximum result was provided under seeding rate of 900 thousand/ha. The profitability level of 33,93–46,88 % was obtained using chemical method of crops care. The best result was obtained on the variant with seeding rate of 900 thousand/ha.

The following conclusions have been made up:

1. The maximal crop capacity of 2.61 t/ha of Romantyka variety was obtained on crops with the seeding rate of 800 thousand/ha under mechanical method of crops care. Ustya variety formed the highest crop capacity at the level of 2.46 t/ha on crops with the seeding rate of 900 thousand/ha under mechanical method of crops care. It has been found out that Romantyka variety reacted better to mechanical method of crop care and variety Ustya reacted better to seeding rate increase.

2. The largest amount of field cost is necessary for implementation of technology of soybean growing with seeding rate of 900 thousand/ha and with chemical method of crops care. We got production with the highest cost under the same technology and the lowest cost of 1 centner of the main products was obtained on the variant of Ustya variety with mechanical method of crops care.

3. We obtained maximal gross production under sowing soybean of Romantyka variety with seeding rate of 800 thousand/ha and using mechanical method of crops care. Growing of soybean applying such technology provided the highest income. Rather less income was obtained due to growing soybean of variety Romantyka with seeding rate of 700 thousand/ha and using mechanical method of crops care.

4. The level of profitability is an economic category determining profit obtained on one spent hryvna for producing products and evaluated by percents. The technology of growing soybean variety Romantyka using mechanical method of crops care and with seeding rate of 800 thousand/ha provided maximal level of profitability of 151.97 %. We also obtained the high level of profitability of 147.13 % under growing Romantyka variety soybean using mechanical method of crops care and with seeding rate of 700 thousand/ha.

Key words: economic evaluation, efficiency, crop capacity, soybean, seeds, prime cost, profit, profitability.

Formation of symbiotic apparatus and yield of soybean depending on sowing time and different ways of applying micro fertilizers

O. Shovkova

The results of two year studies on the issue of the effects of sowing dates (early, optimum and late), pre-sowing seed treatment micronutrient fertilizers Rexolin and foliar application of soybean crops with micro fertilizers in chelate-based Rexolin and Brasitrel in the conditions of left Bank Forest-steppe of Ukraine on the work of the symbiotic apparatus in soybean plants have been submitted. The effects of these factors on the formation of seed yield of this crop have been discovered.

Interest in the cultivation of soybean in Ukraine is growing today; accordingly to this the area of its sowing is increasing. But the yield of this crop remains low. It has been determined by the imperfection of elements of technology of soybean cultivation. Therefore one of the priorities of agrarian science is to improve existing agro-technical methods of its cultivation.

Soya plants, entering into a symbiosis with module bacteria, are able to assimilate molecular nitrogen from the air transforming it into ammonium form and supply to the plants in exchange for products of photosynthesis. The presence of sufficient amount of micro fertilizers during the growth and development of soybean is required for effective nitrogen fixation is required. The use of which is of great importance in the metabolism of plants. In addition it is known that microelements are part of many biologically active substances, they affect enzymatic processes and improve the use nutrients and fertilizers by the plants.

Of great importance in the process of nodulation and nitrogen fixation are elements such as molybdenum and boron. To meet the needs of soybean plants above mentioned microelements by manufacturing chelated micronutrient fertilizers that contain nutrients in easily accessible and digestible form. They are used by pre-sowing seed treatment and foliar application at critical periods of growth and development of soybean plants: in the phases of budding and the formation of green beans and seed ripening.

The purpose and objectives of the study was to investigate the effect of pre-sowing treatment of seeds and foliar fertilizing with micro fertilizers for different sowing dates on the peculiarities of formation and functioning of the symbiotic apparatus in soybean plants and yield of its crops.

The research was carried out in 2013–2014 in the experimental field of Poltava state agricultural experimental station named after. M. I. Vavilov of the Institute of pig and APP NAAS of Ukraine.

The experimental setup involved the study of action and interaction of three factors: A – sowing date (early – at soil temperatures of 10 °C at a depth of 0–10 cm; the optimum is at a temperature of 12 °C at the depth of 0–10 cm; late – at soil temperatures of 14 °C at a depth of 0–10 cm); B – pre-sowing seed treatment micronutrient fertilizers (untreated; treatment by Rexolin); C – foliar application of micro fertilizers (without feeding; feeding by Rexolin; feeding by Brasitrel).

Soybeans have been sowed, guided by the temperature characteristics of the soil according to the scheme experience range type seeds of varieties of Romantika. Before sowing seeds were treated with micro-fertilizers Rexolin (150 g/ton of seeds). During the growing season was carried out foliar application with water soluble micro fertilizers in chelate-based Rexolin normal 500 g/ha and Brasitrel with the drug consumption of 3 l/hectares.

The results of two year studies indicate the influence of pre-sowing treatment of soybean seeds and foliar fertilizing of crops during the growing season with micro fertilizers in different sowing periods on the formation of the number and mass of nodules. Intensive growth of nodules occurred before the phase of ripening of the seeds. Counting their number showed that most nodules formed on soybean roots in the early period of sowing on the plots where they had a foliar feeding of crops with Rexolin and Brasitrel in combination with pre-sowing treatment with Rexolin – of 48.1 and 48.7 Ps/plant, respectively, an increase of 9.4–10.0 Ps/plant in comparison with the control.

A slightly less number of nodules formed at the plots of optimal and late sowing dates. So, in the ripening phase of the seeds at the optimum time of sowing there were on average one plant 36.4–46.6 Ps, late – 34.7–43.6 Ps. It can be explained by the negative influence of the external environment.

Foliar application with micro fertilizers without seed treatment had a lesser effect on the formation of nodules than the use of them in combination (pre-sowing treatment of seeds + fertilizer during the growing season).

It was also determined that depending on sowing time and application of micro fertilizers changes not only the number of nodules on the root system, but also their weight. Maximum results were recorded in the ripening phase of the seeds. Depending on options of experience weight of nodules ranged 457– 692 mg/plant at the first sowing time, 419–640 mg/plant for the second and 401–595 mg/plant for the third time of sowing.

The results indicate a significant influence of the studied factors on the yield of soybean. On average over two years of research it varied in the range of 1.52 to 2.48 t/ha depending on hydrothermal conditions of year, sowing dates and use of micro fertilizers.

Thus, in conditions of left Bank Forest-steppe of Ukraine studied elements of technology (pre-sowing treatment of soybean seeds and foliar nutrition of crops during the growing season micro fertilizers in chelated basis for different sowing dates) have a positive effect on the development of nodule bacteria, symbiotic activity and grain yield of soybean crops. In embodiments where the observed maximum values of total number of nodules (of 48.1 and 48.7 Ps/plant) and their weight (681 and at 692 mg/plant), and formed the highest yield of soybean seeds is between 2.39 and 2.48 t/ha.

Key words: soybean, seeding time, Rexolin, Brasitrel, the total number of nodules, weight of nodules, yield.

Annual oat and leguminous mixes performance and food value depending on growing technology under the conditions of Ukrainian Polissya

V. Panchyshyn, V. Moysiyenko

Increased production of feed and feed protein by selecting the species composition and their mixes allows to increase the yield of mixed collection of high-protein products for animal husbandry, to improve the organization of the greenery production line in the summer, to improve soil fertility and optimize the structure of sown areas. Quality feed provision affects the level of livestock performance and the products competitiveness in the market. However, in recent years, feed protein shortage is 25-30 % or about 1.9 million tonnes, which demands a new approach and significant changes in the fodder base formation.

On the basis of the field research conducted we have found out a high performance and quality of sowing oats and leguminous mixes, depending on fertilization and the species composition of the bean component. Thus, according to the results of dispersion analysis, phytocoenosis was of the most significant impact on the mixes performance and its share was 57 %, the fertilizers share in the yield amount was 40 % and the rest accounted for their combination and other factors.

Applying fertilizers contributed significantly to the increase of green mass productivity and its forage characteristics. In the variant without fertilizing the difference between the green mass yield in the mixes and pure oat sowing was 3.4-21.1 t/ha. However, in the variant with applying mineral fertilizers along with off-root fertilizers the lowest yield was noted in the mix of oats with fodder beans and ornithopus.

This is due to the fact that in these mixes oat plants with their more developed root system and faster growth responded to fertilizing better and, as a result, inhibited to some extent the growth and development of bean component. It has been established that applying fertilizers at the rate of $N_{60}P_{60}K_{60}$ provided the yield increase to 12.8-23.6 t/ha regardless of agrophytocenoses type. Additional LCD applying (Rost concentrate liquid complex fertilizer -: $N_5P_5K_5$ + S + Mg + Fe + Cu + Mn + B + Zn + Mo + Co) increased the yield of green mass for another 0,8-5,7 t/ha.

Annual mixes can provide from 27.9 to 53.6 t/ha of green mass under $N_{60}P_{60}K_{60}$+ LCD fertilization under conditions of light gray lightloamy forest soils of Zhytomyr Polissya. Winter pea and oat mix with the yields over 50 t/ha of green mass and 12 t/ha of dry matter turned out to be the best one. The content of crude protein in 1 kg of green fodder regardless of fertilization made 30,5-31,2 g. This mix provided the highest yield of digestible protein in the organic mineral fertilizer variant of 1.29 t/ha, which is 0,78 t/ha higher compared with oats single-species sowing. Herewith, a feed unit contained 153-155 grams of digestible protein.

Crude protein and fat content in the dry matter are the most important indicators characterizing the quality of the feed mass. The increase of crude fiber in the dry matter affects the digestibility of green feed in the ruminants. Yet, crude protein reduces in the feed since there is an inversely proportional dependence between the abovementioned components. The analysis showed that crude protein content was the highest in the tare-oat mix dry matter – 129,9-133,6 g/kg. However, dry matter content decreased along with fertilization rate increase, and thus crude protein content in green mass decrease was revealed in the fertilized areas compared with the variant without fertilization.

Thus, protein content ranged in the control from 21.5 to 31.2 g/kg of green mass, while in the variant of $N_{60}P_{60}K_{60}$+ LCD fertilization the figure decreased by 0.4-0.7 g/kg of green mass. The research results also indicate a high value of dry weight of plants in the phase of legumes flowering. Crude protein level in the mixes made 114-134, crude fiber – 319-350, crude ash – 42-60 g/kg of dry matter.

We have out found that the change in dry matter content in the plants affect the total dry matter yield and total yield of nutrients in forage agrophytocenoses. It is found out that feed units yield increased proportionally relative to the output of dry matter. Studying the mixes has shown that the dry matter yield in the variant without fertilization ranged from 3.17 to 7.44 t/ha, which is 0.88-5.15 t/ha more than that in a single-species sowing. Dry matter yield increased by 2.11-5.42 t/ha under adding different levels of fertilizers.

Adding fertilizers has also increased the yield of feed units by 1.47-2.90 t/ha, and in the organo-mineral supply variant ($N_{60}P_{60}K_{60}$ + LCD) the increase was 1.7-13.4 % compared with the $N_{60}P_{60}K_{60}$ fertilization variant.

Herbage yields of oats and tare with lupine was respectively 45.1 and 52.1 t/ha and that with ornithopus beans and fodder legumes made 30.3 and 27.9 t/ha. The highest content of feed units in 100 kg of dry matter was noted under growing oats with Olympus narrow-leaved species of lupine – 67.0-68.5 regardless of fertilizing variant.

Key words: annual mixes, sowing oat, spring vetch, winter pea, blue lupine, beans forage ornithopus, fertilization, yield, quality.

Pot marigold productive properties, the dependence on 1,000 seeds weight in the BNAU biostation conditions
S. Suhar, O. Gorodyska

The overall efficiency assessment of pot marigold varieties of home and overseas breeding has been studied during the crop vegetation period. Mahrovaya 2000 variety was marked having the best indicators that characterize the inflorescences diameter sign – 5.8 cm, weight of 1,000 seeds is 10-12 g, which is 2.3 cm, higher than the standard and Natalia variety showed the best result – 5.6 cm, weight of 1,000 seeds was 10-12 g, which 2.1cm exceeds the standard.

The seed production rate of one plant, on the average during the two-year period, was manifested in Mahrovaya 2000 variety with the weight of 1,000 seeds – 10-12 g, which is 15.61 per 1 plant, somewhat lower rate was in the same variety with the weight of 1,000 seeds – 13-15 g, which is 15.4 g per 1 plant. Natalia variety showed the best result with the weight of 1,000 seeds, comprising 7-9 g, i.e. 11.4 g per 1 plant.

The weight of 1,000 seeds varies from 8 to 15 g. It is necessary to take into account that the pot marigold seed weight depends directly on the ratio of seed types in the inflorescence and row number. The weight of 1,000 seeds in non-pleiopetalous inflorescences with larger curved sickle and shuttles similar seeds is on the average 18 g. In pleiopetalous inflorescences with the overwhelming majority of small annular seeds it is less than 7-8 g. However, the weight of the annular seeds and of other seed types decreases with the increase of double-floweringness. Decrease of the seed size contributes to the increase in the seed number in the pleiopetalous inflorescences: one fully double-flowering one has more than 100 seeds, while one non-double-flowering inflorescence has approx. 30 seeds.

Pot marigold is a strategically important plant in the contemporary medicinal plant production. However, the recent decade has faced the loss of the base of the culture, and consequently the current level of the raw material production does not meet the existing needs of the state.

About 200 species of medicinal plants are used in medicine. Nearly 50 % of them are crop plants.

Herbal medicines tend to have more efficient medical properties than the chemically synthesized agents, and rather often they are the only medication in the treatment of certain diseases.

The aim of our research was to determine the influence of 1,000-seed weight on the formation of inflorescence diameter, seed production rate per one plant and the yield rate of pot marigold varieties.

The seed yield properties are characterized by the seed ability to give yield, the size of which is determined by biological inheritance, positive phenotypic plasticity that occurs under the influence of the growing conditions. Various seeds of one genotype (variety), grown in different conditions, in their next generation in the similar growing conditions can give different crop yield. The seed yield properties are used in seed science. Seeds with the high markers of the varietal purity, high sowing qualities and yield properties in case of the appropriate agricultural technology provide high yield rates. While using seeds as sowing material it is taken into account their sowing qualities, i.e. a set of properties that characterize the extent of their sowing suitability (purity, germination and vigor, strength and growth viability, the absence of pests and diseases).

The bud diameter of pot marigold is rather variable as the inflorescence diameter depends on the plant height, plant location shoot order, shoot length, variety, and 1,000 seed weight.

The weight of 1,000 seeds is an important indicator not only for pot marigold but for all the crops. That is why in our research we determined the effect of this indicator on seed productivity per plant.

The production rate is the most important feature of any variety and, therefore, it is usually defined as the main direction in plant breeding. The production rate is the basic indicator, which characterizes the economic value of the variety. The final yield indicator is the result of the complicated interaction of genotype and environment during all the periods of plant vegetation. Yield rate is a complicated indicator, so we should discuss it in terms of a set of properties. In breeding and genetic research works scientists do not examine yield inheritance, but rather separate signs it consists of. The proper assessment of separate elements of productivity, which influence yield formation, helps achieve the objectives set at the beginning of the breeding process.

Key words: variety, pot marigold (*Calendula officinalis*), 1,000 seed weight, inflorescence, yield, inflorescence diameter.

Influence of varietal features on crop yields of lettuce cephalate in the Right-bank Forest-steppe of Ukraine
V. Ketskalo

Research results of suitability of lettuce cephalate of Polish selection to cultivation under the conditions of the Right-Bank Forest-Steppe of Ukraine are presented. The peculiarities of the oncoming and passing of phenological phases of plants development depending on the varietal characteristics of plants under the conditions of the study area are stated. Biometric parameters of plants during planting out in open soil at early phase of forming of the rosettes of leaves and during harvesting are defined. Indicators of yield level during years of research are analyzed and the level of profitability of cultivation of lettuce cephalate in open soil is determined.

The aim of the research was to expand assortment of high-yielding varieties of lettuce cephalate of Polish selection and thus to rise productivity of green culture under the conditions of the Right-Bank Forest-Steppe of Ukraine. In accordance with the intended purpose, the task of the research included defining more productive and effective varieties among the varieties of Polish selection concerning the soil and climatic conditions of the Right-Bank Forest-Steppe of Ukraine that meet the needs of producers and consumers better.

The research was conducted by conventional methods during 2012-2014 with varieties of lettuce cephalate of Polish selection, Edita ozharovska, Etti, Fortunas. Domestic variety Godar was taken under control.

Phenological observations of plants were conducted during the growing season. Appearance of individual and mass springs was marked in the planting period, the first real leaf and rosette of 4-5 leaves was formed.

After planting out in open soil setting of a head, technical ripening and harvesting was fixed.

Biometric measurements were carried out in due time during the growing season. Lettuce heads were weighed and their diameter was measured during harvesting. Harvest was sorted in accordance with the state standard DSTU 2175–93 "Green vegetables" and DSTU ISO 8683-2001 "Lettuce. Guidelines for Storage and Transportation in Refrigerated Condition".

The study of the varieties of lettuce cephalate Godar, Edita ozharovska, Etti and Fortunas found that under conditions of the Right-Bank Forest-Steppe of Ukraine during the growing season plants were characterized by uneven growth and development, certain difference in the oncoming and passing of some phenophases was observed depending on the variety and climate conditions of the year.

However, on average for the period of 2012-2014 there was no significant difference in passing phenological phases – they started with the difference of 1-3 days and they started later for Godar (control).

Assessment of seedlings quality in terms of phytometric indicators shows that at the time of planting out in open soil the number of leaves of foreign varieties Etti and Fortunas was higher in relation to control and amounted to 5.6 pc respectively. Foreign varieties had bigger diameter of the rosette of plants as well as the number of leaves at the time of planting out. Thus, rosette of leaves of Godar variety (control) grew up to the diameter of 13.4 cm while other varieties' indicator ranged 14.6-17.5 cm.

Average data in the course of the years of studies has shown that Godar variety plants formed leaves with smaller area – 22.4 cm^2, and therefore the surface of leaves was smaller – 29.2 cm^2. Fortunas variety had larger area of leaves and larger total surface of leaves – 29.2 cm^2 and 175.2 cm^2 respectively.

Therefore, at the period of planting out in open soil seedlings of lettuce cephalate of foreign variety had better plant biometrics compared with plants of native brand Godar. After planting out seedlings in open soil, plant biometrics hardly changed in the period of adaptation.

At early technical ripening foliation of lettuce was 9-14 pcs/plant. Godar variety had lower indicators while Edita ozharovska had more leaves. Analyzing the size of the diameter of the plant, it should be noted that this indicator prevailed over native variety Godar than of the varieties of foreign selection.

The undertaken studies show that varieties of lettuce cephalate create a rather large vegetative mass in a short growing season, compared to other vegetable plants. Higher levels of productivity were obtained while growing Fortunas variety – 16.7 t/ha, which prevails control at 30 % and ensures profitability of 81 %. Rather lower crop yield was received from Etti and Edita ozharovska varieties that is 14.9 t/ha and 14.0 t/ha respectively, which prevails control at 16% and 9%. Lower crop yields indicator was shown by Godar variety – 12.9 t/ha which provided profitability of 43 %.

Consequently, the undertaken studies indicate suitability of lettuce cephalate of Polish selection to growing conditions in the Right-Bank Forest-Steppe of Ukraine on podzolized black soil and calculation of economic efficiency proves the expediency of their use under the conditions of open soil of the study area.

Key words: lettuce cephalate, variety, Godar, Edita ozharovska, Etti, Fortunas, productivity, crop yield.

Immunological characteristics of samples of flax in the North-East of Belarus

V. Bogdan, K. Korolev, T. Bogdan

The article presents the results of estimation of collection samples of flax in the North-East of Belarus on infectious and provocative backgrounds. It was found that the samples differed significantly among themselves on the degree of development of *Fusarium* wilt.

On the basis of the conducted research we have identified 4 groups of resistance to *Fusarium* wilt, i.e. resistant (R < 20 %), weak-susceptible (R = 20-30 %), middle susceptible (R = 30-50 %), susceptible (R > 50 %). The defined samples are recommended for fiber flax breeding as sources of resistance to *Fusarium* wilt.

The collection of samples of the Asian eco-geographical groups was most subject to this disease in field experiment, the degree of development which amounted to 54.3 % of the conditional scale score of 2.0 units patterns of Western European group had 26.4 % of the disease and the highest score of the conditional scale of 4.0 %. Eastern European group occupied an intermediate position according to indicators of 43.4 % of the amount of disease and 3.0 the conditional score of the scale.

The evaluation of the samples was carried out by grouping the samples for resistance to *Fusarium*, the degree of development, the conditional score of the scale and identified specimens from various ecological and geographical groups.

Among different biological groups of ripeness of plant flax fiber, in conditions of artificial infectious and provocative backgrounds, relative resistance had a collection samples such as: Nameless, Honkei 35, Tamari, Sunrise, Drakkar, Marylin, Biei Shinshu, Suzanne, AP 4 with the degree of development of *Fusarium* wilt of 20-30 %. The degree of development of disease in the samples ranged from of 9.46 % to 84.1 %. Genotypes resistant group will be used in further breeding work as sources of resistance to this disease.

Key words: flax, breeding, sample collection, resistance, *Fusarium* wilt, development.

Impact of sowing time and inter-row spacing on the plant productivity formation of chamomile (*Matricaria chamomilla L.*)

O. Knyazyk, R. Creshun

The peculiarities of chamomile productivity formation and its dependence on sowing time and positional application were studied. The inter-row spacing enlargement and plant density reduction improve chamomile productivity rate (plant mass, inflorescence number). The efficiency of the plant productivity formation sown in mid-April was established, and the highest plant emergence and survival rates were observed. Later sowing times contributed to more numerous formation of chamomile shoots and inflorescences, which are used for the therapeutic purposes.

The results of the study demonstrate that the definite sowing time and method influence the germination ability of chamomile seeds. The highest seed germination capacity (93.5 %) was observed when the seeds were sown on 15 April using the wide-row sowing method (45 cm).

These techniques contributed to a better plant survival, and at the end of the vegetation period (fruit formation phase), the survival index was 96.2 %.

During the chamomile vegetation the phenological observation of plant growth and development was carried out.

The study demonstrated that up to the phase of stalk-forming period the plant growth rate is rather high, but later before the budding period chamomile plants grow slowly (2-3 cm per decade). In the period between budding and flowering, the plant growth increased significantly and comprised from 8 to 10 cm.

The chamomile linear growth decelerated after the flowering period thus ensuring equal distribution of the nutrients from the vegetative section to the genital part. The largest plant height was marked at the sowing time on 5 April with inter-row spacing from 15 cm to 32.9 cm.

In the chamomile growth and development process, the trend to plant mass enlargement and the enlargement of its individual parts (stems, leaves, inflorescences), as well as change in the ratio of its elevated parts were marked.

It has been stated that in the budding phase the leaf ratio to the overall mass was 2.0 – 3.1 %, and in the fruit formation phase it was 4.7 – 6.9 %. The similar tendency was observed in the change of stem weight gain stems that carry genital organs.

The inter-row spacing increase (45 cm) influenced the chamomile biomass growth. In the fruit formation phase, the overall plant weight grew in comparison with the close sowing method (15 cm) from 18.6 to 2.7 g respectively.

According to our observations one chamomile plant is capable of forming from 40 to 60 inflorescences during the vegetation period.

The application of the technological methods in cultivation allows getting the maximal number of chamomile inflorescences.

The later sowing time led to the shoot and inflorescence number increase.

The overall inflorescence number and productive inflorescence number are bigger in case of close sowing (with 15 cm inter-row spacing) compared to the wide-row sowing (45 cm), which corresponds to the number of first-order shoots. As the use of close sowing method led to less number of shoots, the inflorescences grew well due to absence of inter-shading and were proportionally located. In case of wide-row sowing shoots were more numerous, but the seeds in the second- and third-order inflorescences were not frequently matured.

The chamomile individual productivity markers, i.e. plant weight and inflorescence number predetermine the optimal application of the cultivation technology to realize its potential.

The most favourable conditions for high chamomile productivity formation (with plant weight – 13.14 g, and inflorescence number – 60) were observed at the sowing time of 15 April.

Also it has been got the maximum individual measure of chamomile productivity in the wide-rows of sowing (mass of plant – 14.82 g and the number of inflorescence during the vegetation – 51).

The same dependence is observed in the plant density of plants. Density reduction leads to the increase in inflorescence number and plant weight. In case of the density of 40 plants/m^2 the inflorescence number was 46 units, and the plant weight was 7.98 g, while on the trial plots with the density of 20 plants/m^2, these markers increased to 55 units and 14.76 g respectively.

Key words: *Matricaria chamomilla* L., sowing time, inter-row spacing, productivity, inflorescence number, plant weight.

The state of protective street green belts in the residential and transport zone in Bila Tserkva

T. Sagdeeva

The complex system of the green space in Bila Tserkva was formed in the 50s-90s of the 20th century, but still the green belt coverage of the general use is three times less than the norms require. At present, the single-row and multi-row protective forest stands of the linear configuration grow along the main streets of the town's residential area – 50th anniversary of Victory Boulevard, Levanevsky Street, etc. The silvicultural and taxation characteristics of the state and development of the main tree species in these green stands, the influence of a number of factors have been determined. Apart from the increased vehicular traffic pollution rate of the above-mentioned streets, the state of the green belt is aggravated by the damage of its plant and soil covers caused by trampling, asphalt or paving slab covering, construction activities, and direct mechanical injuries of the trees. The direct link between the green belt degradation rate and the afore-mentioned harmful activities has been identified.

The sanitary state and vitality of the trees depend on the species, species peculiarities, and forest stand structure. The sanitary state of *Tilia cordata* Mill. and *Quercus robur* L. *pyramidal variety* worsens while approaching the road. It was established that two – and especially three-tiered stands, consisting of several species, are more resistant to the unfavourable factors due to the different viability rates in various species. In the residential and transport areas under study, *T. platyphyllos Scop.* is the most stable; *Quercus robur* L., *Q. robur v. pyramidal*, *Fraxinus viridis* Micha, *Populus pyramidalis* L., *P. bolleana* L., *T. cordata*, *Ulmus laevis* Pall. are relatively stable; *Acer platanoides* L., *Aesculus hippocastanum* L. are medium resistant; *Gleditschia triacanthos* L. and *Robinia pseudacacia* L. are unstable.

The green belts suffer a lot due to the mechanical load near "The Covered Market" situated in 50th anniversary of Victory Boulevard. *R. Pseudacacia* located in the first tier has been degrading. *T. cordata* and ripe *P. bolleana* trees in the mixed deciduous plantation located in the area close to the secondary school №7 and cafe "Mon City" are in the severely weakened state. *A. platanoides* and *Q. robur v. pyramidal* which grow in the second tier and are oppressed by the wood tent look rather

weakened. Only *T. cordata* demonstrated a worse state in the green rows nearest to the road. *P. pyramidalis* and *A. hippocastanum* are healthy.

By decreasing the crown density rate in the 1st tier it is possible to create the following range: *P. pyramidalis* (56.1 %), *A. platanoides* (42.9 %), *P. bolleana* (40.7 %); the second tier comprises *A. platanoides* (58.3 %), *A. hippocastanum* (55.0 %), *T. cordata* (53.0 %), *Q. robur v. pyramidal* (49.2 %). *P. pyramidalis* dominates in the relative crown height (92 %), *P. bolleana* (83 %) is inferior. These species form the best crown fencing (with the height up to 18 m) that protects from the noise and chemical pollution caused by motor vehicles. The lower part of the phytocenosis is closed by the second-tier trees (with the crown height up to 7 m) and third-tier trees (up to 3 m). All the tiers are partly overlapping each other.

Under the moderate mechanical load conditions, the first-tier green stands consisting of A. hippocastanum in combination with oak, acer, poplar that grow in 50th anniversary of Victory Boulevard close to the hotel "Ros" and "Nova Poshta LLC" office have been degrading. 40 % of the *Q. robur v. pyramidal* trees perished in the rows nearest to the road. *A. platanoides* trees have been weakened, *A. hippocastanum* trees have been severely weakened. *P. pyramidalis* trees in almost ripe age are healthy. By increasing the crown density rate from 52 to 72 % these species make up the following range: *A. platanoides, A. hippocastanum, Q.* robur *v. pyramidal*, *P. pyramidalis*. Oak and chestnut are slightly inferior to poplar pyramidal in their relative crown length – 75 and 72 % respectively.

More than half of all the trees in 50th Anniversary of Victory Boulevard have mechanical damages of the trunks with the injury area of 35 to 1,200 cm^2 on the height level of 0.5 to 1.7 m. Most (72 %) injured trees are located in the area close to the market and other outlets, slightly less (67 %) number of the injured trees are near the school №7 and even fewer (55 %) at moderately loaded area of the Boulevard (between the hotel "ROS" and "Nova Poshta LLC"). Grass trampling rates to the soil mineral layer in these areas are as follows: intense effect – 5.2 %, average – 1.5 % and moderate – 1.3 %. In Levanevsky Street, green space trampling by making paths is 3 %, dirtiness – 5 %, sodding in the air gaps of the tent 100 %, 25 % of all the trees have mechanical injuries.

Key words: protective street green belts, Bila Tserkva, residential and transport urban area, forest stand structure, green belt damage.

Direct impact of sowing time on the basil growth processes and its yield

N. Sadovska, A. Hamor, H. Popovych, M. Yerke

The basil production (*Ocimum basilicum* L.) heads the list of herb production all over the world. The best place for basil breeding is the location where the temperature sum of above 10 °C is 3700-3900 °C. These conditions indicate the possibility and feasibility of basil production in the lowland area of Transcarpathian region providing further development and improvement of the technological methods.

The trial was conducted in 2014-2015 in the lowland area of Transcarpathian region. The basil varieties such as Gvozdychny, Yunga, Korychny and Fioletovy opal were studied during the trial. The variety Yunga served as the control variety. The seeds were sown to obtain transplant seedlings thrice at 10-day intervals (the third decade of April – the 1st seeding, the first decade of May – the 2nd seeding, the second decade of May – the 3d seeding). During the period of seedling formation the timing of the onset of the phenological phases was recorded, and the biometric parameters were determined. The record plot was 15 m^2, the repetition was treble. After forming the first five pairs of leaves the seedlings were planted in the open ground using the scheme 50x20 cm. In the budding phase – early flowering period, the herbal raw material was collected, afterwards both the fresh herb material and the dried herb material of air-dry state were weighed. The second collection was performed after the repeated growth of the plants in the same phase as the first one.

It was established that in the first sowing time the longest period from sowing to seedling emergence (8 days) was observed in the variety Gvozdychny. The consequent sowing time led to faster seedling emergences which were two days and one day less respectively. The similar results were obtained with the variety Junga.

The shortest seedling emergence period was observed in the variety Fioletovy opal. In all three seeding periods the seedlings appeared within 4 days.

The similar period of massive seedling emergence after the first seeding time was observed in all the varieties. In the varieties Yunga and Gvozdychny, they appeared within 10 days, in the varieties Korychny – two days and Fioletovy opal - three days earlier.

The periods of bud formation were rather similar in Junga and Korychny varieties. In case of sowing in the first decade of May they coincided completely and were minimal in the trial – 42 days. In the variety Korychny, despite earlier seedling emergence by sowing at the same period, the bud formation period began 10 days later.

The budding period was delayed in the variety Fioletovy Opal, though the rapid seedling emergence was observed. Thus, in the first sowing time the plants of this variety entered into budding within 53 days, in the second – within 57 days, and in the third – only within 74 days after their sowing.

The least fluctuation in the budding periods was observed in the variety Korychny (within 50-56 days), while in the variety Fioletovy Opal, the difference was the highest (within 57-76 days).

The study of leaf apparatus formation of basil plants under study made it possible to establish that the first pair of true leaves formed in the varieties Yunga and Gvozdychny within the shortest period (9-10 days). This was observed in the plants sown in the second decade of May. In the varieties Korychny and Fioletovy Opal the shortest period of the first pair of leaves formation (within 8-9 days) was observed in the sowing time in early May.

The longest period of the fifth pair of leaves formation in all the varieties was observed when the sowing was in the third decade of April. The period ranged from 52 days in the varieties Younga and Korychny to 54 days in the variety Gvozdychny and reached the maximum of 58 days in the variety Fioletovy opal. The shortest period (37 days) of the fifth pair of leaves formation was observed in the variety Gvozdychny. In case of sowing in the second decade of May the longest period of the fifth pair of leaves formation was in the variety Fioletovy opal – 55 days.

It was also found that in the first sowing time the highest plants (over 16 cm) were observed in the varieties Gvozdychny and Korychny. The control plant height in this sowing time was minimal and only reached 9.9 cm. The average leaf area was also minimal and reached 3.52 cm^2, while in the varieties Gvozdychny and Korychny, the leaf area of the same sowing time was 2 times larger than in the control group. The smallest fluctuations in plant seedling height, depending on the seeding time, were observed in the variety Korychny, and the difference did not exceed 0.9 cm.

Seeding time impact on the leaf area size was observed in the variety Fioletovy opal variety, and the average area was maximal – 7.55-7.8 cm^2.

It should be noted that in all the varieties under study it was possible to obtain two harvests only when sowing took place in the third decade of April and early May. The plants of the third sowing time after the first cutting renewed very slowly due to high summer temperatures and did not manage to form the necessary vegetative weight before the end of the growing season.

The highest yield of green mass during the first cutting was received in the variety Gvozdychny of the early sowing time. The harvest weight was 8.2 t/ha, that was 5.1 % more than in the control group. The green mass of the second cutting, though smaller, exceeded the control group (10 %) as well as other varieties.

Similar in their green mass weight of the first cutting were the varieties Korychny and Fioletovy opal (7.0 and 6.9 t/ha respectively) of the first sowing time. As to the weight of the green mass of the second cutting they differed greatly. The green mass weight in the variety Korychny was three times more than in the variety in Fioletovy opal.

Sowing in early May in all the varieties led to the decrease in the green mass yield of both cuttings.

Compared to the earlier sowing time, in case of later sowing time the varieties Gvozdychny and Junga gave the same amount of the green mass, while in Korychny variety it was reduced, and in Fioletovy opal variety this index increased considerably.

In general, the total green mass yield of 13.6 t/ha was achieved in the variety Gvozdychny sown in the third decade of April. This index exceeded the control group by 10.7 %.

The results of the trial revealed that the highest dry weight share in the total herb yield was observed in Gvozdychny variety. Dry material yield under various sowing times varied from 19.2 % to 21.4 %.

Key words: basil, seeds, sowing time, phenological phases, green mass, dry mass, yield.

The ways to control the production process of winter rapeseed hybrids conditions in the Central Steppes of Ukraine

V. Tkachuk, L. Kozak, A. Kozak

Winter rape cultivation has environmental justification not only in Europe, North America and other countries, but also in Ukraine. This is due to the use of crop diversity. Its connected to production of vegetable oil, meal, green weight. This requires a sufficient number of the crop seeds, what can be achieved not only via expansion of crop area, but also via realization of higher genetic potential of existing hybrids taking place in Ukraine, Europe and worldwide. Solving this problem is possible not only due to breeding, but to agricultural practices as well. Such is winter rape sowing optimizing. This is one of the central and complex directions of realization ofcrop genetic potential. This is evidenced by the data of seeding rate, which can vary from 3-5 kg to 10-12 kg. Our experimental results confirm the idea presented above. We carried out the research under the Central Forest-Steppe of Ukraine, in the experimental fields of Bila Tserkva National Agrarian University in 2012-2014. We have studied the Monsanto hybrids: Exotic, Exagone and Extarro by seeding them with a seeding rate of 300, 500 and 700 thous/ha viable seeds. Our results showed that seeding rates can influence the processes of structure elements formation of winter rapeseed yield and this magnitude depends on plants density, their survival in the spring-summer period, the amount of branches of the first order, pods, seeds per plant.

The research of hybrid seed germination in 2012-2014 showed that germination of coated seeds in laboratory was ranged 98.0-98.5 % which indicates high seeds quality. Field germination of winter rape hybrid seeds which were researched in accordance to their seeding rates on average over three year was: Exotic – 91,6 %, Exagone – 90,6 %, Extarro – 89,4 %. Thus, hybrids and Extarro – 89,4 % are conceding to Exotic (control) for this indicator, accordingly 1.0 and 2.2 %. As for the controlling the formation of field germination with sowing norms, the following trend has been found out: increasing norms of coated rapeseed sowing from 300-700 thous. pcs./ha conditioned the decline: Exotic hybrid by 1.5 %; Exagone – 1.2 %, Extarro – 0.5 %. Increasing the seeding rate (average for 3 years) from 300 to 500 thous. pcs./ha and from 500 to 700 thous. pcs./ha reduced their field germination accordingly: Exotic hybrid 1.5-1.9 %; Exagone – 1.2-0.8 %; Extarro – 0.9-0.5 %. Therefore, genetic reaction of hybrids was found on increasing seeding rate from 300 to 500 and from 500 to 700 thous. pcs./ha. Field germination of seeds has a direct effect on the density of plants; this figure was the highest before wintering and threshing. It accounted: hybrid Exotic 438 and 411 thous. pcs./ha, Exagone – 435 and 405 thous. pcs./ha; Extarro – 429 and 396 thous. pcs./ha.

Hybrids and seeding rate affect the number of pods per plant. Our research showed that increasing seeding rate from 300 to 700 thous. pcs./ha causes a decrease in the number of pods per plant. Variations of plant density and the number of pods per plant identified difference in yield of our hybrids. The average yield of each hybrid can be positioned in the following order: Exotic – 2.63 t/ha; Extarro – 2.66 t/ha; Exagone – 2.83 t/ha. Therefore, we have found out that seeding rate is more important factor of regulation yield structure elements than field germination, plant density, the number of pods.

Thus, it has been found out that seeding rate is more efficient factor in density plant regulation as compared with genotype. Difference of plant quantity per 1 ha between hybrids (average for 3 years) amounted in the variants with seeding rate: 300 thous. pcs./ha – 8-9 thous.; 500 thous. pcs./ha – 2-21 thous.; 700 thous. pcs./ha – 0-17 thous.; between seeding rated of each hybrid, according to the lowest seeding rate: Exotic – 171 and 326 thous. pcs./ha, Exagone – 178 and 335 thous. pcs./ha, Extaro – 158 and 317 thous. pcs./ha.

The highest yield for 3 years of the research had Exagone hybrid. The average yield amounted, according to the seeding rate: 300 thous. pcs./ha – 2.17 t/ha; 500 thous. pcs./ha – 3.1 t/ha; 700 thous. pcs./ha – 3.44 t/ha.

Key words: winter rape, field seed germination, plant density, seeding rate, survival plants, seed weight, seed yield.

The assessment of phenophases, biometrics and yield of the brussels sprouts hybrids in the conditions of Right-Bank Forest-steppe

V. Schigol

This article analyzes the characteristics of Brussels sprouts hybrids. In the trials we measured the duration of the individual phases of plant growth, biometric indicators, analysis of indicators of productivity and biochemical study of product organs. We used the hybrids Diablo F_1, Dolores F_1, Franklin F_1, Diamant F_1.

The literature sources and practical experience now indicate a growing interest of people in expanding the assortment of vegetables and the search for new species that can be used in food. The current requirement is the need to introduce new types of vegetables, which is possible due to growing rare plants. The range of the plants may be successfully supplemented by the Brussels sprouts that has a significant potential in terms of science and production. However, its introduction is slow due to low productivity, growing technology imperfections, lack of native varieties and hybrids. Native varieties and hybrids of Brussels sprouts are currently absent in Ukraine. Therefore, there is a need to study the agricultural traits of the hybrids of foreign breeding and the selection of the best ones for further cultivation in Ukraine.

Most Brussels sprouts varieties are characterized by lower yield rate and marketability compared to the hybrids. Therefore, a thorough study and selection of the best hybrids for cultivation under conditions of Right-Bank Forest-steppe is the task of great current importance.

The aim of research was to establish dependence of formation of biometric indicators and yield of Brussels sprouts depending on the hybrid under conditions of Right-Bank Forest-Steppe of Ukraine.

We studied the following hybrids: Diablo F_1, Franklin F_1, Dolores F_1 (Bejo Zaden selection, the Netherlands), Brilliant F_1 (Nickerson Zwaan selection, the Netherlands). These hybrids have a good taste, the same growing season and sufficient yield rate in Ukraine, and Diablo F_1, Franklin F_1 hybrids were included in the State Register of plant varieties suitable for dissemination in Ukraine. Diablo F_1 hybrid was adopted as a control. The trials were carried out in triple repetition on the trial plot of Vinnytsia national agrarian university in 2013-2014 years.

The results of our study suggest the hybrid Franklin's distinct advantage over other hybrids.

The analysis of Brussels sprouts passing the main phenological phases in 2013-2014 demonstrated the advantage of the hybrid Franklin F_1, which recorded the earliest onset of tying heads and full maturity, which in turn means the shortest growing season.

The greatest number of leaves in 2013-2014 was shown by the hybrid Dolores F_1 with an index of 42.6 pc., which is slightly above the control version. The width of the leaf slightly differed in the hybrids and ranged 17,1-17,6 cm. The highest leaf surface area and, respectively, sowing leaf surface were registered in the hybrid Diablo F_1. The hybrid Franklin F_1 demonstrated the highest number of heads on the plant. The highest average yield in 2 years was in the hybrid Franklin F_1, where the figure reached 7.4 t/ha. Somewhat lower yields were shown by Diablo F_1 and Diamond F_1 hybrids.

In our research of Brussels sprouts hybrids, we carried out the chemical analysis of their product organs. The results indicate that the hybrid Brilliant F_1 had the highest contents of ash elements, and the figure was 7.67 %, which exceeded the control option by 3 % (see table 4). Franklin F_1 hybrid had the lowest content of ash elements with an indicator of 6.53 %, which was inferior to control by 13 %. The moisture content in product organs differed insignificantly.

Thus, the results showed the advantage of the hybrid Franklin F_1 in all cases. This hybrid was characterized by earlier set of technical maturity, superior biometric indicators and productivity. However, the content of ash elements, fat and protein was inferior to other hybrids. In case of growing the hybrid Dolores F_1 the yield indicators were relatively lower to other hybrids, and the hybrid Diamant F_1 showed the parameters close to control.

Key words: Diablo F_1, Dolores F_1, Franklin F_1, Diamant F_1, biometric indicators, productivity, biochemical indicators.

Mineral and micronutrient fertilization influence on soybean individual productivity in the Forest-Steppe Right-bank conditions

H. Zabolotniy, V. Tsyhanskiy, O. Tsyhanska

Among the leguminous plants of world agriculture soy belongs to most valuable ones, its grain contains over 40 % of protein and to 25 % of oil. Soy protein is balanced in amino acid composition, it is easily digested by human and animal organisms.

Productivity level and products quality, depending on the sort and terms of growing are particularly important features of modern high quality technology of soy growing. The system of soy fertilizing must be combined, as soy can uptake certain part of elements independently, and for a maximum harvest the optimal and balanced amount of elements nutrients is needed.

The paper highlights the value of soy as a high-protein grain crop. The influence microelements on growth, development and individual productivity of the crop is discussed in the article. Influence of seed treatment on the productivity of soy is shortly presented. The analysis of foreign scientists' papers was conducted.

The soybean is an amazing and versatile crop. It is one of the oldest crops, domesticated in north eastern China.

Microelements are extremely important in soybean growth and development, as their presence in the sufficient amount is the obligatory condition of the intensive up taking nitrogen from air. Despite their insignificant content, microelements are vitally important for development of plants, as they carry out important physiological biological functions.

Thus, estimation of the productivity and quality of soy varieties under different mineral nutrition rates and microelements treatment is scientifically valuable and topical problem that needs a deeper scientific study.

The main purpose of the researches consists in the defining the influence of microelements and fertilizing system on forming the grain-growing productivity of soy sorts in order to obtain increase in productivity and quality of seed in the conditions of right-bank Forest-steppe of Ukraine. Influence of mineral fertilizers dose, pre sowing seed treatment and micronutrient replenishment out of the root on the individual productivity of different ripeness group of soybean sorts in forest-steppe right-bank conditions is presented.

Climatic, soil, genetic, management factors, and their interactions influence on soybean photosynthesis productivity. Some elements of growing technology are considered in this article. The value of mineral nutrition is exposed in growth and development of this crop.

The role of soy crop in plants growing is defined. The peculiarities of mineral nutrition of soybean plants are defined. Influence of microelements on growth, development of soybean plants and forming the corn productivity of sowing is considered.

In order to manage soybean production the best, one needs an understanding of how the plant grows and develops. Without good soil it is impossible to grow a good crop. And a good soil will actually give the plants protection from adverse weather – cold, frost, drought, excess water – as well as protection from pests and diseases. Ideal soil for soybean production peak is a loose, well-drained loam. Plants need various amounts of nutrient elements from the soil as they grow and produce seeds. Apart from nitrogen, different other elements should be available in adequate amounts in ideal soils, but most soils either have deficiencies or imbalances in the amounts of nutrients available to the plants.

Other elements are necessary for plants, but only in very small amounts. Thus they are called the micronutrients or trace elements. Eco-farming suggests that half a hundred in some way figure in the production sequence. Molybdenum is needed by nitrogen fixing bacteria.

In soybeans, the most frequent micronutrient deficiencies are iron, zinc, manganese and molybdenum. But such deficiencies usually occur in poor, weathered or sandy soils, or in soils that are very alkaline or excessively high in organic matter. A loamy soil with adequate humus and soil life should not have micronutrient deficiencies.

For healthy crops and high quality yields, it is important that nutrient elements be available to the plants in the proper amounts and in the right balance. Excess or lack of these elements can cause deficiencies in others.

Key words: soybean, sort, mineral fertilizers, micronutrient, seed treatment, replenishment out of the root, plant structure, individual productivity.