

Summary

Boiarkina L.V., Borovik V.O., Shablya O.S., Sharii V.O. Modern problems of the development of rice production in Ukraine

The purpose of the article is to analyze the current state and problems of the development of rice production, which arose in wartime conditions.

Research methods. A set of general scientific methods and approaches of empirical and theoretical knowledge is applied: abstract-logical, statistical, monographic, modeling, generalization.

Research results. In the overall structure of grain production of cereal crops, rice production is 8 %. Domestic production of rice production satisfies consumption needs by 30–40 %, therefore a significant share of these products is imported. Since 2002, scientists have been actively developing and implementing modern technological solutions that allow to ensure environmental cleanliness, save water, protect the soil and increase the economic efficiency of rice cultivation. The drip irrigation rice cultivation technology developed in 2016 is used in production, while ensuring a yield of 3.5–8 t/ha, 3–5 times less irrigation water is used, the use of fertigation increases the rate of fertilizer use by 20–35% and reduces their overall use by 10–40 %. A sharp increase in the price index, more than twice, was recorded during the ten months of 2022 (from 145.8 to 296.8), despite the fact that during the previous four years its smooth annual growth was observed from 4.5 to 17, 3 %.

Conclusions. In Ukraine, since 2002, modern technological solutions have been actively developed and implemented, which allows to ensure environmental cleanliness, save water, protect the soil and increase the economic efficiency of rice cultivation. The only obstacle that is currently leveling the development of the industry is the temporary occupation of the Russian Federation of Ukraine and, including, the greater part of the *raisonné* zone. A sharp increase in the price index depends to a greater extent on the decrease in the area planted with rice and, as a result, the volume of its production, which is indicated by the inversely proportional value of the regression coefficient ($r = -0.884$).

Key words: rice sowing areas, rice production, modern technological solutions, rice irrigated system, price index.

Vozhehova R.A. Water resources and food supply systems

Problem statement. Water is an important component of food supply systems because it ensures their sustainability, and high-quality water resources are a precondition to produce safe and high-quality food products. Results. Global water resources use has increased sixfold over the recent century and continues to increase steadily by about 1 % per year, driven by factors such as population growth, economic development, and consumption patterns. Climate change, together with a more uneven and unstable supply of water resources, will further complicate the situation in the regions where these resources are already under severe loads. Taking into account the existing climate changes and insufficient

implementation of climate-oriented policies on the global scale, it is expected that in the future agriculture will face risks, a significant part of which will be related to the qualitative and quantitative characteristics of water resources. Valley Scheduling remote irrigation control includes: weather forecast for each field; soil moisture content on the level of field and crop rotation; soil moisture control in the plant's root system zone; irrigation scheduling for each field. The results of such a monitoring allow getting analysis of spectral bands for the experimental field of the Institute of Climate-Smart Agriculture of National Academy of Agrarian Sciences of Ukraine by the values of: normalized difference vegetation index, plants density, water stress index, soil moisture control device on crops. Conclusions. The main measures developed by the scientists of our Institute and adapted to modern climatic conditions and state policy in the direction of mitigating the effects of climate change on the functioning of food supply systems a there is a rational use of water resources in these systems.

Key words: climate change, forecasting, water resources, artificial irrigation, monitoring.

Zaiets S.O., Rudik O.L., Onufran L.S., Kisil L.B. Consumption of nutrients by biomass of winter barley varieties at different sowing times and application of plant growth regulators under irrigation conditions

The purpose of the research is to establish the peculiarities of consumption of nutrients by winter barley plants, depending on the timing of sowing and treatment of seeds with complex drugs of the new generation, in the conditions of irrigation of the Southern Steppe of Ukraine.

Research materials and methodology. The research was carried out using methods and agricultural techniques developed for irrigation conditions. The experiment is three-factor: varieties of winter barley (Akademichnyi and Dev'iatyi val); sowing dates (October 1 and 20); seed treatment with plant growth regulators (control – no treatment, Humifield Forte Brix (0.8 l/t), MIR (6 g/t), and PROLIS (5 g/t). In the biomass of plants, the total content of nitrogen was determined according to Kjeldahl, phosphorus – according to Murphy-Reilly, and potassium – using a flame photometer. Ammonium nitrate was applied to the pre-sowing cultivation of N_{45} and in early spring to top dressing of N_{45} .

The results. It was established that the largest amount of nutrients of winter barley crops accumulates in biological masses at the beginning of earing, which coincides with the formation of the largest ground mass. Without the use of drugs, the difference in nitrogen consumption between the Akademichnyi and Devyatiy Val varieties ranged from 3 to 31 %, depending on the sowing dates. The difference in the accumulation of phosphorus and potassium varied from 1 to 21 % and from 3 to 23 %, respectively. The use of Humifield Forte brix, MIR and PROLIS for seed treatment mainly contributed to the increase in the crop's need for nutrients. In the ripening phase, treated crops contained on average more nitrogen,

phosphorus and potassium by 15.2 kg/ha, 6.0 and 10.1 kg/ha, respectively. A variety of winter barley. The more productive two-armed variety Devyatiy Val for the formation of ground mass needs 23.4–29.2 kg/ha more nitrogen, while the need for phosphorus and potassium is stable.

Conclusions. Treatment of crop seeds with Humifield Forte Brix, MIR and PROLIS drugs increases the consumption of nutrients at all stages of organogenesis. Sowing is carried out after the optimal terms, consume less nutrients.

Key words: varieties of barley, winter type, alternative type, biological mass, sowing dates, consumption of power elements.

Kovalov M.M., Mashchenko Yu.V., Tkach A.F.
The effect of soil density and hardness on the efficiency of sunflower cultivation under different fertilization systems

The article experimentally investigates and substantiates the peculiarities of sunflower crop formation in the conditions of the Right Bank Steppe of Ukraine. The application of various fertilization systems in conditions of insufficient moisture in the Right Bank Steppe of Ukraine is associated with weather risks, non-compliance with the appropriate structure of sown areas and fertilization systems, which makes it difficult to obtain high and stable yields of agricultural crops. The development of farming systems is the main prerequisite for increasing both the harvest levels and the competitiveness of the country's agriculture as a whole. **Purpose** of the article is to identify the dependence of changes in the dynamics of the equilibrium density and hardness of the soil when using different fertilization systems.

Methods. Field, laboratory, statistical.

Results. The use of mineral and organo-mineral fertilization system contributed to the reduction of the soil density index in the upper sowing layer by 0–10 cm, while in the control plots this index was greater by 0,08 and 0,15 g/cm³. This regularity was also observed in deeper layers.

A comparison of sunflower productivity in short-rotation grain-row crop rotation shows that the organo-mineral fertilizer application system is more productive than the mineral one by 0,51 t/ha (19,5 %) and 0,32 t/ha (12,3 %) respectively. During the growth and development of sunflower plants, the hardness of the arable layer decreased by 0,2 kg/cm² in the control, and increased by 0,2 g/cm² in the mineral layer. But under the organo-mineral processing system, it increased by 2,6 g/cm².

Conclusions. The advantages of the organo-mineral system of fertilization are due to the use of precursor plant residues as organic fertilizers, which have a positive effect on the synthesis of organic matter in the soil, as a result of which the physical properties of the soil improve and sunflower productivity increases

Key words: sunflower, fertilization systems, productivity, productivity, soil density and hardness.

Panfilova A. V. Varietal testing of winter wheat in the conditions of the Southern Steppe of Ukraine

Purpose. Studying the varietal composition and to determine the influence of varietal characteristics on the grain yield of winter wheat in the conditions of the Southern Steppe of Ukraine. **Methods.** Field and laboratorian trials were carried out with accordance

to current requirements and standards of scientific research in agronomy and agriculture.

Results. It was established that the average grain yield of winter wheat varieties that were taken for research during the years of state variety testing in the Steppe zone of Ukraine amounted to 4.55–7.62 t/ha. At the same time, the highest grain yield was formed by plants of the variety Zhuravka odeska, and the lowest – by the variety Doskonalist odeska. The studied varieties of soft winter wheat are characterized as highly drought-resistant (7.8–8.8 points) and highly winter-resistant (7.6–8.8 points). At the same time, the variety Zhuravka odeska – has very high drought resistance and winter resistance – 9.0 points each. According to the results of research conducted in the conditions of the experimental field of the Mykolaiv National Agrarian University during 2019–2022, it was determined that the highest grain yield (5.92 t/ha) was obtained by growing the Duma odeska variety. It was found that in the dry year of 2020, the Nota odeska variety turned out to be the best in terms of yield – 5.07 t/ha, which is 0.17 t/ha more than the average for the studied varieties. In the wet year 2021 and the moderately wet year 2022, the highest grain yield was formed by plants of the Duma odeska variety – 6.41 and 6.47 t/ha, respectively, which is 0.26 and 1.04 t/ha more than the average studied varieties.

Conclusions. Researched winter wheat varieties of the Breeding and Genetic Institute – National Center for Seed Science and Varietal Research are characterized by high adaptability. Duma odeska (5.92 t/ha) and Katrusya odeska (5.73 t/ha) are more productive among the studied varieties in the conditions of the Southern Steppe of Ukraine, on average over the years of research. The Nota odeska variety produced the highest grain yield (5.07 t/ha) in dry conditions in 2020.

Key words: variety, variety study, yield, winter wheat.

Polyoviy A.M., Bozhko L.Yu., Barsukova O.A., Ivasenko O.S. Agro-climatic conditions of the productivity of winter wheat on the field in conditions of climate warming

Goal of the work: to analyze the impact of the warming that occurred at the end of the last and the beginning of the current century as a result of climate change on the growth and development of winter wheat, to provide an agroclimatic assessment of the productivity of winter wheat in Odesa region under conditions of warming, which caused an increase in heat supply and a deterioration of wet conditions provision of crops, as well as led to the strengthening of droughts during the growing season of winter wheat. This research used the materials of meteorological and agrometeorological observations from the network of agrometeorological stations in Odesa region, as well as data on the average yield of winter wheat in the region for the period from 1995 to 2019.

Research results. It was established that during the researched period, the yield of winter wheat according to the trend had an increasing character and is characterized by deviations from the trend caused by the influence of weather. Low yields were formed in years with dry conditions in the autumn period, because of which the number of stalks decreased, and crops were in poor condition during winter. In addition, the deterioration of moisture supply conditions and increased air temperatures in the period from earing to wax maturity caused the formation of stunted plants

with a reduced number of spikelets in a spike. During spring and summer period in Odesa region, the main factor in the formation of high yields is the moisture supply of crops. The highest yield of 37–39 t/ha was obtained in years with spring reserves of moisture in the soil (more than 150 mm in a meter-long soil layer), and the density of plants for the restoration of vegetation is more than 1000 stems per 1 m².

Complex agro-climatic indicators were developed to assess the agro-climatic conditions for the formation of winter wheat yield by main periods of its development, that take into account the influence of all three periods. These indicators represent different combinations of agroclimatic factors and elements of winter wheat productivity. Agroclimatic indicators for assessing the conditions of the formation of winter wheat yield in the spring-summer period and an indicator that includes the impact on its yield in the autumn-winter period also were developed.

Conclusion. The yield of winter wheat in Odesa region is influenced by following factors: autumn sowing dates, the condition at the time of the termination of vegetation, overwintering conditions, and spring-summer vegetation conditions.

Annual yield deviations are caused by the influence of weather conditions, the average yield along the trend line determines the yield of winter wheat due to the agricultural culture.

Three comprehensive indicators were developed to assess the agroclimatic conditions for the formation of winter wheat crops in Odesa during the warming climate: the moisture index (K_u), the biological productivity index of winter wheat (K_b) and the agroclimatic index (K). Following conditions for the formation of winter wheat crops of different levels were estimated according to the values of the agroclimatic indicator: a harvest of 15 c/a is formed if the value of the agroclimatic indicator is at the level of 30 relative points, a harvest of 16–20 t/ha is formed for $K = 31$ –50 relative points, a harvest of 21–30 t/ha for $K = 51$ –90, a harvest above 31 t/ha for $K = 91$ –100 relative points.

Key words: weather conditions, winter wheat, harvest, comprehensive indicators.

Vozhehova R.A., Marchenko T.Yu., Lavrynenko Yu.O., Bazaliy G.G., Zhupina A.Yu., Bidnyna I.O. Correlation of gluten content in grain, protein content, yield and duration of the "blooming-maturity" period in wheat breeding samples soft winter crops derived from hybrids of different ecological and genetic origins under irrigation conditions

The goal is to establish the nature of the "mass fraction of raw gluten in grain" trait in soft winter wheat lines created with the involvement of late-ripening samples of the Western European ecotype. To establish correlation-regression models of the dependence of grain gluten with the duration of the interphase period "flowering – grain maturity", grain yield and protein content in elite numbers in breeding nurseries. Research methods are field, laboratory, biochemical, selection-genetic, statistical. field research was carried out at the Institute of Irrigated Agriculture of the National Academy of Sciences in 2019–2021. The object of research was modern winter wheat varieties of the Institute, collection samples of the Western European ecotype that were introduced from France (registration numbers Kf1...16) and hybrids created with their participation. The research was carried out under irrigation conditions at the

pre-irrigation soil moisture level in the 0–50 cm layer of 75 % RH. The gluten content was determined by washing the sample in running water (DSTU ISO 21415-1:2009 Wheat and wheat flour. Gluten content. Part 1. Determination of raw gluten by manual method). The results. It was established that the minimum content of raw gluten in the number of grains was in the range of 9.6...20.0 %. The maximum share of crude gluten was recorded at the level of 33.2...38.8 % in lines from the hybrid populations Kf4 16/Ovid, Kf5-16/Ledya and Kf2-16/Khersonian Bezosta. According to the average indicators of protein, the combinations Kf2-16/Khersonskaya bezosta (28.1 %) and Kf4-16/Ovidii (24.2 %) were noted. A positive weak correlation of gluten content and grain yield was recorded in hybrid combinations Kf4-16/Ovid and Kf2-16/Khersonian bezosta ($r = 0.329$ and 0.221 , respectively), which indicates the possibility of simultaneous selection for yield and raw gluten content. Lines from these combinations also have the highest levels of gluten (38.8 and 33.2 %). Such correlations of these traits indicate the possibility of simultaneous selection for grain productivity and bread-making quality of grain. Only one line, 18–776, had a high yield combined with protein (13.1 %), gluten (37.6 %), moderate resistance to diseases and lodging. Conclusions. The nature of the manifestation of the trait "amount of raw gluten" in selection numbers selected from hybrid populations with the participation of Western European ecotypes of soft winter wheat, correlation-regression models of the dependence of gluten content, grain yield and the duration of the "flowering-maturity" period were established. Simultaneous increase in yield and bread-making quality of grain with traditional selections is possible, but such simultaneous increase of these traits is more suitable for hybrid heterogeneous populations with low parameters of gluten expression (23...25 %) and yield (7.5...8.5 t/ha), or according to one of the signs.

Key words: wheat, populations, breeding nurseries, correlation-regression models.

Vozhehova R.A., Tyshchenko A.V., Tyshchenko O.D., Piliarska O.O., Fundirat K.S., Konovalova V.M. Relationship between forage and seed productivity of alfalfa populations

Purpose. Determining the relationship between the productivity of fodder mass and alfalfa seeds on grass plants of different years of life and selection of the best populations that combine high fodder and seed productivity.

Methods. The research was conducted at the Institute of Irrigated Agriculture of the NAAS (Ukraine, Kherson, Naddniprianske village, 46°44'50.1"N 32°42'30.0"E), located on the Ingulets irrigated massif, during 2017–2020 in field conditions. The object of study was alfalfa varieties and populations for fodder and seed use.

Results. In the first year of life, populations characterized by high forage productivity were: A.r. d. y Zh. / CP-11 – 4.57 kg/m², V.11 / P. d. – 4.69 kg/m² and FCHNV² – 4.85 kg/m², while high seed productivity was characterized by populations: M.g. / CP-11 – 243.10 kg/ha, A.-N.d. No. 15 – 226.30 kg/ha, M.g. / P.p. – 227.67 and Sin(s). / Primorka – 229.87 kg/ha. According to the results of the correlation analysis of alfalfa populations with feed and seed use in the first year of life, it was established that there is no correlation ($r = -0.047$). Based on the productivity

of fodder mass and seeds in combination with biplot analysis, the populations G4 – M.g. / P.p., G15 – M.g. / CP-11, G22 – B.11 / P. d. and G23 – Zh. / CP-11, which combine relatively high fodder and seed productivity on grass in the first year of life. In the second year of life, populations characterized by herbaceous high seed productivity were: A.-N.d. No. 15 – 412.70 kg/ha, Syn(c). / Primorka – 400.80 kg/ha and Doby for k.s. – 394.77 kg/ha, while the following populations had high feed productivity: Elehiya – 10.17 kg/m², Syn(s). / Primorka – 10.13 kg/m² and M.g. / CP-11 – 10.16 kg/m². An average correlation was established in alfalfa populations for fodder and seed use in the second year of life ($r = 0.626$). Selected population Syn(s). / Primorka (G5), which combines high fodder and seed productivity in the grass of the second year of life. Seed yield in two years ranged from 396.77 to 639.00 kg/ha, fodder productivity in two years ranged from 12.29 to 14.37 kg/m². According to the results of the correlation analysis of alfalfa populations with fodder and seed use for two years, a low positive dependence was established ($r = 0.237$). For two years, isolated populations of M.g. / P.p. (G4), Syn(s). / Primorka (G5) and M.g. / CP-11 (G15), combining high fodder and seed productivity. **Conclusions.** In two years, a low positive correlation was established ($r = 0.237$) and isolated populations of M.g. / P.p. (G4), Syn(s). / Primorka (G5) and M.g. / CP-11 (G15), combining high fodder and seed productivity.

Key words: alfalfa, varieties, populations, forage productivity, seed productivity, correlation analysis, biplot analysis.

Kokovikhina O.S. The quality of soybean seeds and the mass of one thousand seeds depending on the variety composition, fertilization and plant protection under irrigation conditions in Southern Ukraine

Goal. The goal was to establish the productivity indicators of different soybean varieties depending on the investigated factors: varietal composition, fertilization and plant protection, to determine the germination energy and laboratory seed germination of soybean varieties.

Research methods. Research was conducted during 2019–2021 at the experimental field of the Institute of Irrigated Agriculture of the NAAS of Ukraine. Field experiments were established by the method of split plots in four repetitions according to the methodology of research in agronomy.

The results. According to the indicator of conditional yield of protein with its increase to 1.75 t/ha, the Oleshsha variety had an advantage under the conditions of using Phosphate gel and chemical plant protection. In the Ideal variety without fertilizers and without plant protection, it is significantly 2.9 times (up to 0.61 t/ha). Under biological protection, the conditional yield of protein increased by 14.8 % (up to 1.32 t/ha), but under chemical protection it had the greatest value – 1.38 t/ha and was 20.0 % more than the control. The highest oil content in soybean seeds, in the range of 21.8 %, was in the Oleshsha variety for the use of Phosphate gel and for chemical plant protection. This indicator decreased by 17.2 percentage points in the Ideal variety without fertilizers and without plant protection. The treatment of crops with chemical and biological preparations contributed to an insignificant increase in oil content, on average, up to 20.8 %, which was 2.9 percentage

points more than the control variant, in which this indicator was 20.2 %.

Conclusions. Calculations proved that the weight of 1000 soybean seeds increased to 157–15 g in the Pivdenna krasunya variety due to the use of the biological preparation Phosphate gel and the use of biological and chemical plant protection, while in the Ideal and Zorya Stepu varieties this indicator decreased by 14.6–17.8 % (up to 135–137 g) in versions without fertilizer and without plant protection. Conditional collection of oil had a maximum value of 1.09 t/ha on the Oleshsha variety with using Phosphate gel and chemical plant protection.

Key words: soybean, seeds, quality, variety, plant protection, weight of one thousand seeds, quality indicators, protein, oil, oil content.

Kosenko N. P. Formation of seed productivity of carrot (*Daucus carota* L.) grown by non-transplantation method on the conditions of drip irrigation in the Southern of Ukraine

Goal. To determine the effect of sowing time and plant density on the formation of seed productivity and seed quality by non-transplantation (seed-to-seed) method at drip irrigation in the southern of Ukraine was the purpose of our research.

Methods. The researches were based on complex use of field, calculated-comparative mathematical-statistical, methods and system analysis.

Results. It was determined that in the conditions of southern Ukraine under conditions of drip irrigation it is possible to obtain a high level of overwintering of mother plants of carrot at using the without transplantation method of seed production. It was established that the time of sowing and the density of seed plants have a significant effect on growth, development, seed productivity and seed quality.

It was determined that the optimal time for sowing is the first or second decade of August, which provides a significant increase in yield by 14,6–17,6 % compared to sowing in the third decade of August. The density of mother plants at the end of the autumn vegetation has a significant impact on the formation of seed yield. At a density of 250 thousand plants/ha, the seed productivity of plants was 21,3% higher than at a density of 150 thousand plants/ha. The highest seed yield (593 kg/ha) was recorded for sowing in the first decade of August and the density of seed plants was 250 thousand plants/ha. From data of cross-correlation-regressive analysis dependence is certain and the mathematical model of the productivity of seed is built depending on the technological methods of growing. The correlation dependence was established between seed yield and the density of seed plants: the regression coefficient is $R = 0,94–0,98$. The quality of seed substantially didn't change from the time of sowing and the density of plants. The suitability of the seed variety was 97,0 %.

Conclusions. Using the method of growing table carrot seeds without planting root crops makes it possible to obtain a seed yield at the level of 475–596 kg/ha, with high sowing qualities. The use of a non-transplanting method of growing carrot seeds makes it possible to obtain a seed yield at the level of 540–593 kg/ha, with high sowing qualities. Seeds that are grown by the no-planting method meet the requirements of the state standard of Ukraine, presented to the certified seeds.

Key words: carrot, seed growing method, sowing time, plant density, yield, seed quality.