

## Summary

**Bahan A.V., Shakaliy S.M., Yurchenko S.O., Ivashchenko V.M., Barabolia O.V., Pokotylo A.V. Formation of biometric indicators and yield level of corn hybrids by maturity groups**

**Purpose.** The purpose of the research was to study the biometric parameters of plants and yields of corn hybrids by maturity groups.

**Methods.** Field and laboratory research methods included determining the duration of the growing season, plant height, height of attachment of the upper cob, the number of developed cobs on the plant, yield. The index of the ratio of the height of attachment of the upper cob to the height of the plant was calculated. The object of the research were 9 corn hybrids of domestic selection of different maturity groups.

**Research results.** According to average data, the duration of the vegetation period of corn hybrids was 96–122 days, depending on maturity groups. The height of plants in corn hybrids was: early-ripening – 189.5–251.4 cm, middle early – 231.0–268.2 cm, mid-ripening – 242.5–279.6 cm. The height of attachment of the upper cob varied within: early-ripening hybrids – 75.4–96.0 cm, middle early hybrids – 76.2–96.0 cm, mid-ripening hybrids – 91.5–122.6 cm. The index of the ratio of the height of attachment of the cob to the height of the plant, which was 0.31–0.44. The number of cobs on the plant was equal to: early-ripening hybrids – 1.6–1.9 pieces, middle early hybrids – 1.4–1.5 pieces, mid-ripening hybrids – 1.4–1.6. Yields by maturity groups of corn hybrids varied as follows: early-ripening hybrids – 7.18–7.90 t/ha, middle early hybrids – 7.52–8.16 t/ha, mid-ripening hybrids – 8.33–8.95 t/ha.

**Conclusions.** It was established that the increase in the duration of the growing season affects the height of the plant and the height of the attachment of the upper cob. The tallest are hybrids of the mid-ripening group DMS Sector (279.6 cm) and DMS 3015 (275.0 cm). The highest height of cob attachment was observed in the hybrid DMS Sector (122.6 cm). A hybrid of the mid-ripening group Vizyr provided the highest yield of 8.95 t/ha.

**Key words:** vegetation period, plant height, cob attachment height, number of cobs on the plant, correlation coefficient.

**Barat Yu.M., Natalevych V.V. Productivity of grapes depending on the application of microbiological fertilizers**

Mineral fertilizers are widely used in intensive viticulture, providing high yields with slightly lower quality grapes.

**Purpose.** The aim of the study was to determine the effect of mixtures of microbiological fertilizers with sown rows of legumes and grasses on the yield and quality of Riesling grapes.

**Methods.** The experiment was conducted on a farm Wilchingen Bergwy (Switzerland). The study used a microbiological fertilizer – a biological preparation prepared from mixed populations of *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus circulans*. The strains of microorganisms used for this study come from the collection of microorganisms of the

scientific laboratory. The experiment was developed on a block system: control (without biofertilizers) – option 1 and using a strain of *Azotobacter chroococcum* – option 2, a mixture of populations of *Azotobacter chroococcum* and *Bacillus megaterium* – option 3, a mixture of populations of *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus circulans* – option 4. The space inside the row was kept under clean steam, and in the rows every year (March–April) a mixture of peas and barley was sown and earned in the soil in the flowering phase of legumes. Grapes were harvested in the phase of full ripening, the number of bunches and weight of grapes from the vine, yield, sugar content and total acids for the period 2019–2020 were determined.

**Results.** The application of biofertilizers affected the formation of the yield of grapes. The highest yield was obtained with the application of *Azotobacter chroococcum* (8.77 t/ha). The combination of *Azotobacter chroococcum* and *Bacillus megaterium* reduced the yield compared to the application of *Azotobacter chroococcum* alone by 1.02 t/ha, and the use of a mixture of *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus circulans* resulted in a decrease of 1.77 t/ha.

In all variants, due to the introduction of microbiological fertilizers, the sugar content in the wort increased compared to the variant without application. Thus, the greatest value was obtained from the option of making a combination of all three biological products – 21.3%. With the introduction of *Azotobacter chroococcum* + *Bacillus megaterium* was obtained 20.1% of the sugar content in the wort, and with the introduction of *Azotobacter chroococcum* the percentage was 19.9%.

The total acid content in the wort under the action of microfertilizers increased in proportion to the decrease in sugar content. The lowest value of this indicator was with the introduction of *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus circulans* – 5.4 g/l.

**Findings.** So, the application of microbiological fertilizer *Azotobacter chroococcum* yielded the highest yield of grapes – 8.77 t/ha. The combination of *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus circulans* increases the sugar content in the wort and reduces the total acid content.

**Key words:** viticulture, biofertilizer, number of bunches from a bush, weight of berries from a bunch, weight of berries from a bush, yield.

**Vozhegova R.A., Lavrynenko Yu.O., Marchenko T.Yu., Piliarska O.O., Mishchenko S.V. Weight of 1000 grains and yield of maize hybrids depending on the density of sowing and treatment with biological products**

**Purpose** is to investigate the influence of plant density and treatment with biologically active drugs on the formation of the mass of 1000 grains and grain yield in modern maize hybrids under irrigation.

**Methods** – field, laboratory, statistical. **Results.** On average, the highest seed yield over the years was in the middle-late hybrid Arabat at a density of 70 thousand plants/ha – 17.45 t/ha. At a density of 80

thousand plants/ha, the yield was 16.91 t/ha, with the thickening of crops to 90 thousand plants/ha, there was a sharp decrease in yield to 15.86 t/ha. The middle-late Chongar hybrid also showed the maximum yield at a density of 70 thousand plants/ha – 16.68 t/ha. At a density of 90 thousand plants/ha, the minimum yield was 16.17 t/ha. Medium-ripe hybrid Kakhovskiy showed maximum yield at a plant density of 80 thousand plants/ha – 13.45 t/ha, reducing plant density to 70 thousand plants/ha led to a decrease in yield to 13.03 t/ha, increasing the density to 90 thousand plants/ha also led to a drop in yield to 13.25 t/ha. Early-maturing hybrid Stepoviy showed the maximum yield at a density of 90 thousand plants/ha – 12.05 t/ha, reducing the density to 80 and 70 thousand plants/ha led to a decrease in grain yield to 11.84 and 11.95 t/ha in accordance. The most effective among the drugs was the drug Biospectrum BT. Thus, the average late hybrid Arabat (FAO 430) on average for the use of this drug – 15.69 t/ha (yield increase of 1.26 t/ha or 8.7%), the hybrid Chongar (FAO 420) on average – 15.44 t/ha (yield increase 1.06 t/ha, or 7.3%). The hybrid of the medium-ripe group – Kakhovskiy showed a slightly lower yield on average when treated with the drug Biospectrum BT – 12.17 t/ha (yield increase of 1.12 t/ha, or 9.9%). Early-maturing hybrid Stepoviy showed a yield using the drug Biospectrum BT – 9.92 t/ha (yield increase 0.91 t/ha, or 10.1%). The increase in yield from biological products Trichopsin BT, Fluorescein BT was lower. **Conclusions.** It was found that treatment with biologicals provided an increase in the weight of 1000 grains. Maize hybrids showed a maximum weight of 1000 grains for treatment with the drug Biospectrum BT – 289.5 g. An increase in the weight of 1000 grains from treatment with the drug Biospectrum BT compared with the control on average in the experiment – 2.9%. The drug Trichopsin BT increased the weight of 1000 grains by 4.3 g, or 1.5%, the drug Fluorescein BT increased the weight of 1000 grains by an average of 3.1 g, or 1.0%. It was found that treatment with biologicals provided an increase in the weight of 1000 grains. Maize hybrids showed a maximum weight of 1000 grains for treatment with the drug Biospectrum BT – 289.5 g. An increase in the weight of 1000 grains from treatment with the drug Biospectrum BT compared with the control on average in the experiment – 2.9%. The drug Trichopsin BT increased the weight of 1000 grains by 4.3 g, or 1.5%, the drug Fluorescein BT increased the weight of 1000 grains by an average of 3.1 g, or 1.0%. A significant correlation coefficient (+0.986) indicates a positive effect of the mass of 1000 grains on the grain yield of maize hybrids. The maximum grain yield of the early-ripening hybrid Stepoviy (FAO 190) was obtained at a density of 90 thousand plants/ha and treatment with Biospectrum BT – 9.75 t/ha. The medium-ripe hybrid Kakhovskiy (FAO 350) showed the maximum yield at densities of 80 thousand plants/ha and treatment with Biospectrum BT – 12.79 t/ha. The mid-late hybrid Chongar (FAO 420) showed the maximum grain yield at a density of 70 thousand plants/ha and treatment with Biospectrum BT – 16.31 t/ha. The mid-late hybrid Arabat (FAO 430) showed the maximum grain yield at a density of 70 thousand plants/ha and treatment with Biospectrum BT – 16.41 t/ha.

**Key words:** corn, hybrid, biological preparations, weight of 1000 seeds, grain yield.

**Vozhehova R.A., Lykhovyd P.V., Biliaieva I.M., Boitseniuk K.I. The level of information support for aromatic and medicinal plant growing in Ukraine**

**Purpose** – to carry out a meta-analysis of the current level of information support concerning cultivation technologies of major medicinal and aromatic crops, zoned for the Steppe of Ukraine, to determine the existing gaps and form a research program for the development of scientifically based agricultural technologies for their production.

**Methods.** Analytical processing of the formed scientific, methodological and practical recommendations on the cultivation technologies of medicinal and aromatic crops, which are included in the State Register of Plant Varieties of Ukraine dated September 20, 2021 and zoned for the Steppe of Ukraine or greenhouse. The main points of the study: primary tillage, fertilization, terms, methods and rates of sowing/planting, plant care, integrated management of crops protection against weeds, insects and diseases, irrigation, harvesting. The gradation of the information support was determined by the categories: sufficient, insufficient, absent.

**Results.** Meta-analysis of 19 species of aromatic and medicinal plants, zoned for the Steppe, makes it possible to testify the low level of information support regarding their cultivation technologies. Nine of the studied crops have extremely insufficient information on cultivation technologies (there is almost no data on the research of the cultivation technology elements), and only four of them are sufficiently studied to form scientifically based recommendations and zonal cultivation technologies.

**Conclusions.** The lowest information support, and therefore the greatest need for a thorough study of cultivation technologies, was determined for such medicinal and aromatic crops as belladonna, three-lobed beggartick, astragalus, eastern galega, common madder, oregano, narrow-leaved lavender, annual bitter peppers, peppermint. The best information support of agricultural technologies is found in such crops as milk thistle, hyssop, coriander, and common fennel, which are sufficiently studied for mass introduction into production in the farms of the South of Ukraine.

**Key words:** meta-analysis, medicinal plants, essential oil crops, Steppe of Ukraine, South of Ukraine.

**Hlupak Z.I., Butenko A.A., Shkurat S.V. Soybean productivity depending on inoculation and biological growth regulators in the conditions of the north-eastern part of the Forest Steppe of Ukraine**

**Purpose.** The *aim* is to optimize seed treatment with rhizolin and biological plant growth regulators, to reveal their influence on soybean productivity on typical low-humus black soils in the conditions of the north-eastern Forest Steppe of Ukraine.

**Methods.** Planning, field experiments, observations and counts were carried out according to Dospekhov. Methods of mathematical statistics were used to process the data obtained. Statistical processing of the yield data was carried out by the method of analysis of variance using the Statistica for Windows, Microsoft Excel software package. Accompanying observations, counts and analyzes were carried out according to the "Methodology of the State Variety Testing of Agricultural Crops".

**Results.** The studies have shown that the leaf surface area of soybeans depended more on the weather and climatic conditions of the years of

research than on the factors studied. Thus, the smallest leaf surface area of the plant was formed in the least favorable year 2021 in all variants of the experiment, and the highest one was in 2019. On average, over the years of the researches, inoculation of seeds with rhizolin contributed to an increase in the leaf surface area of soybean plants by 1,1–1,4 thousand m<sup>2</sup>/ha compared to the control. The largest leaf surface area was formed on the variant of seed treatment with rhizolin in combination with emistim C – 46,1–67,4 thousand m<sup>2</sup>/ha.

On average, over the years of the researches, the highest indicators of individual plant productivity (the number of beans per plant 15,5 pieces, the number of seeds per plant – 28,8 pieces, the weight of seeds from 1 plant – 4,78 g and the weight of 1000 seeds – 167 g) was obtained on the variant of joint application of the inoculum rhizoline in combination with the biological growth regulator emistim C. The increase in yield was 0,3 t/ha compared to the control.

**Conclusions.** The studies have shown a positive effect of inoculation and biological growth regulators on soybean productivity. The highest productivity was obtained under the conditions of seed inoculation before sowing with risoline in combination with the biological growth regulator emistim C.

**Key words:** pre-sowing seed treatment, plant height, leaf surface area, individual productivity, yield.

**Dymov O.M., Holoborodko S.P. Water supply of the Steppe Zone of Ukraine and rational use of irrigated land in the conditions of regional climate change**

**Purpose** – to substantiate the state of organizational support of irrigated land in the conditions of regional climate change and determine agrotechnical measures that contribute to the effective use of irrigation water in the cultivation of agricultural crops on irrigated lands of the southern part of the Steppe Zone, and on irrigated lands – the growth of reserves of productive moisture in the soil, as well as moisture that accumulates during precipitation in the autumn-winter and spring-summer periods. **Methods.** The methodological basis of the research is a set of general scientific methods: analysis, synthesis, graphic method, combined with scientific developments of domestic scientists on the structure of sown areas of agricultural crops, regional climate change, the search for ways to effectively use irrigated land and generalization of research results.

**Results.** The structure of acreage in the southern Steppe subzone for the period 1990–2020 is analyzed. Indicators of precipitation, evaporation and lack of moisture supply during the growing season of agricultural crops in this subzone for the period 1945–2020 are determined. The reasons for inefficient use of reclaimed land are revealed. Some aspects of legislative support for the development of irrigated agriculture are highlighted. The article analyzes the state of affairs in the water management complex of Zaporizhzhia, Mykolaiv and Odesa regions. **Conclusions.** It is advisable to revive irrigation in Ukraine on the basis of reconstruction and modernization of existing land reclamation systems, the development of which should be adapted to the variability of natural and anthropogenic factors. At the state level, it is necessary to legislate industrial relations between landowners and land users in order to effectively cooperate with state Basin Water Resources departments. Restoration and expansion

of irrigation areas will significantly reduce the lack of moisture supply and increase crop yields.

**Key words:** crop structure, precipitation, evaporation rate, legislative support, water management complex, harvest.

**Zhuikov O.G., Lavrys V.Yu. Quantitative and qualitative indicators of functioning of the assimilation apparatus of ornamental sunflower at different sowing rates in the conditions of the Southern Steppe of Ukraine**

According to the indicator of the average area of a single leaf blade, in the experiment we noted a trend according to which this indicator increased with increasing seed sowing rate from 50 to 60 thousand units / ha, and subsequently with increasing sowing rate up to 70 thousand units / ha began to decline. The average for the Teddy F1 hybrid was 72.6 cm<sup>2</sup>, Double Sunking F1 – 70.3 cm<sup>2</sup>, Santa Fe F1 – 70.8 cm<sup>2</sup>, respectively. The dependence of the leaf blade thickness of sunflower hybrids was absolutely similar: it was minimal in the Teddy F1 hybrid variant - 0.58 mm, in the Double Sunking F1 hybrid variant it decreased to 0.55 mm, and the minimum value was in the variant of the hybrid Santa Fe F1 – 0.52 mm on average by factor B. According to our data, the dependence of the intensity of green color of the leaf blade of sunflower hybrids was similar: if this indicator was not significantly dependent on factor A, the increase in seeding rate caused a decrease in the intensity of green leaf color when compared with the reference sample. If we take the color intensity of the standard for 100%, the color of the leaf blade of the Teddy F1 hybrid was 73%, Double Sunking F1 – 69%, Santa Fe F1 – 69% of the standard. The lowest intensity of green color of sunflower leaves was at the maximum seeding rate and did not exceed 62% on average by factor A. On average by factor B, the leader in the content of green pigment in the leaves recognized hybrid Teddy F1 – 8.69 mg/g, optional hybrid Santa Fe F1 it was 7.45 mg/g, Double Sunking F1 – 8.02 mg/g. The maximum area of the assimilation apparatus of the culture was formed according to the variant of hybrid Teddy F1 and in the flowering phase was 30.7 thousand m<sup>2</sup>/ha, according to the variant of hybrid Double Sunking F1 – respectively 29.5 thousand m<sup>2</sup>/ha, hybrid Santa Fe F1 - 26,1 thousand m<sup>2</sup>/ha. For all variants of culture hybrids there is a dependence, according to which the leaf surface area with increasing seeding rate from 50 to 60 thousand units / ha increased, and with a subsequent increase in seeding rate to 70 thousand units / ha, on the contrary, began to decline significantly. The maximum values of the net productivity of photosynthesis reached for the hybrid Teddy F1 and the average for factor B was 1.99 g m<sup>2</sup>/day, hybrid Double Sunking F1 – respectively 1.93 g/m<sup>2</sup>/ day, and hybrid Santa Fe F1 – 1,84 g/m<sup>2</sup> / day.

**Key words:** ornamental sunflower, hybrids, seed sowing rate, leaf surface area, chlorophyll fractional composition, enzyme content, photosynthetic potential, net photosynthesis productivity.

**Zhuikov O.G., Hodos T.A. Phytosanitary state of Sarepta mustard agrocenosis at different levels of biologization of technology for growing crops in the southern steppe**

The results of the accounting of cabbage fleas in the Sarepta mustard crop allow us to conclude that both the population of this species and the number of damaged crop plants depended more on the technology

of growing the crop than on the rate of sowing seeds. However, the most significant impact on this indicator was the technology of growing crops. Thus, according to the traditional zonal cultivation technology, on average by factor B, the population of cabbage fleas was 4.5 units/m<sup>2</sup>, according to the biologized – 4.4 units/m<sup>2</sup>, and according to organic - 4.8 units/m<sup>2</sup>. A similar nature of dependence was noted by us in terms of the rate of damage to seedlings by this pest: according to the traditional technology, it amounted to 7.2%, for biological and organic – respectively 7.3%. The nature of dependence on the studied factors, prevalence and harmfulness of rapeseed foreshed was absolutely identical: on average, according to the seeding rate factor, the population of cultural plants with traditional cultivation technology was 6.7 pieces/m<sup>2</sup>, with biologized – 5.0 pieces/m<sup>2</sup>, and for organic – 4.8 pieces/m<sup>2</sup>, respectively. The number of damaged plants, according to our research, was 9.0%, 8.1% and 6.9%, respectively.

For all variants of cultivation technology, the increase in seeding rate led to a significant reduction in weediness in both quantitative and weight terms: for traditional cultivation technology, the increase in seeding rate from 2.0 to 3.0 million units/ha helped reduce the number of storms 46.4%, and in weight terms – by 42.3%; for biologized – by 44.4 and 44.7%, respectively; organic – by 40.9 and 39.7%. On average, by factor B, the number of weeds per unit of sown area by traditional cultivation technology was 6.2 pieces/m<sup>2</sup>, organic – 6.7 pieces/m<sup>2</sup>, and organic – 5.4 pieces/m<sup>2</sup>, which in terms of air-dry biomass was 18.2 g/m<sup>2</sup>, 20.6 g/m<sup>2</sup> and 15.4 g/m<sup>2</sup>.

The most effective in protecting crop plants from fungal pathogens is organic cultivation technology, which outperformed traditional zonal and biologic cultivation technology by an average of 33.8 percentage points. The complete abandonment of the use of synthetic chemical plant protection products using organic technology of growing Sarepta mustard has led to a significant increase in the attendance of flowering plants of the culture by pollinating insects, primarily – honey honey bee.

**Key words:** Sarepta mustard, biologization, organic technology, phytosanitary condition of crops, pests, weeds, pathogens.

#### **Zaiets S.O., Rudik O.L., Onufran L.I. Optimization of sowing dates of winter barley in the irrigation zone of the Southern Steppe of Ukraine in the aspect of current climate change**

**Purpose.** The aim of the work is to search for the existing patterns of shifting the optimal sowing dates for winter barley in the conditions of the Southern Steppe of Ukraine in the aspect of global climate change. **Methods.** There were used studies that were carried out according to typical schemes after 18 years on the fields of the Institute of Irrigated Agriculture of the National Academy of Sciences. The cultivation technology was recommended for these zonal conditions, and the varieties are included in the State Register. The experiments were performed according to the methods of field and laboratory studies for irrigation conditions. At the initial stage of research, during 1999–2001, in the period from September 20 to October 15, the winter barley variety Rosava was sown. At the final stage, in 2016–2018, in the period from September 20 to October 20, varieties of the classical winter variety Akademichny and varieties of

the alternative type Devyaty Val and Dostoyny were sown. The methods of mathematical statistics and modeling were used to process and agree on the results. The assessment of weather conditions during the periods of field research, presented according to the actual data of the zonal meteorological station, indicates the typicality of conditions for the noted periods. **Research results.** Under the initial period of climatic conditions, the highest level of yield, crops of winter barley of the Rosava variety were formed during sowing in the period from September 25 to October 1. At the end of the research cycle, the fluctuations in the yield of barley variety Akademichny within the sowing period from September 20 to October 10 were at a non-significant level. In varieties of winter barley of an alternative type – Devyaty val and Dostoyny, the sowing dates from September 20 to October 10 also did not predetermine a significant variation in yield. Their productivity varied within a narrower range of values, and the standard deviation for the noted varieties was 0.08 and 0.04 t/ha, respectively, against 0.13 and 0.43 t/ha for the Akademichny and Rosava varieties. The current change in weather conditions, which are the result of global climatic transformations, contributes to the cultivation of winter barley under irrigation in the South of Ukraine. Sowing calendar dates, within which there is an insignificant fluctuation in the yield of crop grain, are expanding. **Conclusions.** Changes in the response of typical winter barley varieties to sowing dates that have occurred over the past 15-20 years, and atypical responsiveness of varieties that belong to an alternative type to this factor, have been established. Taking into account the current changes in the weather conditions of the autumn-winter period and the rapid renewal of the varietal composition of the crop, the determination of the optimal sowing terms cannot be permanent.

**Key words:** agrometeorological conditions, climate change, winter barley, varieties, sowing dates.

#### **Kyryliuk V.P., Krychivskyi V.M. Modern adaptive systems of the main main tillage for spring barley**

**Purpose.** Study of the influence of long-term application of the systems of basic tillage and fertilization on the yield of spring barley.

**Methods.** During 2018–2021, the Khmelnytsky State Agricultural Research Station studied the impact of fundamentally different systems of basic tillage and traditional and new fertilizer systems on quantitative and qualitative indicators of crop productivity. The research was carried out in a 4-field crop rotation with the following alternation of crops: soybeans, spring barley, white mustard, winter wheat. Crop cultivation techniques are generally accepted for the area with the exception of basic tillage and fertilizers. Doses of fertilizers for barley were as follows: under the traditional (mineral) fertilizer system (background 1) - N<sub>60</sub>P<sub>60</sub>K<sub>60</sub>; for the new (organo-mineral) fertilizer system (background 2) - soybean straw + N<sub>10</sub> /t of straw + N<sub>30</sub>P<sub>30</sub>K<sub>30</sub>). The research was conducted according to generally accepted methods.

**Results.** It was found that the highest yield of spring barley (4.52 t/ha) against the background of traditional (mineral) fertilizers was provided by the shelf (control) system of basic tillage. Against the background of organo-mineral fertilizers, the highest yield of spring barley (5.12 t/ha) was obtained under the shelf (control) system. In non-shelf systems there was a decrease in yield from the shelf by 6-17 % with the lowest value for

flat and the highest - for disk. Against the background of organo-mineral fertilizer, compared to mineral, for all systems there was an increase in the yield of spring barley by 12-39 %.

**Conclusions.** Based on the indicators of yield and economic efficiency, the shelf system of basic tillage to a depth of 20-22 cm under spring barley on the background of straw fertilizer predecessor with nitrogen  $N_{10}$ /t of straw and mineral fertilizer  $N_{30}P_{30}K_{30}$  can be considered the most favorable, adapted to the culture of the situation present and weather and climatic conditions in recent years.

**Key words:** grain culture, fertilizers, yield, efficiency.

**Koval G.V., Yeshenko V.E. The prevalence of the main diseases of crops of 5-field crop rotation at different intensities of the main tillage**

**Purpose** (problem statement). Substantiation of the possibility of replacing in the system of the main autumn tillage of plowing by flat-cut loosening at different depths, taking into account the prevalence of pathogens of the main diseases on crops.

**Methods.** The studies were carried out in a stationary experiment with a 5-field crop rotation with the following alternation of spring crops: soybeans – rapeseed – wheat – oil flax – barley. The most common diseases were counted according to generally accepted methods.

**Results.** The main source of the prevalence of diseases in crops cultivated in the crop rotation was affected by diseases of plant residues and soil as a medium where these residues can be found. As a consequence of replacing moldboard plowing with non-moldboard loosening, the phytosanitary state of cereal crops was noticeably deteriorated due to a significant increase in the infestation of plants by helminthosporium root rot. With the deepening of both methods of basic soil cultivation, crops of spring wheat and barley were healed from root rot, and with a decrease in the depth of plowing and flat-cut loosening, the phytosanitary state of crops deteriorated. The spread on soybean and rapeseed crops of such a leading disease of these crops as white rot is closely related to the minimization of the main tillage. The same regularity also applied to the prevalence of various types of fusarium on oil flax sowing.

**Conclusions.** Deep incorporation of plant residues into the soil during moldboard plowing will help to improve the health of the 5-field crop rotation from diseases, and the phytosanitary state of the crops will be strained by replacing medium-depth shallow treatments, although the deepening of treatments was not always accompanied by a significant improvement of the crops.

**Key words:** plowing, flat-cutting loosening, tillage depths, soybeans, rapeseed, wheat, spring barley, oil flax, leading diseases.

**Kovalov M.M. The efficiency of growing arugula in hydroponic film greenhouses**

The article experimentally investigates and substantiates the peculiarities of the formation of the arugula harvest of domestic and foreign varieties in the conditions of the film geo-dome greenhouse of the Northern Steppe of Ukraine. The economic efficiency of the proposed methods and elements of cucumber cultivation technology with the use of dry hydroponics (Dry Hydroponics modules) in film dome greenhouses

is calculated. A study was conducted to increase the yield of arugula varieties of domestic and foreign selection.

**Purpose.** The aim of the article is to compare the cultivation of dry hydroponics and soil culture.

**Results.** The technology of growing arugula in the conditions of protected soil in the winter crop rotation of the IV light zone is estimated. The expediency of growing the studied variety of foreign selection in the cultivation method by dry hydroponics has been proved.

As a result of the analysis of experimental data on the processes of growth and development of plants of the studied varieties of arugula of domestic and Dutch selection, the highest rates of dry matter accumulation were possessed by the variety Znahar. The dry matter content of this variety was 3.9-5.3% higher in hydroponic cultivation and 2.7 4.1% higher in soil cultivation than in Lybid, Koltivata and Gracia cultivars.

In the conditions of hydroponics acceleration of terms of approach of technical maturity of culture was noted. Harvesting took place at 44,3-46,0 days from the emergence of seedlings in hydroponics, at the same time in soil culture, it took place at 5,3-5,5 days later. The timing of mass flowering, depending on the method of cultivation, had a similar trend and was: in hydroponic cultivation for sorots: Witch doctor – 56,0 days, Lybid – 56,0 days, Koltivata – 55,3 days, Grace-54,8 days; at soil cultivation for grades: the Healer – 61,0 days, Lybid – 60,3 days, Koltivata – 59,5 days, Grace – 56,8 days.

**Conclusions.** Accounting for the yield of arugula varieties showed their high productivity. The level of yield was significantly influenced by the method of culture. The most productive was the variety of arugula of the Dutch selection Koltivata. Its yield in hydroponics and soil culture was 0,6-3,5 % and 0,9-4,6 %, respectively, more than other varieties. Among domestic varieties of arugula, the most productive was the Lybid variety when grown on hydroponics – 1,650 kg / m<sup>2</sup>, and on soil culture the Znahar variety – 1,476 kg / m<sup>2</sup>.

**Key words:** Dry Hydroponics modules, Eruca sativa, geocouple film greenhouse, soil culture, yield.

**Marchenko K.Yu. Chlorophyll content and net productivity of photosynthesis of naked oats under the action of biological preparations**

The article highlights the results of the research to study the action of the microbial preparation Melanoriz (1.0, 1.25, 1.5 l / t) for different methods of application of plant growth regulator Agrolight (seed treatment before sowing – 0.26 l / t, spraying crops - 1.0 l / ha) for the formation of the content of chlorophyll a and b and the net productivity of photosynthesis of the leaf apparatus of naked oats.

The research was performed in the field and laboratory conditions of the Department of Biology of Uman National University of Horticulture during 2019–2021. Field experiments were established by a systematic method and conducted three times.

The content of the sum of chlorophylls a and b in the leaves of naked oats was determined by the method described by Z.M. Grytsaienko. The net productivity of photosynthesis (CPF) of crops was calculated according to the method of O.O. Nychporovych.

Statistical data processing was performed in Microsoft Office Excel 2007 by the methods of dispersion and correlation analysis according to Dospekhov.

On the average for three years of researches the most active accumulation of chlorophylls occurred in variants at complex application of preparations Melanoriz in norms 1,0; 1.25; 1.5 l / t + Agrolight 0.26 l / t + Agrolight 1.0 l / ha, where the excess content of the sum of chlorophylls a and b relative to the control was 6; 6 and 7%. The highest level of photosynthetic productivity of crops was formed in the variants Melanoriz 1.5 l / ha + Agrolight 0.26 l / t + Agrolight 1.0 l / ha and was 4.85 g / m<sup>2</sup> per day at 4.22 g / m<sup>2</sup> per day in control.

The combined use of different norms of the microbial preparation Melanoriz with the growth regulator of Agrolight has a positive effect on the formation of the sum of chlorophylls a and b and the net productivity of naked oats. In particular, on average for 2019–2021 studies, these indicators increased compared to the control variant by 6–17% in terms of chlorophyll content and by 9–15% - net productivity of photosynthesis.

**Key words:** chlorophyll, pure photosynthesis productivity, naked oats, microbial preparation, plant growth regulator.

#### **Maliarchuk M.P., Kaznovskiy O.V., Influence of different methods of basic tillage on agrophysical indicators and soybean seed yield**

The aim of the research is to establish the influence of different methods of basic tillage and doses of nitrogen fertilizers on the agrophysical properties of the nutritional regime and yield of soybean seeds. **Methods.** The research was conducted during 2020–2021 in the stationary field experiment of the Askaniiska State Agricultural Research Station of the Institute of Irrigated Agriculture of the National Academy of Agrarian Sciences of Ukraine in the area of the Kakhovka irrigation system laid in 2008 in a four-field row crop rotation. The predecessor of soybeans was winter wheat with post-harvest sowing of white mustard on green manure. The efficiency of the main tillage was determined against the background of different doses of nitrogen fertilizers: control – without fertilizers; N30; N60; N90. The results of yield accounting show that the use of plowing to a depth of 28–30 cm in the system of differentiated tillage provided the highest level of yield on average in 2020–2021 for doses of nitrogen fertilizer N60 at 3.54 t/ha. Replacement of plowing with chisel loosening at the same depth in the system of multi-depth tillage led to a decrease in yield by 0.35 t/ha, or 9.9%, and for disc tillage by 12–14 cm in the system of tillage single-depth shallow and zero tillage the lowest yield level was obtained, which was 2.73 and 2.93 t/ha, respectively, or was lower than in the control by 22.9 and 17.2%. The influence of different doses of nitrogen fertilizers on the yield level was also established. Thus, for the N60 dose the highest level of yield was obtained for the N30 dose in the variant without fertilizer application, the yield decreased by 6.5 and 5.9%, respectively. The most significant decrease in yield at 21.6% was observed for doses of nitrogen fertilizer up to N90. **Conclusions.** As a result of research conducted on the Kakhovka irrigation system, it was found that in short-rotation row crop rotations with post-harvest sowing of white mustard on green manure after winter wheat and plowing barley to a depth of 28–30 cm in the system of differentiated tillage, realization of potential productivity opportunities of Diona soybean variety.

**Key words:** nitrogen fertilizers, nutrient regime, zero cultivation, green manure.

#### **Moldovan Zh.A., Moldovan V.G. Influence of Mineral Nutrition on the formation of the leaf surface area by corn plants in the conditions of the Western Forest-Steppe**

**Purpose** is to study the effect of pre-sowing seed treatment and foliar top dressing on the formation of leaf surface area by hybrids of corn of precocious groups.

**Methods.** Experimental work included conducting field studies using Field, Laboratory, morphological, physical, comparative calculation methods according to the corresponding methods.

**Results.** It was found that in the conditions of the Western Forest-Steppe, the indicators of the leaf surface area of maize plants changed significantly depending on the phase of their development, pre-sowing seed treatment, foliar top dressing and hybrid composition. In particular, in the 5–6-leaf phase, the leaf surface area of the early – maturing hybrid DN Meotida was 2.72–3.45 thousand m<sup>2</sup>/ha, in the medium-early hybrid DB Khotin – 3.00–3.79 thousand m<sup>2</sup>/ha, depending on the option of pre-sowing seed treatment and foliar top dressing. Both studied maize hybrids formed the largest leaf surface area during the panicle flowering phase – 31.83–40.37 thousand m<sup>2</sup>/ha – an early maturing hybrid of Meotida days and 35.06–44.40 thousand m<sup>2</sup>/ha – a medium-early hybrid of DB Khotin. The growth of leaf surface area indicators, respectively, was 10.1–26.7% and 9.7–26.9% compared to the control. The Leaf index in the phase of maximum indicators of the leaf surface area ranged from 3.18 to 4.04 for the early – maturing hybrid of the Meotida DN, and from 3.51 to 4.44 for the mid-early hybrid of the Khotin DB, with an optimal value for corn per grain of 3–4.

**Findings.** The most effective option among the subjects was the one where pre-sowing seed treatment with a complex of preparations (Vympel-K + seed Oracle + zinc Oracle) was provided, followed by treatment of corn crops in the 3–5-leaf phase (Vympel-2 + Oracle phosphorus) and in the phase of 7–9 leaves (Vympel-2 + Oracle zinc + Oracle magnesium), which provided an increase in the leaf surface area in the early-maturing hybrid DN Meotida by 26.7% and in the mid-early hybrid DB Khotin by 26.9%.

**Key words:** hybrid, growth stimulator, microfertilizers, nutrition, development phase, leaf surface.

#### **Morozov O.V., Morozov V.V., Kozlenko Ye.V. Model of formation of water quality of Ingulets irrigation system in 2021**

**Purpose** is to identify patterns and obtain models of formation of mineralization and hydrochemical composition of irrigation water of the Ingulets main canal for 2021.

**Methods:** Field experiment, laboratory analyzes of water by standard methods, regression and correlation analyzes, system approach and system analysis, generalization of data, comparison.

**Results.** In order to identify the features and patterns of formation of the hydrochemical composition of irrigation water of the Ingulets main canal in 2021, correlation and regression analyzes of data were performed. Correlation-regression analysis showed that there is a strong functional relationship between irrigation water mineralization and chlorine ions ( $r = 0,99$ ), and sulfate ions ( $r = 0,99$ ); weak – between the mineralization of irrigation water and bicarbonate ions ( $r = 0,47$ ). To prevent the excess of chlorine ions 350 mg-eq/dm<sup>3</sup> and sulfate ions 500 mg eq/

dm<sup>3</sup> the mineralization of irrigation water should not exceed 1500 mg/dm<sup>3</sup>. Correlation-regression analysis revealed a strong functional relationship between irrigation water mineralization and calcium ions ( $r = 0,92$ ) and magnesium ions ( $r = 99$ ); weak – between the mineralization of irrigation water and sodium and potassium ions ( $r = 0,02$ ). The decrease in the content of chlorides in the irrigation water in August–September is explained by the fact that in the second half of August, due to favorable conditions along the Ingulets riverbed, the Dnieper water was drawn to the mouth of the GNS “anti-river”. But this situation does not happen every year, it is a special case. At the same time, for the formation of more or less satisfactory water quality with the use of “anti-river” technology requires constant round-the-clock work of at least four GNS units, but this will not provide a constant stable satisfactory water quality.

**Conclusions.** Models of formation of mineralization and hydrochemical composition of irrigation water of Ingulets main canal for 2021, which were obtained by applying regression and correlation analyzes, showed that as the mineralization of irrigation water increases, the content of chlorine, magnesium, calcium and sulfate ions will increase proportionally. Hydrocarbonate ions and sodium and potassium ions play a secondary role in the formation of the hydrochemical composition of irrigation water of the Ingulets main canal. A strong functional relationship between the chloride content in the surface waters of the Ingulets River and water consumption (correlation coefficient ( $r$ ) 0,85, determination coefficient ( $R^2$ ) 0,728) has been established. Peculiarities and regularities of chloride content formation in the surface waters of the Ingulets River depending on water consumption have been revealed. As water consumption increases from Karachunovsky reservoir the content of chlorine ions decreases proportionally. To prevent the excess of chlorine ions more than 350 mg-eq / dm<sup>3</sup> flow rates of water discharges from Karachunovsky reservoir must be not less than 10,0 m<sup>3</sup>/s.

**Key words:** irrigation, water quality indicators, correlation and regression analyzes, anionic and cationic composition.

**Pavlichenko K.V., Grabovskyi M.B. Yields of green and dry mass of maize hybrids and biogas output depending of the use of macro and microfertilizers**

**The purpose** is the determination of the influence of macro and microfertilizers on the yield of green and dry mass of maize hybrids and biogas output.

**Methods.** Experimental field research was conducted in 2019–2021 according to appropriate methods with subsequent statistical data processing. Agricultural techniques for growing corn for silage were generally accepted for the conditions of the Right-Bank Forest-Steppe of Ukraine, except for the factors studied. Biogas output was obtained by calculation method.

**Results.** It was found that the most intensive increase in green and dry mass of corn hybrids occurred before the phase of milk-wax ripeness of grain, followed by a decrease of 5.2–68% in the phase of wax ripeness. The use of macrofertilizers provides the formation of high yields of green and dry mass in the phase of milk-wax ripeness of grain in maize hybrids at the level of 40.9–48.9 and 14,7–17.7 t/ha.

Seed treatment of YaraVita Teprosyn NP + Zn (5 l/t) + spraying of plant corn of the phase of 3–5 leaves of YaraVita Maize Boost (4 l/ha) allows to obtain an increase in yield of green and dry mass higher by 1.2–3.8% and when processing YaraTera Tenso Cocktail seeds (0.15 kg/t) + spraying plant corn in the phase of 3–5 leaves of YaraVita Kombiphos (3 l/ha) by 1.5–4.2% compared to the variants without their use. There is no significant difference between 2 and 3 variants with the use of microfertilizers. When N<sub>90</sub>P<sub>60</sub>K<sub>60</sub> and N<sub>120</sub>P<sub>90</sub>K<sub>90</sub> were introduced, the biogas output was higher by 15.2–22.4% and 21.7–30.9% compared to the control. When using microfertilizers the biogas yield was higher by 1.8–3.6%, compared to variants without their use.

**Conclusions.** Maximum yields of green and dry mass and biogas output were obtained in the phase of milk-wax ripeness of grain in the Carifols hybrid against the background of N<sub>120</sub>P<sub>90</sub>K<sub>90</sub> application and processing YaraTera Tenso Cocktail seeds (0.15 kg/t) + spraying plant corn in the phase of 3–5 leaves of YaraVita Kombiphos (3 l/ha) – 48.9, 17.7 t/ha and 15.6 thousand m<sup>3</sup>/ha.

**Key words:** fertilizers, productivity, bioenergy, hybrid, seeds, spraying.

**Shvets O.M. Sustainable future in the next decade, based on soil science**

Soils are home to more than 25% of the Earth's total biodiversity and support life on land and in water, circulation and nutrient retention, food production, pollution elimination, and climate regulation.

**The purpose** of the article is to review and analyze a sustainable future in the next decade based on Soil Science.

**Methods.** The research is based on systematic and comparative analysis, dialectical method, as well as methods of classification and generalization.

**Results.** The accumulation of evidence suggests that several sustainable development goals can be met simultaneously when soil biota is placed at the center of land management assessments; this is due to the fact that the activities and interactions of soil organisms are closely linked to the numerous processes that ecosystems and society rely on. Since soil biodiversity is at the center of many globally significant sustainable development programs, it is possible to achieve the Sustainable Development Goals more effectively and comprehensively. The paper examines scenarios in which soil biota can clearly support Global Sustainable Development Goals, global changes and pressures that threaten soil biodiversity, as well as actions to preserve soil biodiversity and achieve sustainable development goals. This synthesis shows how the latest empirical evidence from soil biology research can shape tangible actions around the world for a sustainable future.

**Conclusion.** Soil biodiversity is at the heart of natural solutions for climate, biodiversity, and humanity, including protecting natural areas, restoring degraded ecosystems, applying sustainable farming practices, and adapting urban areas to nature and people. More research is being proposed to determine the relationship between soil biodiversity experiences and real solutions for a sustainable future, and this needs to be done now both to protect soil biodiversity and to promote sustainable development programs.

**Key words:** underground world, diversity, microbes, soil, soil biodiversity, land use, climate change.

**Kosenko N.P., Bondarenko K.O. The productivity and quality of new hybrids of asparagus under drip irrigation on south of Ukraine**

**Purpose.** Development of the basic elements of the technology of cultivation of new asparagus hybrids under drip irrigation on south of Ukraine is the purpose of research. **Methods.** We used general scientific methods: field, laboratory, measurement and calculation, comparative, mathematical-statistical and system analysis. **Results.** The research showed that 91,4-96,6% of plants survived winter conditions well after autumn planting of one-row seedlings. The use of black polystyrene mulch for mulching rows in the spring allows the harvest to begin 5-7 days earlier than without mulching. Morphological peculiarities and adaptive potential of the tested hybrids have the greatest influence on the formation of plant productivity. In the second year of cultivation the yield of young spears of Grolim hybrid was 0,9 t/ha, Gijnlim – 0,88 t/ha, Baklim – 0,92 t/ha. In the third year of cultivation (the fourth year of culture) yield was respectively 58,9, 38,6 and 70,6% more than the previous year. According to the results of correlation and regression analysis, a connection between the height and the number of generative asparagus shoots at the end of the growing season and the yield of marketable products in the next year was determined. The application of the liquid form of the organic fertilizer (Bioproferm 6 t/ha) increases plant productivity by 15,3% and improves the quality of commercial asparagus spears. The highest amount of dry matter was found in shoots of Bucklim hybrid, the highest amount of total sugars and ascorbic acid was found in Grolim. **Conclusions.** The studied hybrids Grolim, Gijnlim and Baklim have high adaptive potential in the conditions of southern Ukraine. Baklim hybrid was characterized the highest productivity, which is higher than hybrid Gijnlim by 27,6%. Application of Bioproferm preparation and covering plants with black polyethylene mulch resulted in the highest yield and improved quality of early asparagus products.

**Key words:** *Asparagus officinalis* L., hybrid, Bioproferm, mulching, yield, quality of spears.

**Kholod S.M., Illichov Yu.G., Kirian V.M., Muzafarova V.A. Characteristics of spring barley cultivar for productivity of the Southern Forest-Steppe zone of Ukraine**

**Purpose** is to evaluate samples of spring barley of different origin in the conditions of the southern part of the Forest-Steppe zone of Ukraine according to a set of productivity and adaptability indicators for their involvement as a source material in scientific programs.

**Methods.** During 2018–2020 on the base of Ustymivka Experimental Station for Plant Production of the V.Ya. Yuriev Plant Production Institute of NAAS the authors studied, evaluated and described 25 spring barley samples of various eco-geographical origins by productivity traits. In the field and laboratory conditions, indicators of yield and productivity were growing period length, lodging resistance, performance and its structural elements were determined. Calculus of variations analysis of variance were per-formed in STATISTICA 10 and EXCEL.

**Results.** The peculiarities of 25 cultivars of spring barley were described by expression levels of the following quantitative traits: morpho-biological (performance, productive tillering capacity, the number of spikelets and grains in the ear, spike length, 1000 grains weight, weight of ear and grain, plant height) and economic (yield, growing period length, lodging resistance) ones.

Stimulus, Contrast, MIP Visnyk (UKR), Tselinny 30, Ranniy (KAZ), Polygena, Trebon (CZE), Lilly (DEU) (432–495 g<sup>2</sup>) were distinguished by the high level of spring barley grain yield. By weight of 1000 grains varieties Sozonivskiyi (53.5 g), CH 28 (49.4 g) (UKR), Ranniy (45.3 g) (KAZ), Povolzhsky 16 (46.4 g). In the varieties Statok (UKR), CDC Gainer (CAN) increased productivity is formed due to high productive bushiness, longer ear length and number of grains, in varieties Tselinny 30 (KAZ) and Sozonivskiyi (UKR) – due to high productive bushiness. Stable samples were isolated – Aristei, MIP Vdiachnyi, Tiver, CH 28, Statok (UKR), Povolzhsky 16 (RUS), Tselinny 30, Ranniy (KAZ), CDC Garter, CDC Gainer (CAN).

**Conclusions.** Samples of spring barley material were selected according to productivity indicators, which can be recommended as a source material in breeding to increase the productive potential of the culture in the conditions of the Southern Forest-Steppe of Ukraine.

**Key words:** spring barley, cultivar, productivity, yield, growing period length, trait levels.