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CULTIVATION OF EARLY SOYBEAN VARIETIES IN THE CONTEXT OF INTENSIVE AGRICULTURE AND CLIMATE CHANGE

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Relevance. Ways of further increasing the productivity of soybean crops in Ukraine include the selection of the most efficient varieties. Their choice should be based on soil and climatic conditions and available equipment and made concerning agricultural technology and methods of reducing the costs of cultivation. There are five groups of soybeans the ripening of which is guaranteed in Ukraine, according to the duration of their growing season. Early soybean varieties should become a priority in agriculture as they yield regardless of soil moisture, precede winter wheat, ripen evenly and lose excess moisture in a short period which secures high-quality processing of seeds [1].

However, since there are numerous early soybean varieties officially listed in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022, it is important to highlight those ones that have economic, technological and ecological advantages, thus making them the most profitable [2].

Review of recent research and publications. When it comes to the selection of soybean varieties, it is highly important to pay attention to the natural and climatic features of the region they will be grown in. Soybeans belong to heat-loving crops but at the same time they don't do well in moisture-rich soil – its amount should be moderate. The balance can be achieved by selecting drought-resistant soybean varieties and the ones that are at the same time relatively resistant to cold [3].

Yield (over 4 t/ha), protein content (over 45%), resistance to drought, low temperatures and diseases are the most common indicators that are taken into account when it comes to the selection of soybean varieties [4].

Ukraine, like the rest of the world, is currently undergoing global climate change which influences the choice of approaches in soybean cultivation. Therefore, moisture deficit in soil both during the sowing and seed ripening periods should be taken into account. Moisture supply of soil is especially important for sowing as it secures obtaining fully-grown, mature and dense seedlings. Selecting drought-resistant and relatively cold-resistant soybean varieties can solve this problem as they can be sown in the soil with moisture deficit or at earlier times. To protect soybean crops from moisture deficit, in particular, during maturation in late summer and early autumn, it is recommended to grow early soybean varieties – their growing season is 80–110 days [5].

Modern technologies of growing crops are often referred to as intensive agriculture or intensive farming, as they involve widespread mechanization and repeated sowing of the same crop on the same plot of land combined with the extensive use of synthetic fertilizers for the chemical protection of plants from pests. This also applies to modern soybean varieties. Soybean varieties are characterized by a number of adaptability properties. This involves the height of plants and lower beans attachment, resistance to the lodging of the stem and shedding of seeds, etc. [6]

Aim of the study. The aim of the article is to assess early soybean varieties concerning the indicators of their productivity, crop quality, resistance to adverse environmental circumstances and the factors of intensive agriculture based on the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022.

Materials and methods. The research is based on the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022 [7] and Official descriptions of plant varieties and indicators of their economic feasibility provided in the bulletins On the Protection of Plant Variety Rights in the Sort information and reference system [8].

We evaluated early soybean varieties by the following indicators – seed yield, protein and fat content, resistance to the most widespread diseases (downy mildew Peronospora manshurica Sydow, ascochitosis Ascochyta sojaecola Abramov, bacteriosis Pseudomonas savastanoi pv. glycinea, septoriosis Septoria glycines T. Hemmi, fusarium Fusarium Link) and drought. We analysed the duration of their growing season, the height of plants and attachment of lower beans, and their resistance to the lodging of the stem and shedding of seeds.

To assess the resistance of soybean varieties to drought, diseases, lodging and shedding we used a nine-point scale: 9 points are given to plants with the highest level of resistance; plants with good resistance get 7 points; 5 points mean that the resistance of the variety is satisfactory; 3 points mark a plant with unstable resistance; very vulnerable plants receive 1 point [9].

All studies are based on the Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine [10].

We compared the parameters under consideration using mathematical and statistical methods of correlation and regression analysis.

Results and discussion. The growing season of all early soybean varieties comprises 86–105 days. 72 early soybean varieties are included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022, which is 25% of the total number of all soybean maturity groups. Elena has the shortest growing season in the group – 87 days; Deni comes next as it requires 89 days to grow; it is followed by Avanturine and Sprytna the growing of which takes 94 days. Zhakhidka, ES Mentor, Opus, Maxus, ES Favour, Pallada, ES Director, AAC Invest 1605, and Oriana have the longest growing seasons and namely – 105 days. However, the duration of the growing season is a relative value and can vary a lot under the influence of weather and changing climate of a particular area.

Plant height is one of the most important indicators of soybean varieties adaptability. It is more convenient to deal with higher-growing varieties in mechanized harvesting. Moreover, the losses are minimal with higher soybean varieties making them more promising for cultivation. The average plant height of early soybean varieties is 59–155 cm. However, only 6 early soybean varieties have a height of more than 100 cm. Ksenia is the highest one with 155 cm, Znakhidka comes next – 127 cm followed by Bohemians – 110 cm; Adamos is 101 cm, Maxus and Medea are 100 cm each. The lowest varieties which are, therefore, least suitable for mechanized harvesting, include Ambella – 59 cm, Tavern – 60 cm, ES Governor and Adessa – 61 cm each, Amethyst, ES Gladiator, Perlyna, Pysanka, and Diamond are 65 cm each (Table 1).

We found no correlation between the height of plants of early soybean varieties and the duration of their growing season which means that it does not affect the height of plants. However, when we studied some varieties, we established dependencies between the factors under consideration. In particular, such varieties as Znakhidka,

Table 1

The adaptability of Early Soybean Varieties

Variety	Growing season, days	Plant height, cm	Height of lower beans attachment, cm	Resistance to lodging, score	Resistance to shedding, score
1	2	3	4	5	6
Adsoy	98	76	10	7	8
SVH16T00S2	104	70	12	8	9
Pysanka	95	65	10	9	9
Bisser	95	81	13	9	9
Symphony	95	80	14	8	9
Ksenia	97	155	13	8	8
Elena	87	81	13	8	7
Znakhidka	105	127	16	9	8
Angelica	95	80	13	9	9
Almaz	102	65	13	8	8
Merilyn	103	78	11	8	6
Hoverla	95	81	12	9	6
Bohemians	104	110	13	7	6
Vilshanka	102	93	14	8	6
Fortuna	97	90	14	8	8
Anthracite	97	90	13	8	8
Deni	89	80	11	8	8
Alexandrite	102	81	14	8	8
Adamos	97	101	15	8	8
Estafeta	94	80	13	9	9
Sprytna	92	80	11	9	9
Khvylia	104	87	12	8	8
Siverka	96	91	12	8	8
Phoenix	96	81	13	8	9
ES Mentor	105	78	13	9	7
Favourite	93	90	11	8	8
Alligator	102	74	12	9	9
Opus	105	80	11	8	8
Maxus	105	100	16	9	8
Sultana	102	70	16	9	8
Gallek	95	70	13	8	8
Silesia	100	80	14	7	8
Baika	97	85	13	8	8
Triad	95	76	13	9	9

Continuation of Table 1

1	2	3	4	5	6
NS Maximus	95	85	22	8	8
Alinda	97	93	14	9	9
Muse	101	87	14	8	9
Ariadne	95	84	14	7	9
Lisbon	95	75	13	8	8
Pedro	95	75	10	8	8
Avanturine	92	80	13	9	9
ES Senator	100	81	12	8	8
Vidra	95	85	13	8	8
Furio	95	81	14	9	9
Alaska	100	81	13	7	6
Zelda	97	81	13	7	7
ES Gladiator	100	95	13	9	7
Perlyna	97	95	16	8	8
Etudes	102	79	15	8	9
Balaton	101	79	12	8	8
Violetta	102	76	10	8	7
Algiz	103	80	10	8	7
ES Favour	105	66	11	8	8
Maya	103	77	11	7	6
Pallada	105	93	13	8	9
Tavern	99	60	11	7	8
ES Albator	104	69	11	9	8
ES Governor	104	61	10	9	8
ES Director	105	71	12	9	8
GL Melany	104	71	12	9	8
Fortetsia	103	66	14	6	8
Jacqueline	99	69	12	8	8
Adessa	96	61	8	9	8
AAC Invest1605	105	74	14	6	7
Ambella	94	59	8	9	7
Lia	103	79	10	8	7
Raidho	99	76	13	9	8
Medea	95	100	12	8	8
Amethyst	100	65	13	6	6
Phaeton	100	75	13	8	8
Oriana	105	81	16	8	8
Ustya	103	73	11	8	8

Bohemians, and Maxus are high and have a long growing season, whereas Pysanka's growing season is the shortest and at the same time this is the lowest plant in this group.

Plant height is not the only important indicator of soybean varieties adaptability. The height of lower beans attachment is another one because if the attachment of the beans is low and the distance from the soil surface is short, they can remain on the uncut part of the stem, significantly increasing crop losses. Therefore, it is essential to pay attention not only to the plant height which is important for mechanised harvesting but also to choose varieties with a high attachment of lower beans. The average height of lower beans attachment of early soybean varieties is 8–22 cm. NS Maximus has the highest attachment of lower beans to the soil surface, and accordingly, higher adaptability. Its height is 22 cm; Znahidka, Maxus, Sultana, Perlyna, and Oriana come next with 16 cm each. Varieties with the lowest attachment of beans are Adessa – 8 cm, Lia, ES Governor, Violetta, Algiz, Pedro, and Pysanka – 10 cm each.

There is an average direct correlation between the height of plants of early soybean varieties and the height of lower beans attachment – ($r = 0.377$), which shows that the height of attachment depends on the height of plants by 37.7%. The regression equation ($y = 0.0533 x + 8.3506$) between the indicators under consideration and the graphical display of dependence with the coefficient of determination ($R^2 = 0.1422$) shows that when the height of soybean plants increases by 1 cm, the height of lower beans attachment increases by 0.14 cm as can be seen in Fig. 1.

Resistance to lodging is another highly important adaptability indicator of soybean varieties. It is easier to cut upright plants which minimises losses. The average resistance score of early soybean varieties is 6–9. Pysanka,

Bisser, Znakhidka, Angelica, Hoverla, Estafeta, Sprytna, ES Mentor, Alligator, Maxus, Sultana, Triad, Alinda, Aventurine, Furio, ES Gladiator, ES Albator, ES Governor, ES Director, GL Melany, Adessa, Ambella, Raidho are most resistant to lodging with a score of 9 points. AAC Invest 1605 and Amethyst received 6 points for resistance to lodging, while Adsoy, Bohemians, Silesia, Ariadna, Alaska, Zelda, Maya, and Tavern got 7 points for resistance to lodging.

We found no correlation between the height of plants of early soybean varieties and their lodging resistance score. This indicates that the plant height does not affect lodging – the score of high soybeans for resistance to lodging won't necessarily be low.

Resistance of early soybean varieties to shedding plays an important role in late harvesting, as well as in the non-simultaneous ripening of beans. If the resistance of soybean plants to seed shedding is low, the slightest mechanical damage during cutting can lead to crop loss. The average resistance score to seed shedding is 6–9 points. Such varieties as SVH16T00S2, Pysanka, Bisser, Symphony, Angelica, Estafeta, Sprytna, Phoenix, Alligator, Triad, Alinda, Muse, Ariadne, Avanturine, Furio, Etudes, Pallada have the highest resistance to seed shedding with a score of 9 points. Merilyn, Hoverla, Bohemians, Vilshanka, Alaska, Maya, and Amethyst have the lowest score for resistance to seed shedding.

Resistance of soybean varieties to adverse growing conditions is determined by their resistance to drought and diseases. Resistance to drought ensures high productivity if there is a moisture deficit. The most drought-resistant soybean varieties in this group include Pysanka, Bisser, Estafeta, Alinda, Avanturine, Balaton, Algiz, and ES Favour – they received 9 points on our scale. Adamos and Lia have the lowest score for drought resistance – 6 points each; Almaz, Taverna, Fortetsia, and AAC Invest 1605 received 7 points each (Table 2).

The average score of early soybean varieties for resistance to diseases is 7–9 points. Soybean varieties with the lowest level of resistance to diseases include Gallek, Opus, and Vilshanka. The remaining soybean varieties have a disease resistance score of 8–9 points.

The seed yield of early soybean varieties is in the range of 1.80–3.70 t/ha. The most productive varieties include Estafeta and Sprytna – 3.70 t/ha each, Pallada – 3.67 t/ha, Khvylia and Elena – 3.40 t/ha each, ES Director – 3.34 t/ha, ES Favour – 3.30 t/ha, Vilshanka, SVH16T00S2–3.25t/haeach,ESGovernor–3.24t/ha,ESAlbator – 3.22 t/ha. Alaska has the lowest seed yield – 1.80 t/ha, Perlyna and Phoenix are second to last – 1.90 t/ha each.

As for varieties with the highest protein content within this group, these are Opus – 46.0%, AAC Invest – 44.5%, Sultana – 43.5%, and ES Gladiator – 43.0%. Varieties with the lowest protein content are Pedro – 36.0%, Deni – 37.0%, and Ksenia – 37.6%.

We found an average direct correlation (r = 0.351) between the protein content of seeds and the length of the growing season of early soybean varieties. This means that the protein content of seeds depends on the duration of the growing season by 35%. The regression equation (y = 0.1391 x + 26.274) between the parameters under consideration and the graphical representation of the dependence with the coefficient of determination (R2 = 0.1233) suggest that when the duration of the growing season increases by 1 day, the protein content of soybean seeds increases by 0.12% as can be seen in Fig. 2.

The average fat content in the seeds of early soybean varieties is 18.0–25.5%. Varieties with the highest fat content are Almaz – 25.5%, Anthracite – 25.0%, Hoverla and

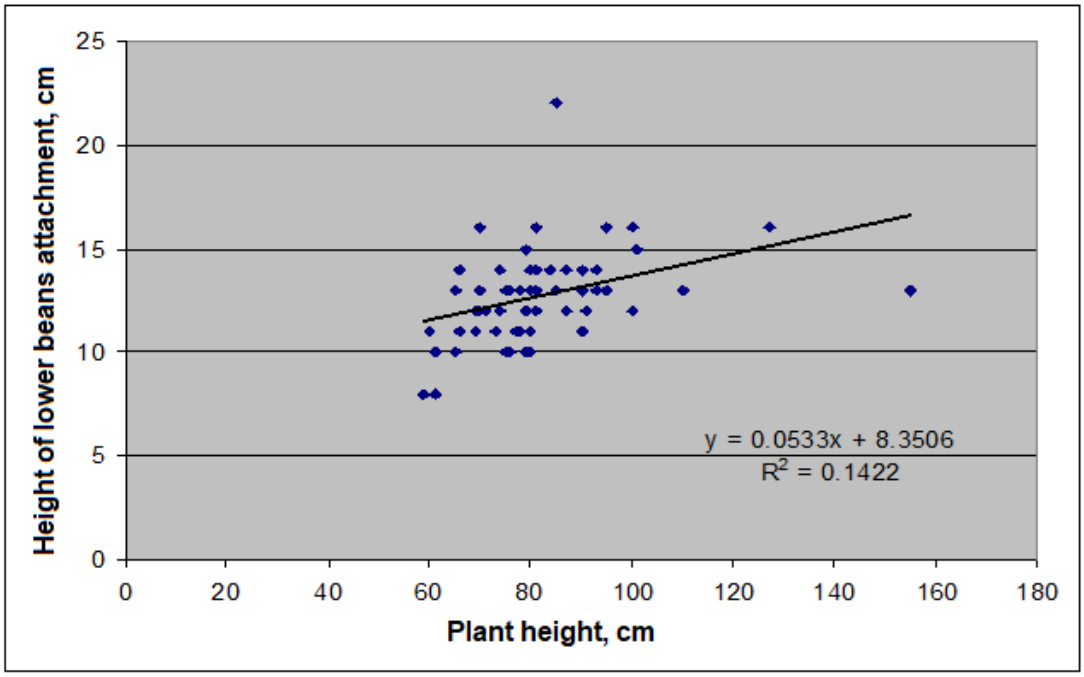

Fig. 1. Coefficient of determination (R2) and regression equation between the height of soybean plants (x) and the height of lower beans attachment (y) in early soybean varieties

Table 2

Sustainability, Productivity and Seed Quality of Early Soybean Varieties

Variety	Resistance to drought, score	Resistance to diseases, score	Seed yield, t/ha	Protein content in seed, %	Fat content in seed, %
1	2	3	4	5	6
Adsoy	8	9	2.71	41.3	22.0
SVH16T00S2	8	8	3.25	41.0	21.4
Pysanka	9	9	2.26	42.1	20.4
Bisser	9	9	2.36	41.8	20.8
Symphony	8	9	2.38	40.3	21.2
Ksenia	8	9	3.00	37.6	20.0
Elena	8	9	3.40	41.5	20.0
Znakhidka	8	8	2.75	39.5	22.5
Angelica	8	8	2.25	37.8	23.4
Almaz	7	9	3.16	38.0	25.5
Merilyn	8	8	2.25	40.0	22.0
Hoverla	8	9	2.41	38.0	23.5
Bohemians	8	9	2.00	40.0	21.4
Vilshanka	8	7	3.25	41.5	21.5
Fortuna	8	9	2.50	39.0	19.5
Anthracite	8	9	3.15	38.0	25.0
Deni	8	8	3.00	37.0	22.5
Alexandrite	8	9	2.80	38.0	20.5
Adamos	6	9	3.20	39.0	23.5
Estafeta	9	8	3.70	39.5	22.5
Sprytna	8	8	3.70	39.5	22.5
Khvylia	8	9	3.40	41.0	21.5
Siverka	8	9	2.00	41.5	20.5
Phoenix	8	9	1.90	39.0	20.0
ES Mentor	8	8	2.00	40.0	20.0
Favourite	8	8	2.00	39.0	21.0
Alligator	8	9	2.35	40.5	21.0
Opus	8	7	2.34	46.0	20.4
Maxus	8	9	2.09	41.0	20.7
Sultana	8	9	2.38	43.5	21.5
Gallek	8	7	2.00	38.0	18.0
Silesia	8	9	2.50	40.0	20.5
Baika	8	8	2.50	39.5	22.0
Triad	8	9	2.28	39.1	21.7
NS Maximus	8	8	2.70	41.0	21.0
Alinda	9	9	2.04	40.5	19.5
Muse	8	9	2.25	41.5	20.5
Ariadne	8	9	2.07	41.1	20.0
Lisbon	8	8	2.27	39.5	20.0
Pedro	8	9	2.19	36.0	22.7
Avanturine	9	9	2.26	38.0	22.0
ES Senator	8	8	2.50	41.0	21.0
Vidra	8	9	3.00	41.5	20.5
Furio	8	9	2.31	40.7	21.6
Alaska	8	9	1.80	41.8	20.0
Zelda	8	9	2.00	39.0	20.0
ES Gladiator	8	8	2.27	43.0	20.5
Perlyna	8	9	1.90	38.0	20.5
Etudes	8	9	2.33	40.6	23.3
Balaton	9	8	2.74	42.0	22.7
Violetta	8	9	2.59	40.5	23.0
Algiz	9	8	2.88	41.5	21.1
ES Favour	9	9	3.30	40.1	22.2

Continuation of Table 2

1	2	3	4	5	6
Maya	8	9	2.62	42.1	22.0
Pallada	8	8	3.67	39.0	20.0
Tavern	7	9	2.71	39.4	20.2
ES Albator	8	9	3.22	41.5	21.6
ES Governor	8	8	3.24	39.9	22.0
ES Director	8	8	3.34	40.6	21.0
GL Melany	8	9	3.07	39.8	22.2
Fortetsia	7	9	2.58	40.1	20.1
Jacqueline	8	8	2.96	39.2	20.5
Adessa	8	8	2.92	39.0	21.9
AAC Invest1605	7	9	2.24	44.5	19.4
Ambella	8	9	2.49	38.5	22.0
Lia	6	8	2.26	40.8	21.0
Raidho	8	8	2.50	38.0	21.1
Medea	8	8	2.26	39.0	23.5
Amethyst	8	8	2.60	38.0	19.0
Phaeton	8	8	2.20	39.5	19.5
Oriana	8	8	2.65	38.0	18.2
Ustya	8	8	2.65	41.0	19.5

Adamos – 23.5% each, Angelica – 23.3%, and Etudes – 23.3%. As for the lowest fat content in the seeds of soybean varieties, it is characteristic of Gallek – 18.0%, Oriana – 18.2%, and Amethyst – 19.0%.

We found no correlational dependencies between other indicators under study. However, there are some within certain varieties. Estafeta and Sprytna, which are the most highly productive early soybean varieties, received the highest score for resistance to lodging and shedding. Such highly productive varieties as Pallada and ES Director had the longest growing season, and Khvyla, ES Albator and Elena got the highest score for resistance to diseases. The lowest-yielding soybean variety, Alaska, has the lowest score for resistance to lodging and seed shedding.

Conclusions and future prospects. The highest-yielding early soybean varieties included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022 are Estafeta and Sprytna – 3.70 t/ha. Pallada is their runner-up with a yield of 3.67 t/ha followed by Khvylia and Elena – 3.40 t/ha. Varieties with the highest protein content

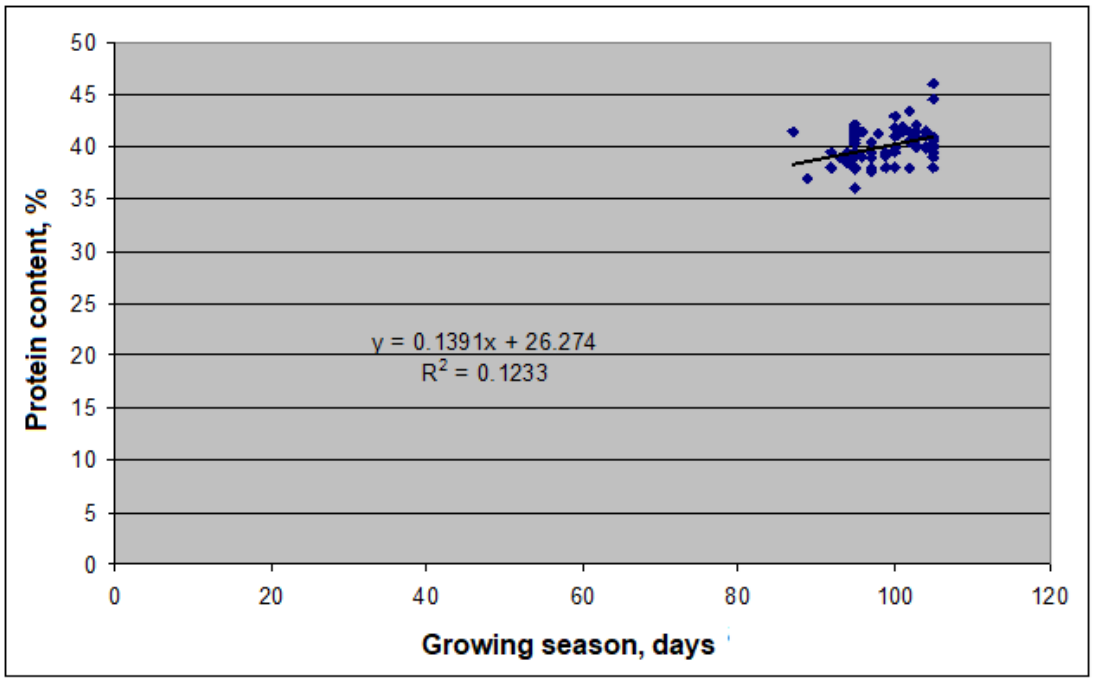

Fig. 2. Coefficient of determination (R2) and regression equation between the duration of the growing season (x) and protein content in seeds (y)

are Opus – 46.0%, AAC Invest – 44.5%, Sultana – 43.5% and ES Gladiator – 43.0%. As for fat, Almaz – 25.5% and Anthracite – 25.0% are leading. The most drought-resistant varieties include Pysanka, Bisser, Estafeta, Alinda, Avanturine, Balaton, Algiz, and ES Favour. The vast majority of soybean varieties are highly resistant to disease, except for Gallek, Opus, and Vilshanka. Varieties with the highest level of resistance to shedding include SVH16T00S2, Pysanka, Bisser, Symphony, Angelica, Estafeta, Sprytna, Phoenix, Alligator, Triad, Alinda, Muse, Ariadna, Avanturine, Furio, Etudes, Pallada. Such varieties as Pysanka, Bisser, Znakhidka, Angelica, Hoverla, Estafeta, Sprytna, ES Mentor, Alligator, Maxus, Sultana, Triad, Alinda, Avanturine, Furio, ES Gladiator, ES Albator, ES Governor, GL Melany, Adessa, Ambella, Raidho have the highest resistance to lodging. Varieties with the maximum lower beans attachment are *NS* Maximus – 22 cm, Znakhidka, Maxus, Sultana, Perlyna, Oriana – 16 cm each. The above-listed varieties have higher productivity, better crop quality and agroecological properties, they are more sustainable and adaptable for harvesting.

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Tkachuk O.P., Didur I.M., Mazur O.V. Cultivation of early soybean varieties in the context of intensive agriculture and climate change

72 early soybean varieties are included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022, which is 25% of the total number of all soybean maturity groups. The growing season of all early soybean varieties comprises 86–105 days. Elena has the shortest growing season in the group – 87 days; Deni comes next as it requires 89 days to grow; it is followed by Avanturine and Sprytna the growing of which takes 94 days. Zhakhidka, ES Mentor, Opus, Maxus, ES Favour, Pallada, ES Director, AAC Invest 1605, and Oriana have the longest growing seasons and namely – 105 days.

The highest-yielding early soybean varieties included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2022 are Estafeta and Sprytna – 3.70 t/ha. Pallada is their runner-up with a yield of 3.67 t/ha followed by Khvylia and Elena – 3.40 t/ha. Varieties with the highest protein content are Opus – 46.0%, AAC Invest – 44.5%, Sultana – 43.5% and ES Gladiator – 43.0%. As for fat, Almaz – 25.5% and Anthracite – 25.0% are leading. The most drought-resistant varieties include Pysanka, Bisser, Estafeta, Alinda, Avanturine, Balaton, Algiz, and ES Favour. The vast majority of soybean varieties are highly resistant to disease, except for Gallek, Opus, and Vilshanka. Varieties with the highest level of resistance to shedding include SVH16T00S2, Pysanka, Bisser, Symphony, Angelica, Estafeta, Sprytna, Phoenix, Alligator, Triad, Alinda, Muse, Ariadna, Avanturine, Furio, Etudes, Pallada. Such varieties as Pysanka, Bisser, Znakhidka, Angelica, Hoverla, Estafeta, Sprytna, ES Mentor, Alligator, Maxus, Sultana, Triad, Alinda, Avanturine, Furio, ES Gladiator, ES Albator, ES Governor, GL Melany, Adessa, Ambella, Raidho have the highest resistance to lodging. Varieties with the maximum lower beans attachment are NS Maximus – 22 cm, Znakhidka, Maxus, Sultana, Perlyna, and Oriana – 16 cm each. The above-listed varieties have higher productivity, better crop quality and agroecological properties, they are more sustainable and adaptable for harvesting.

Key words: soy, varieties, characteristics, intensive agriculture, sustainability.

Ткачук О.П., Дідур І.М., Мазур О.В. Вирощування ранньостиглих сортів сої в умовах інтенсивного сільського господарства та зміни клімату

До Державного реєстру сортів рослин України, придатних для вирощування у 2022 році, внесено 72 ранньостиглих сорти сої, що становить 25% від загальної кількості сортів усіх груп стиглості сої. Вегетаційний період усіх ранньостиглих сортів сої становить 86–105 днів. Найкоротший вегетаційний період у сорту Олена – 87 днів; Дені йде наступним, оскільки для його росту потрібно 89 днів; за ними йдуть Авантюрин і Спритна, вирощування яких займає 94 дні. Найдовші вегетаційні періоди у сортів Знахідка, ЕС Ментор, Опус, Максус, ЕС Фавор, Паллада, ЕС Директор, ААС Інвест 1605, Оріана, а саме по 105 днів.

Найбільш урожайними ранньостиглими сортами сої, занесеними до Державного реєстру сортів рослин України, придатних для вирощування у 2022 році, є Естафета та Спритна – по 3,70 т/га. Друге місце займає сорт Паллада з урожайністю 3,67 т/га, далі йдуть Хвиля та Олена – по 3,40 т/га. Найбільший вміст протеїну мають сорти Опус – 46,0%, ААС Інвест – 44,5%, Султана – 43,5% та ЕС Гладіатор – 43,0%. За жирністю лідирують Алмаз – 25,5% та Антрацит – 25,0%. До найбільш посухостійких належать сорти Писанка, Бісер, Естафета, Алінда, Авантюрин, Балатон, Альгіз, ЕС Фавор. Переважна більшість сортів сої має високу стійкість до хвороб, за винятком сортів Галлек, Опус, Вільшанка. До сортів із найвищим рівнем стійкості до осипання належать СВХ16Т00С2, Писанка, Бісер, Симфонія, Анжеліка, Естафета, Спритна, Фенікс, Алігатор, Тріада, Алінда, Муза, Аріадна, Авантюрин, Фуріо, Етюд, Паллада. Такі сорти, як Писанка, Бісер, Знахідка, Анжеліка, Говерла, Естафета, Спритна, ЕС Ментор, Алігатор, Максус, Султана, Тріада, Алінда, Авантюрін, Фуріо, ЕС Гладіатор, ЕС Альбатор, ЕС Губернатор, ГЛ Мелані, Адеса, Амбелла, Райдо мають найвищу стійкість до вилягання. Сорти з найвищим прикріпленням нижніх бобів: НС Максимус – 22 см, Знахідка, Максус, Султана, Перлина, Оріана – по 16 см. Перелічені сорти мають вищу продуктивність, кращі врожайні та агроекологічні властивості, є більш стійкими та придатними до збирання.

Ключові слова: соя, сорти, характеристика, інтенсивне землеробство, стійкість.