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# ADAPTABILITY AND AGROECOLOGICAL SUSTAINABILITY OF FAST RIPENING SOYBEAN VARIETIES

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***Abstract.*** *The growing season of ultra-fast ripening and fast ripening soybean varieties comprises 83-85 days. 17 ultra-fast and fast ripening soybean varieties were included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2021. The growing season for the majority of them is 85 days. However, it is shorter for Diona – 83 days and Arnica – 84 days.*

*The height of plants of fast ripening soybean varieties differs greatly – from 58 cm to 110 cm. Arrata is the highest variety – 110 cm, Rohiznianka and Rizdviana are 81 cm each, OAC Avatar and Diona – 80 cm each.*

*The height of the lower beans attachment of fast ripening soybean varieties is 10-16 cm from the soil surface. OAC Brooke has the highest attachment of lower beans – 16 cm. It is followed by Rohiznianka – 15 cm, Kobza and OAC Avatar – 14 cm each.*

*Resistance to lodging is an indicator that determines if a plant can be cut completely without its stem bending over. Aventurine, OAC Lakeview, Hieba and Berkana have the highest level of resistance to lodging and received 9 points each; OAC Avatar, Rohiznianka, Holubka got 8.9 points each.*

*All fast ripening soybean varieties have high resistance to seed shedding – 7-9 points. The most drought-resistant varieties include OAC Lakeview, Hieba, Berkana – they got 9 points each. The most disease-resistant soybean varieties are Aventurine, Kobza, Diona, Arrata, Rohiznianka, Arnica – they received 9 points each.*

*The seed yield of fast ripening soybean varieties is 2-3.25 t/ha. Diona has the highest yield – 3.25 t/ha followed by Arrata – 3 t/ha. The least productive varieties are Rohiznianka – 2 t/ha, OAC Brooke – 2.03 t/ha, Kobza – 2.14 t/ha.*

*Soy varieties with the highest protein content in seeds include Berkana – 43.4%, Raiduha – 42.3%, Holubka and Melody – 42.1% each. The seeds of Arrata have the lowest protein content – 38%. It is followed by Legend and Diona – 38.5% each, and then Kobza – 39.1%.*

*As for the fat content, Hieba is leading – 22%, followed by OAC Lakeview – 21.7% and Holubka – 21.6%. The seeds of Krasunia have the lowest fat content – 19.3% followed by Arnica – 20.5% and Melody – 20 .6%.*

***Keywords:*** *soybeans, fast ripening varieties, adaptability, agroecological sustainability, yield, quality*

**Introduction.** Soybeans are a profitable crop. Thereby, its share in the sown areas of most agricultural enterprises in Ukraine is significant. The reason for the increase in soybean acreage in Ukraine is the export demand and the high price of soybeans on the world market, which, in turn, results from the global demand for soybean importers (Shevnikov, 2009).

In 2016, Ukraine was the record holder due to the growth of the gross harvest of soybeans and the increase of soybean exports, leaving other biggest world producers of this crop, the United States and Brazil, behind. This allows us to infer that in the near future Ukraine will be able to export large volumes of soybeans abroad, this way significantly increasing the profitability of their cultivation (Kirilesko et al., 2016).

As the soybean acreage is permanently growing in Ukraine (its crops now take up to 2 million ha), it is feasible to find out which varieties are the most profitable ones and have higher yields along with a shorter growing season, better seed quality and nitrogen-fixing capacity, which are more resistant to drought, diseases, pests, lodging, shedding of seeds (Grigorchuk, 2011). Selecting the best soybean variety will ensure better profit.

**Analysis of recent researches and publications.** Soybeans belong to heat- and moisture-loving crops. Therefore, if the amount of moisture is insufficient or when temperatures are low, it is feasible to choose drought- or cold-resistant varieties. Another important characteristic of soybeans is the time a variety takes to mature (Petrychenko, 2012).

When selecting a soybean variety to grow, it is also important to pay attention to the protein content in its seeds, the height of the plant, the height of lower beans attachment, the thickness of the stem, the growth of plants, their tendency to crack or shed, etc.

The protein content of soybeans is an important indicator for exporting seeds, in particular to the Asian market. It is also of great relevance if soybeans are processed. Soybeans are used as an oilseed crop, so the fat content of their seeds matters as well. The content of protein or fat can significantly affect the sale price (Kaminsky et al., 2005).

The seed yield of soybeans depends directly on the height of the plants. Higher plants have a deep root system that can effectively use moisture – they absorb it from the lower layers of the soil, which is especially relevant in arid climates (Huntyansky, 2008).

The height of lower beans attachment is directly related to the height of plants and is essential for a high-quality harvest. If the attachment is low, it can lead to losses during harvesting. Therefore, if crop producers use combine harvesters, the attachment of lower beans should be at least 12 cm from the soil surface. Making narrower rows during sowing can also increase the

height of lower beans attachment (Grigorchuk, 2011).

The thickness of the stem is another important indicator as it determines the resistance of the variety to lodging. When seeding is too dense, it contributes to lodging, as soybeans are a light-loving crop. Thus, when they are planted densely, varieties will suffer from a lack of light, which will result in a decrease of branching and plant height. This, in turn, will lead to the thinning of the stem and lodging (Nahornyi, 2010).

The tendency of soybean varieties to crack and spill seeds can also cause the partial loss of crop and should be taken into account.

Such parameters of soybean varieties as the height of plants, the height of lower beans attachment, the thickness of the stem, tendency to crack or shed are indicators that determine the adaptability of the crop and affect harvesting conducted with the help of a combine harvester. The resistance of soybeans to drought, pests, and diseases are agroecological characteristics of a variety as they determine the stability of crop yield under adverse environmental conditions (Kaminsky et al., 2005).

If soybeans are sown early, it is advisable to choose varieties with pubescent leaves, since they are more resistant to a decrease in temperature. The intensity of plant growth of different soybean varieties differs and depends on their growing season. Some varieties have a very slow initial growth and cannot compete with weeds, while others have a fast initial growth. There are varieties with a long flowering period; some others bloom only for a week, whereas the duration of the growing season of both can be the same (Kirilesko et al., 2016).

Thousand-seed weight (TSW) depends entirely on the characteristics of a particular variety and affects its yield directly. If the mass of soybean seeds is larger, they can be sown deeper, which will contribute to better germination in dry weather.

The time required by soybeans to ripe is particularly important when they are cultivated as the first crop preceding winter wheat. It is also essential for the timely use of fertilizers and high-quality tillage before crop rotation. This suggests that it is feasible to choose fast ripening varieties (Huntyansky, 2008).

According to the International FAO Classification, all soybean varieties are divided into 13 maturity groups depending on the duration of their growing season. However, only the first five groups are suitable for cultivation in Ukraine. They are ultra-fast ripening varieties with a growing season of up to 85 days; early varieties that require 86-105 days; mid-early varieties – 106-125 days; mid-ripening varieties – 126-135 days; mid-late varieties – 136-145 days (Mykhailov et al., 2011).

When it comes to the selection of a soybean maturity group, it is suggested to take into account the geographical region of Ukraine. Thus, early soybean varieties are recommended for the south

of Ukraine, fast and mid-ripening varieties will do better in the central regions, and fast ripening, early and mid-early varieties – in the north and west of Ukraine (Nahornyi, 2010).

Some other important aspects to take into account when selecting soybean varieties run as follows: fast ripening varieties are used as precursor crops for winter wheat; mid-ripening varieties enable harvesting soybeans with the best level of seed moisture that would require additional drying; late varieties are perfect for farms with large acreages of soybeans where they cannot be harvested in a short time, as their choice helps to prevent seed shedding in case plants are over-ripe. Early soybean varieties reduce risks related to unfavourable growing conditions, whereas varieties with a longer growing season are more productive (Petrychenko, 2012).

The current yield potential of most soybean varieties included in the State Register of Plant Varieties of Ukraine is more than 3.5 t/ha. However, the actual average yield of soybeans in Ukraine is about 2,0 t/ha. Increasing soybean yield by means of the rational use of varieties will further improve the gross harvest yield of soybeans. If agricultural producers will choose soybean varieties listed in the State Register of Plant Varieties of Ukraine on the basis of different soil and climatic conditions, this will enable obtaining both plentiful and stable soybean harvests (Kaminsky et al., 2005).

At the same time, the great variety offered by the State Register of Plant Varieties of Ukraine is sometimes an obstacle, in particular, when it comes to the choice of the most efficient option. It is necessary to select varieties with consistently high yields, and resistance to adverse environmental factors, as unfavourable conditions can lead to lodging. This, in turn, can increase the growing season of soybeans, especially when sowing is late or when temperatures are low.

The lack of efficient predecessors for winter wheat remains a relevant problem for the Right Bank Forest Steppe of Ukraine and the cultivation of fast ripening soybean varieties can solve it. However, the group of fast ripening varieties in the global gene pool of soybeans, including the State Register of Plant Varieties of Ukraine, is the smallest one, compared to other varieties and maturity groups. The majority of varieties in this maturity group are of common origin, which means that they have similar disadvantages, in particular, low yield, a tendency to crack, etc.

**Purpose** is to analyse fast ripening soybean varieties included in the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2021, and the indicators of their adaptability, their agroecological resistance to adverse growing conditions, yield, protein and fat content in seeds, as this will enable us to recommend the most efficient fast ripening varieties.

**Methods.** The evaluation of adaptability, yield, seed quality and agroecological stability of fast ripening soybean varieties was carried out on the basis of the State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2021 (State Register of Plant Varieties of Ukraine Suitable for Cultivation in 2021), 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 (Official Descriptions of Plant Varieties and Indicators of Their Economic Feasibility, 2021).

Soybean varieties are evaluated according to the State Qualification Examination aimed at determining if a variety is suitable for cultivation in Ukraine. This, among other things, implies the assessment of yield, resistance (tolerance) to disease, adverse environmental conditions (drought), resistance to plant lodging and seed shedding, etc (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

The agroecological stability of soybean varieties was assessed on the basis of their drought resistance, as well as resistance to the most widespread diseases: downy mildew (Peronospora manshurica Sydow), ascochitosis (Ascochyta sojaecola Abramov), bacteriosis (Pseudomonas savastonoipv. glycinea), septoriosis (Septoria glycines T. Hemmi) and fusarium (Fusarium Link.).

The growing season is considered to be over, when two-thirds of soybeans on a plant are ripe, firm to the touch, and have the colour and shape that indicates the maturation of a variety. In addition, the lower part of the plant makes a specific sound when shaken (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

Relative resistance of soybean plant varieties to such adverse factors as diseases, drought, plant lodging and seed shedding is evaluated by a nine-point scale – 9 points suggest that the plant has the highest resistance, whereas 1 point indicates the lowest resistance. We used the following gradation of soybean varieties: 9 points – excellent resistance; 7 points – good resistance; 5 points – satisfactory resistance; 3 points – poor resistance; 1 point – very poor resistance (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

The above-listed indicators were established on the basis of the Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine. All experiments were carried out on plots of 10-25 $m^2$ and were repeated four times (Methodology for Assessing Plant Varieties of Cereal,

Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

The height of soybean plants is measured before harvesting in two non-adjacent rows with a measuring stick in 5 equally spaced places on the plot. If plants are lodging, they are raised. The height of the lower beans attachment is determined by measuring the distance from the neck of the plant to the place of the attachment in 25 plants (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

The most widespread soybean diseases were determined by the percentage of affected plants, in accordance with the requirements of the Methodology (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016). Below we listed the signs that suggest that the plant is affected by one of the diseases. In the case of peronosporosis, there is a greyish-purple coating on the lower side of the leaf, and a light yellowish coating on the upper side, which later transforms into brown angular leaf spots, whereas the leaf blade is wavy and swollen. If the plants are affected by ascochitosis, there are brown spots on the leaves and soybeans, ochre in the middle, sometimes concentric with pycnidia (small black dots) on the spots, and brown specks on the seeds. If the plant is affected by bacteriosis, there are small angular light brown spots on the leaves, oily in the middle, which later turn black. If it is septoriosis, there are small angular rusty spots on the leaves that later become black, and then turn yellow and fall. There are also pycnidia on the spots that deeply affect the leaf. Fusarium manifests itself in deep brown spots covered with bright pink pads on cotyledons, which can result in rotting (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016).

Evaluation of the resistance of soybean varieties to drought is based on general guidelines and is performed as a visual assessment of plants during the growing season. The yield of soybean seeds is determined by harvesting them with a combine harvester (Methodology for Assessing Plant Varieties of Cereal, Grain and Legumes and the Evaluation of their Suitability for Cultivation in Ukraine, 2016). The content of protein and fat in soybean seeds was assessed with the help of laboratory tests. We compared the parameters under consideration using mathematical and statistical methods of correlation and regression analysis.

**Results.** The growing season of ultra-fast and fast ripening soybean varieties is 83–85 days. There were 17 ultra-fast and fast ripening soybean varieties in the State Register of Plant Varieties of Ukraine in 2021. The growing season of the majority of these

varieties is 85 days, 83 days for Diona, and 84 days for Arnica.

Plant height is one of the most important indicators of soybean varieties adaptability. After all, higher-growing varieties are better adaptable to mechanized harvesting that can be conducted with minimal losses. The height of plants of fast ripening soybean varieties differs widely from 58 to 110 cm. Arrata is the highest variety – 110 cm, Rohiznianka and Rizdviana are 81 cm each, OAC Avatar and Diona are 80 cm. The lowest varieties are Aventurine – 58 cm, Kobza – 66 cm, OAC Lakeview and Hieba – 68 cm each, Raiduha and Krasunia – 69 cm each (Table 1).

**1. The adaptability of Fast Ripening Soybean Varieties**

| Variety | Growing season, days | Plant height, cm | Height of lower beans attachment, cm | Resistance to lodging, score | Resistance to shedding, score |
|---|---|---|---|---|---|
| Legend | 85 | no data | 10 | 8 | 8 |
| Aventurine | 85 | 58 | 11 | 9 | 8.6 |
| Kobza | 85 | 66 | 14 | 8.7 | 8.8 |
| OAC Avatar | 85 | 80 | 14 | 8.9 | 8.9 |
| Diona | 83 | 80 | 13 | 8 | 8 |
| Arrata | 85 | 110 | 11 | 8 | 7 |
| OAC Lakeview | 85 | 68 | no data | 9 | 9 |
| OAC Brooke | 85 | 77 | 16 | 8.5 | 8.9 |
| Hieba | 85 | 68 | 13 | 9 | 9 |
| Berkana | 85 | 77 | no data | 9 | 9 |
| Rohiznianka | 85 | 81 | 15 | 8.9 | 8.8 |
| Arnica | 84 | 78 | 11 | 7 | 8.8 |
| Holubka | 85 | 72 | 11 | 8.9 | 8.9 |
| Melody | 85 | 73 | 12 | 8.4 | 8.7 |
| Raiduha | 85 | 69 | 13 | 8.1 | 8.8 |
| Krasunia | 85 | 69 | 13 | 8.8 | 8.8 |
| Rizdviana | 85 | 81 | 13 | 8.7 | 9 |

Another important indicator of adaptability along with the height of plants is the height of lower beans attachment. If the attachment of soybeans is too low and close to the soil surface, they can remain on the uncut part of the stem, significantly increasing crop losses. The average height of the lower beans attachment of fast ripening soybean varieties is 10-16 cm. Legend has the lowest attachment – 10 cm, whereas the lower beans of Aventurine, Arrata, Arnica and Holubka are attached at 11 cm from the soil surface. OAC Brooke has the highest lower beans attachment – 16 cm, followed by Rohiznianka – 15 cm, Kobza and OAC Avatar – 14 cm each.

Resistance to lodging implies that the plant is fully cut and harvested, including the whole stem. Aventurine, OAC Lakeview, Hieba and Berkana have the highest resistance to lodging – 9 points each, whereas OAC Avatar,

Rohiznianka and Holubka got 8.9 points each. Arnica is the least resistant variety according to this indicator and received 7 points, while Legend, Diona and Arrata got 8 points each. Anyway, the score is still fairly high.

All fast ripening soybean varieties have high resistance to seed shedding – 7-9 points. OAC Lakeview, Hieba, Berkana and Rizdviana are the most resistant to shedding and got 9 points each. OAC Avatar, OAC Brooke and Holubka also have high resistance to shedding, with a score of 8.9. The least resistant varieties according to this indicator are Arrata – 7 points, Legend and Diona – 8 points each.

The resistance of soybean varieties to adverse growing conditions is determined on the basis of their resistance to drought and diseases. The most drought-resistant varieties are OAC Lakeview, Hieba, and Berkana – 9 points each. The least drought-resistant varieties include Legend – 6 points, Diona – 8 points, Rizdviana, Kobza and OAC Avatar – 8.2 points each (Table 2).

**2. Sustainability, Yield and Seed Quality of Fast Ripening Soybean Varieties**

| Variety | Resistance to drought, score | Resistance to diseases, score | Seed yield, t/ha | Protein content in seed, % | Fat content in seed, % |
|---|---|---|---|---|---|
| Legend | 6 | 8 | 2.30 | 38.5 | 21.1 |
| Aventurine | 8.6 | 9 | 2.26 | 40 | 21.1 |
| Kobza | 8.2 | 9 | 2.14 | 39.1 | 20.7 |
| OAC Avatar | 8.2 | 8.9 | 2.18 | 40.4 | 21.2 |
| Diona | 8 | 9 | 3.25 | 38.5 | 21 |
| Arrata | no data | 9 | 3 | 38 | 21.2 |
| OAC Lakeview | 9 | 8.8 | 2.56 | 41.7 | 21.7 |
| OAC Brooke | 8.5 | 8.8 | 2.03 | 41.7 | 21.3 |
| Hieba | 9 | 8.5 | 2.25 | 40.2 | 22 |
| Berkana | 9 | 8.8 | 2.45 | 43.4 | 20.7 |
| Rohiznianka | 8.6 | 9 | 2 | 41.3 | 21.2 |
| Arnica | 8.7 | 9 | 2.20 | 41 | 20.5 |
| Holubka | 8.5 | 8.8 | 2.33 | 42.1 | 21.6 |
| Melody | 8.4 | 8.8 | 2.19 | 42.1 | 20.6 |
| Raiduha | 8.5 | 8.7 | 2.18 | 42.3 | 21.2 |
| Krasunia | 8.3 | 8.8 | 2.18 | 41.3 | 19.3 |
| Rizdviana | 8.2 | 8.8 | 2.23 | 40.4 | 21.3 |

The most disease-resistant soybean varieties include Aventurine, Kobza, Diona, Arrata, Rohiznianka, and Arnica – they received 9 points each. Soybean varieties that are least resistant to diseases are Legend – 8 points and Hieba – 8.5 points.

The seed yield of fast ripening soybean varieties is 2-3.25 t/ha. Diona has the highest yield – 3.25 t/ha, followed by Arrata – 3 t/ha. The least productive varieties are Rohiznianka – 2 t/ha, OAC Brooke – 2.03 t/ha, and Kobza – 2.14 t/ha.

Soy varieties with the highest protein content in seeds include Berkana – 43.4 %, Raiduha – 42.3 %, Holubka and Melody – 42.1 % each. Varieties with the lowest protein content are Arrata – 38 %, Legend and Diona – 38.5 % each, Kobza – 39.1 %. The seeds of Hieba – 22 %, OAC Lakeview – 21.7% and Holubka – 21.6 % have the highest fat content, whereas the fat content of Krasunia – 19.3 %, Arnica – 20.5 % and Melody – 20 .6 % is the lowest.

The mathematical and statistical analysis helped us to reveal an average negative correlation between the height of plants of fast ripening soybean varieties and their resistance to lodging (r = – 0.387). We also established an average positive correlation between the height of lower beans attachment and resistance to lodging (r = 0.385). There is a strong negative correlation between the height of plants and their resistance to seed shedding (r = – 0.741). This means that lower fast ripening soybean varieties have a higher score of resistance to seed shedding.

The regression equation (y = – 0.0331x + 11.152) and the coefficient of determination ($R^2$ = 0.549) showing the dependence of the resistance score of fast ripening soybean varieties to seed shedding (y) on plant height (x) indicate the following – when the plant height of soybean varieties is reduced by 20 cm, their resistance to seed shedding increases by 0.55 (Fig. 1).

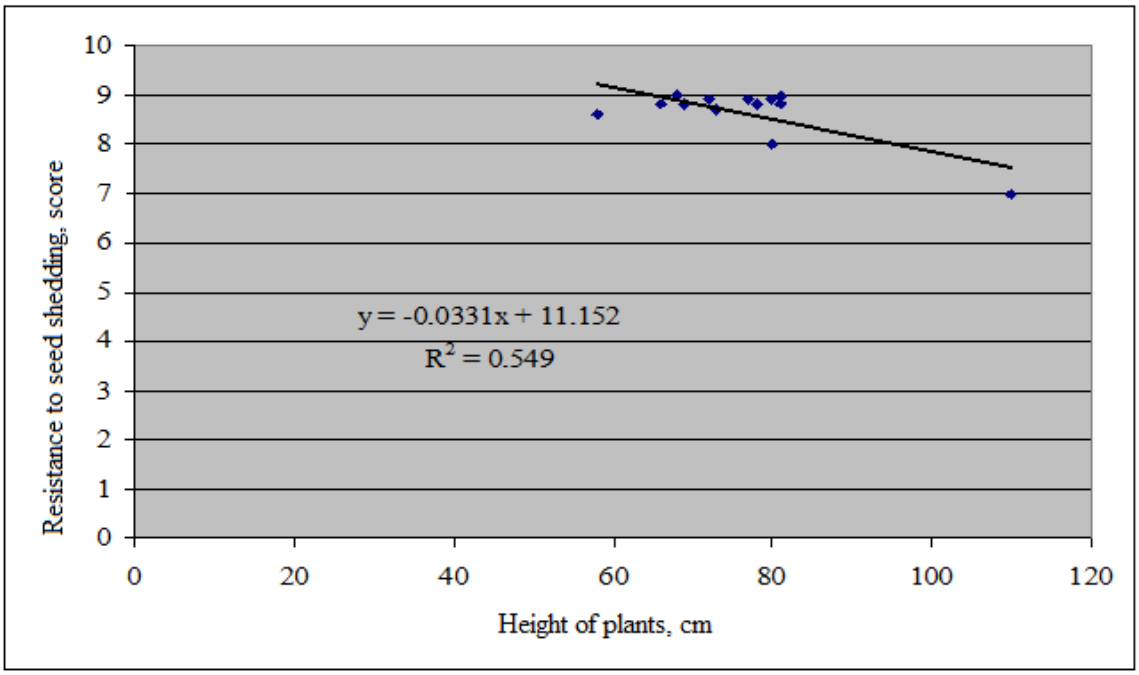


**Fig. 1. Correlational regression dependence, regression equation and coefficient of determination (R2) between plant height (x) and the score of resistance to shedding (y) of fast ripening soybean varieties**

We established an average positive correlation (r = 0.656) between the resistance of fast ripening soybean varieties to drought and diseases. The regression equation (y = 0.2364x + 6.8183) and the coefficient of

determination ($R^2$ = 0.4297) showing the dependence of the resistance to diseases (y) on the drought resistance score (x) indicate the following – when the drought resistance score is increased by one point, resistance to diseases increases by 0.43 (Fig. 2).

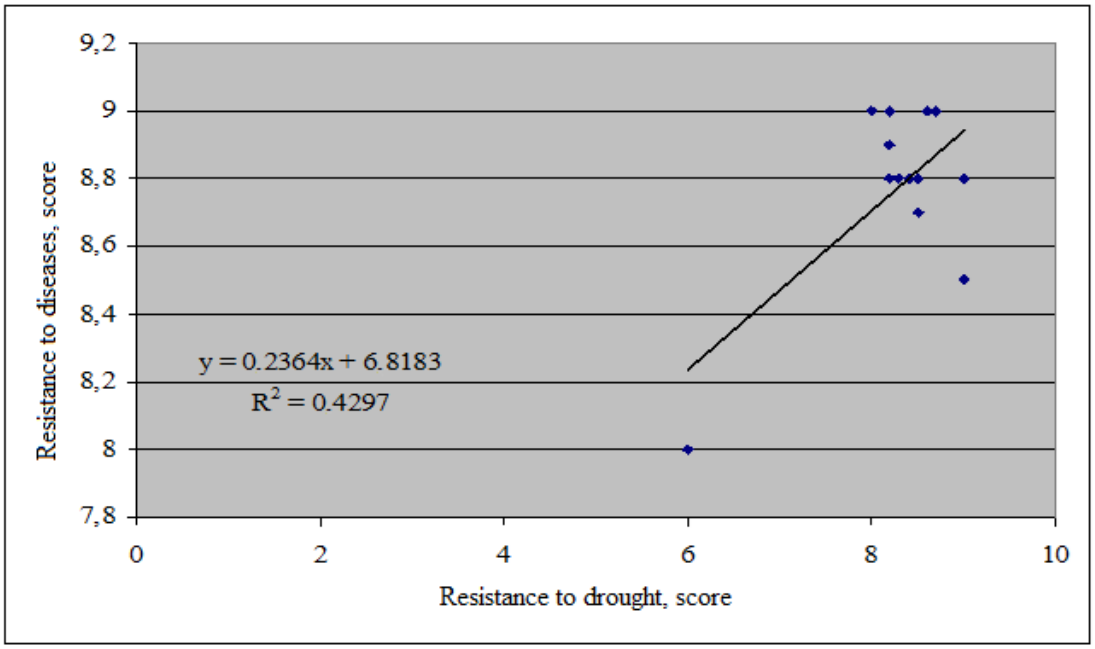


**Fig. 2. Correlational regression dependence, regression equation and coefficient of determination (R2) between drought resistance score (x) and disease resistance score (y) of fast ripening soybean varieties**

We established an average positive correlation (r = 0.620) between the drought resistance score of fast ripening soybean varieties and the protein content in their seeds. The regression equation (y = 1.2402x + 30.512) and the coefficient of determination ($R^2$ = 0.3838) showing the dependence of protein content of fast ripening soybean varieties (y) to their drought resistance score (x) indicates the following – when drought resistance score is increased by one point, the protein content also increases by 1% (Fig. 3).

We established an average negative correlation (r = –0.477) between the seed yield of fast ripening soybean varieties and protein content. The regression equation (y = –2.2106x + 45.872) and the coefficient of determination ($R^2$ = 0.2274) showing the dependence of protein content of fast ripening soybean varieties (y) on the seed yield (x) indicate the following – with the increase in yield by 1 t/ha the protein content in seeds decreases by 1% (Fig. 4).

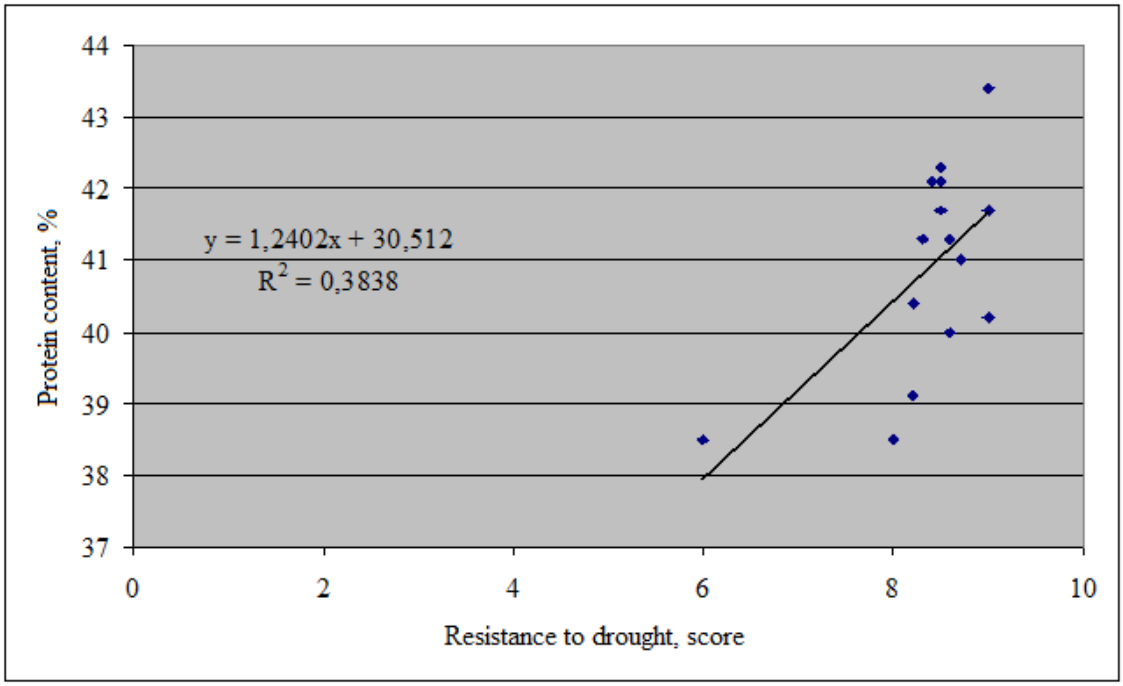


**Fig. 3. Correlational regression dependence, regression equation and coefficient of determination (R2) between drought resistance score (x) and protein content in seeds (y) of fast ripening soybean varieties**

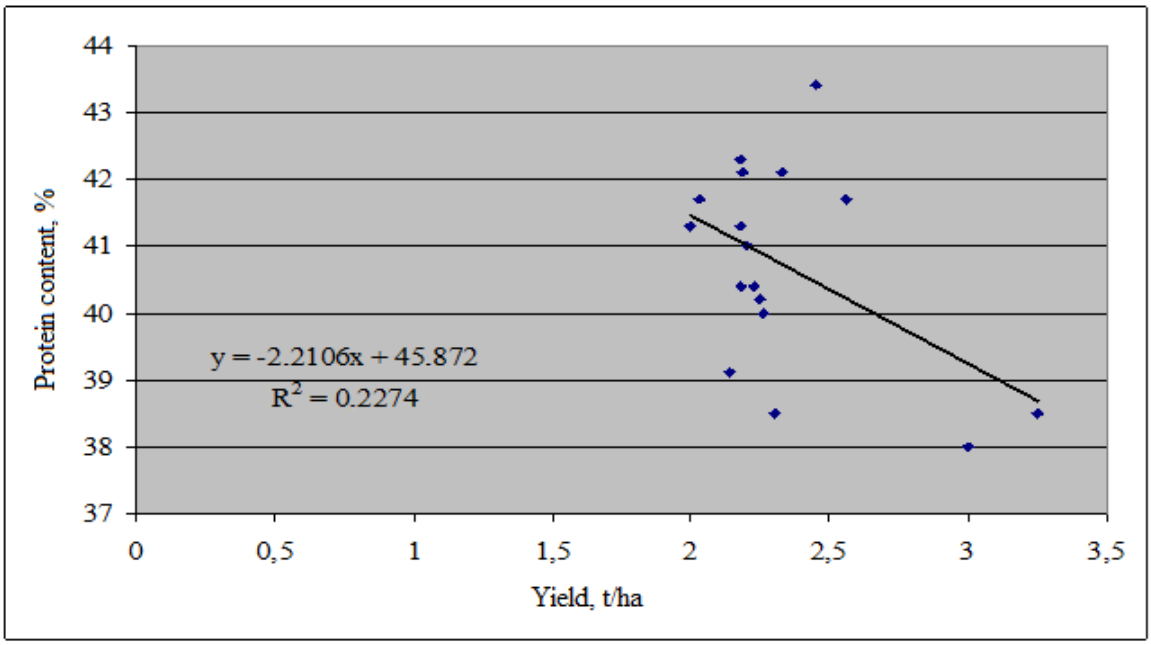


**Fig. 4. Correlational regression dependence, regression equation and coefficient of determination (R2) between yield (x) and protein content in seeds (y) of fast ripening soybean varieties**

We established an average positive correlation (r = 0.528) between the plant height and seed yield of fast ripening soybean varieties. The regression equation (y = 0.0158x + 1.1529) showing the dependence of the yield of fast ripening soybean varieties (y) on plant height (x) indicates the following – when the plant height is increased by 10

cm, seed yield increases by 0.27 t/ha (Fig. 5).

Apart from the dependencies revealed with the help of mathematical and statistical analysis, we established separate combinations of positive and negative factors related to fast ripening soybean varieties. In particular, Arrata and Diona have high seed yields and are at the same time the highest plants with the highest resistance to diseases. However, their seeds have the lowest protein content, and the attachment of their lower beans is the lowest. Arrata also has the lowest resistance to seed shedding. Rohiznianka is the highest plant with the highest attachment of the variety's lower beans on the stem. OAC Avatar and Rohiznianka are the highest varieties and have the highest resistance to lodging. OAC Avatar also has the highest resistance to seed shedding. Rizdviana and OAC Avatar are the highest plants with the lowest drought resistance.

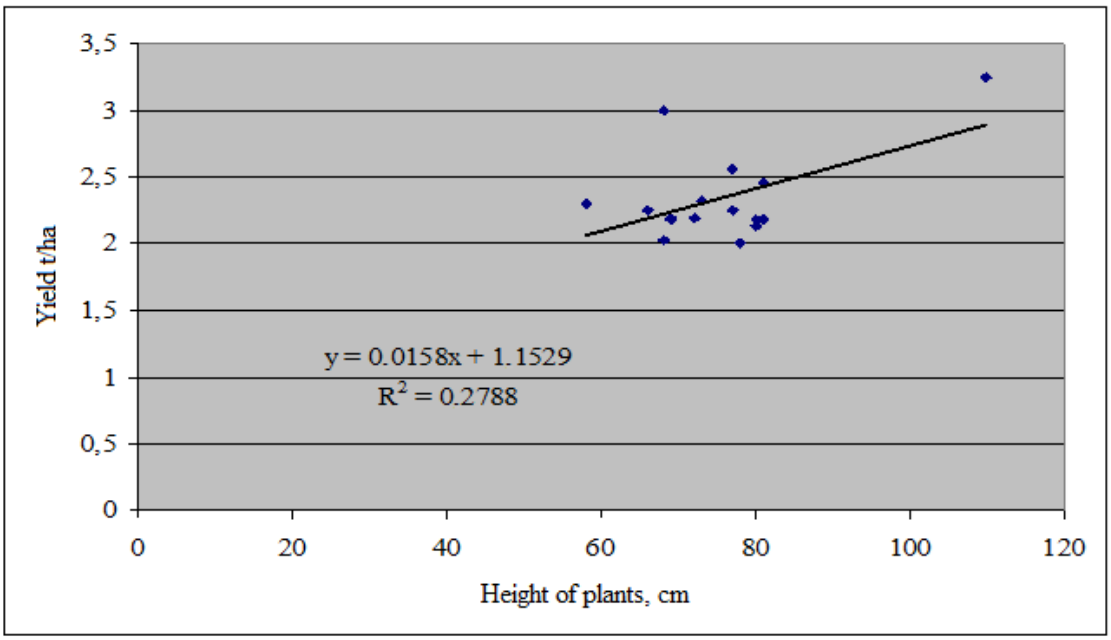


**Fig. 5. Correlational regression dependence, regression equation and coefficient of determination ($R^2$) between the yield (y) and plant height (y) of fast ripening soybean varieties**

Soybean varieties with the lowest seed yield include Rohiznianka and OAC Brooke. At the same time, they have the highest attachment of lower beans. Aventurine is a low variety with a low attachment of lower beans and high resistance to lodging.

**Conclusions.** Diona and Arrata are varieties with the highest seed yield among all ultra-fast and fast ripening soybean varieties included in the State Register of Plant Varieties of Ukraine in 2021. The seeds of Raiduha, Holubka and Melody have the highest protein content. As for fat, Hieba and Holubka

are leading. The most drought-resistant varieties are OAC Lakeview, Hieba and Berkana. Aventurine, Kobza, Diona, Arrata, Rohiznianka, and Arnica have the highest resistance to diseases. OAC Lakeview, Hieba, Berkana and Rizdviana are most resistant to seed shedding. Aventurine, OAC Lakeview, Hieba, and Berkana have the highest resistance to lodging. OAC Brooke and Rohiznianka have the highest attachment of lower beans. The above-listed varieties have higher yield, better crop quality and agroecological properties, they are more sustainable and adaptable for harvesting.

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# АДАПТИВНІСТЬ ТА АГРОЕКОЛОГІЧНА СТІЙКІСТЬ СКОРОСТИГЛИХ СОРТІВ СОЇ

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***Анотація.*** *Вегетаційний період скоростиглих сортів сої становить 83-85 днів. У 2021 році до Державного реєстру сортів рослин України, придатних для вирощування, внесено 17 скоростиглих сортів сої. Вегетаційний період більшості з них становить 85 днів. Проте у Діони він коротший – 83 дні та Арніки – 84 дні. Висота рослин скоростиглих сортів сої різна – від 58 см до 110 см. Найвищий сорт Аррата – 110 см, Рогізнянка і Різдвяна – по 81 см, ОАЦ Аватар і Діона – по 80 см. Висота прикріплення нижніх бобів скоростиглих сортів сої 10-16 см від поверхні ґрунту. ОАЦ Брук має найвище прикріплення нижніх бобів – 16 см. Далі йдуть Рогізнянка – 15 см, Кобза та ОАЦ Аватар – по 14 см. Сорти Авантюрин, ОАЦ Лайквю, Геба і Беркана мають найвищий рівень стійкості до вилягання і отримали по 9 балів; ОАЦ Аватар, Рогізнянка, Голубка отримали по 8,9 бала. Усі скоростиглі сорти сої мають високу стійкість до осипання насіння – 7-9 балів. Серед найбільш посухостійких сортів – ОАЦ Лайквю, Геба, Беркана отримали по 9 балів. Найбільш стійкими до хвороб є сорти сої Авантюрин, Кобза, Діона, Аррата, Рогізнянка, Арніка – вони отримали по 9 балів. Урожайність насіння скоростиглих сортів сої становить 2,00-3,25 т/га. Найбільшу врожайність має Діона – 3,25 т/га, на другому місці – Аррата – 3 т/га. Найменш урожайними є сорти Рогізнянка – 2,00 т/га, ОАЦ Брук – 2,03 т/га, Кобза – 2,14 т/га. Серед сортів сої з найвищим вмістом білка в насінні відзначаються Беркана – 43,4 %, Райдуга – 42,3 %, Голубка та Мелодія – по 42,1 %. Найнижчий вміст білка в насінні має сортАррата – 38 %. Далі йдуть Легенда та Діона – по 38,5 %, Кобза – 39,1 %. За вмістом жиру лідирує сорт Геба – 22 %, далі йдуть ОАЦ Лайквю – 21,7 % і Голубка – 21,6 %. Найнижчий вміст жиру в насінні мають сорти Красуня – 19,3 %, потім йдуть Арніка – 20,5 % і Мелодія – 20,6 %.*

***Ключові слова****: соя, скоростиглі сорти, адаптивність, агроекологічна стійкість, урожайність, якість*