

STANKEVYCH S.V. SCREENING OF BEAN VARIETIES FOR RESISTANCE TO ADVERSE ENVIRONMENTAL FACTORS

POYEDINCEVA A. A. – Graduate student

orcid.org/0000-0001-9600-2921

State Biotechnological University

ZHUKOVA L. V. – PhD of Agricultural Sciences, Associate Professor

orcid.org/0000-0003-1549-8019

State Biotechnological University

STANKEVYCH S. V. – PhD of Agricultural Sciences, Associate Professor

orcid.org/0000-0002-8300-2591

State Biotechnological University

Statement of the problem. When choosing a variety, it is first necessary to pay attention to its zoning zone, since with insufficient ecological plasticity, the variety that was formed in the Steppe zone provided high productivity, but in the Right-Bank Forest-Steppe it cannot guarantee the expected results.

In Ukraine, the most favorable zone for growing beans is the Forest-Steppe. This creates the prerequisites for increasing the sown areas of this crop.

The features of creating environmentally plastic bean varieties are increased adaptation to the effects of unregulated extreme environmental factors: drought, lack of heat and moisture during the growing season, and epiphytity. Also, common bean varieties should be particularly sensitive to regulated anthropogenic environmental factors: fertilization, irrigation, use of chemicals. In addition, critical phases of plant ontogenesis should not coincide with the period of action of adverse factors [1, 2].

In the studies of Mazur V. A. et al. (2021), correlation-regression relationships of the average direct relationship between the potential yield of bean varieties and their disease resistance score ($r = 0,374$), as well as between the potential yield of bean varieties and their drought resistance score ($r = 0,350$), were established [3].

Materials and research methodology. Materials from our own research, state registers of plant varieties suitable for distribution in Ukraine for 2017–2025, and the information and reference system “Varieties” were analyzed and applied.

Results and discussion. The State Register of Plant Varieties Suitable for Distribution in Ukraine for 2025 contains 78 bean varieties, including 24 grain varieties and 54 vegetable varieties (Fig. 1). In percentage terms, 55 % of bean varieties in the register were created in Ukraine. Almost 22 % of the varieties originate from the Netherlands. Varieties from other countries account for less than 10 % of the registered ones. In particular, 6 varieties originate from Poland, 5 varieties from France, 3 varieties each from Switzerland and Germany and 1 from Turkey [4].

It is natural that most of the varieties in the register were created in Ukraine. It is known that domestic varieties have higher agroecological resistance to adverse growing conditions, since they were created in recommended growing zones, while foreign varieties have lower agroecological plasticity.

Regarding the distribution of bean varieties included in the state register of plant varieties suitable for distribution in Ukraine for 2025, by the time of their registration, the majority – 45 varieties or 57,69 % – were included in the register from 2001 to 2020. 29 varieties or 37.18 % were included in the register after 2021 and only 4 varieties (5,13 %) were included before 2000 (Fig. 2).

In addition, we analyzed the bean varieties that were in the register from 2017 to 2025 by the time of entry into the register and their country of origin (Fig. 3).

There are 15 varieties of beans in the register for 2017, of which 14 are from Ukraine and 1 is from the Netherlands. 2 varieties included in the register were registered before 2000, 8 varieties from 2001 to 2010 and 5 varieties after 2010 [4].

The State Register of Plant Varieties Suitable for Distribution in Ukraine for 2018 includes 16 varieties of beans, the country of origin of which is Ukraine. As for the distribution of varieties by the time of their registration, 2 varieties were included in the register before 2000, 8 varieties – from 2001 to 2010 and 6 varieties after 2010 [5].

There are 19 varieties of beans in the register for 2019, of which 18 are from Ukraine and 1 is from the Netherlands. By year of registration, 2 varieties included in the register were included before 2000, 8 varieties were included from 2001 to 2010, and 9 varieties were included after 2010 [6].

The 2020 register, like the 2017 register, includes 15 varieties of beans, 14 of which originate from Ukraine and 1 from the Netherlands. 2 varieties included in the register were registered before 2000, 5 varieties from 2001 to 2010, and 8 varieties after 2010 [7].

There are 21 varieties of beans in the register for 2021, of which 20 are from Ukraine and 1 variety is from the Netherlands. By year of registration, 2 varieties included in the register were included before 2000, 7 varieties were included from 2001 to 2010, and 12 varieties were included after 2010 [8].

There are 20 varieties of beans in the register for 2022, of which 19 varieties are from Ukraine and 1 variety is from the Netherlands. By year of registration, 2 varieties included in the register were included before 2000, 7 varieties were included from 2001 to 2010, and 11 varieties were included after 2010 [9].

There are 70 varieties of beans in the register for 2023, of which 39 varieties are from Ukraine, 18 varieties are from the Netherlands, 6 varieties are from Poland, 1 variety

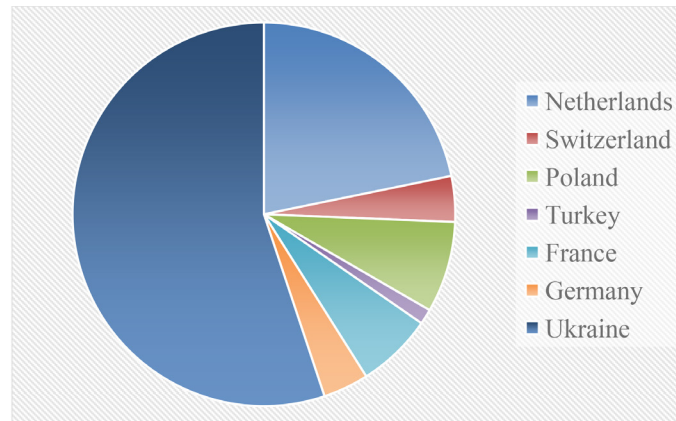


Fig. 1. Countries of origin of bean varieties included in the variety register as of July 15, 2025

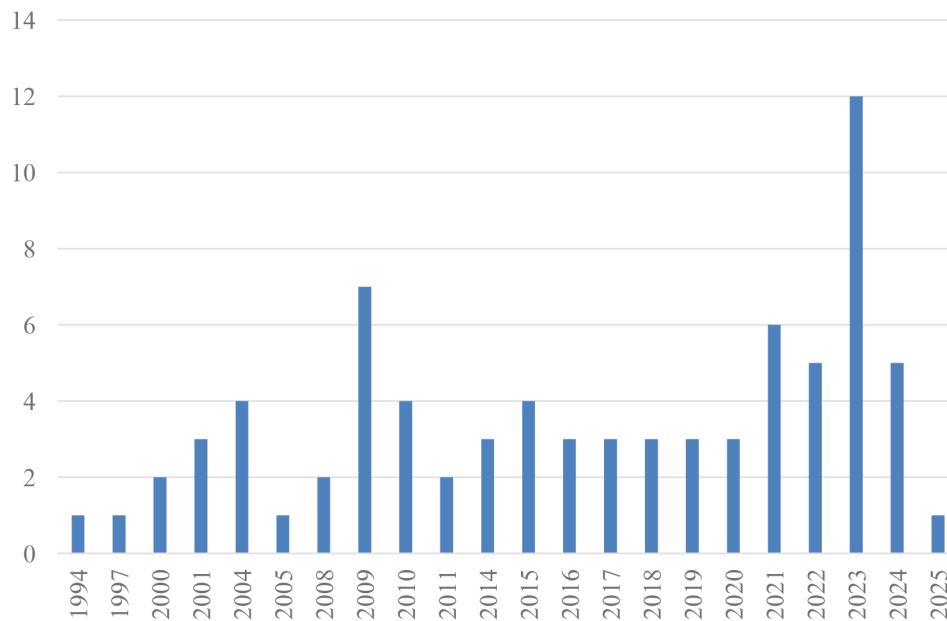


Fig. 2. Distribution of bean varieties registered as of 2025 by year of registration

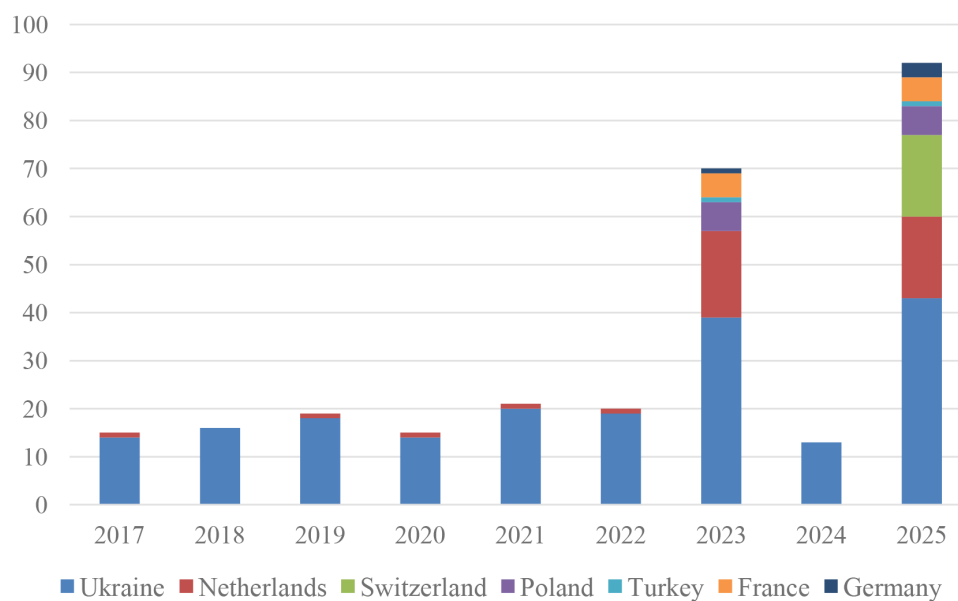


Fig. 3. Distribution of bean varieties by year of registration and country of origin, pcs.

is from Turkey, 5 varieties are from France and 1 variety is from Germany. By year of registration, 4 varieties of beans included in the register were included before 2000, 24 varieties were included from 2001 to 2010, 25 varieties were included from 2010 to 2020 and 17 varieties were included after 2020 [10]. If we consider bean varieties by year of creation, starting from 2019, then 4 varieties were registered in 2019, 3 varieties in 2020, 6 varieties in 2021, 5 varieties in 2022, and 6 varieties in 2023.

In the register for 2024, 13 varieties of beans recommended for cultivation in farms of the Kharkiv region. The country of their creation is Ukraine. By year of registration, 2 varieties were included in the register before 2010, 10 varieties – from 2010 to 2020 and 1 variety – after 2020 [11].

It is also important to remember that every year exclusions made from the State Register of Plant Varieties Suitable for Distribution in Ukraine. Varieties that do not

meet the requirements for a number of indicators, including resistance to diseases, pests, drought, and other adverse factors, removed. In particular, in 2025, 46 bean varieties excluded from the register (Fig. 4). Of these: 24 varieties were created in Ukraine; 10 varieties from the Netherlands; 3 varieties each from Poland, Moldova and the Republic of Serbia; 1 variety each from Turkey, Slovakia and the Republic of Belarus. If we analyze the excluded varieties, more than 52 % come from Ukraine, and 21 % from the Netherlands. The mass share of varieties originating from other countries was less than 10 %.

If we analyze the excluded varieties by year of registration, the largest number of them – 5, was from 2009 (Fig. 5). 4 varieties were registered in 2005. 3 varieties were registered in 1985, 2001 and 2010. 2 varieties were registered in 1989, 1990, 1999, 2002, 2003, 2004, 2011 and 2019. 1 variety was registered in 1959, 1972, 1973, 1981, 1982, 1988, 1992, 1994, 1997, 2006 and 2008.

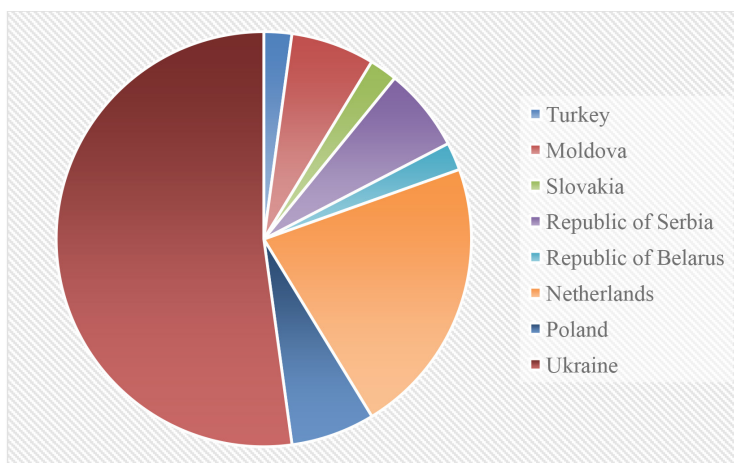


Fig. 4. Countries of origin of bean varieties removed from the register in 2025

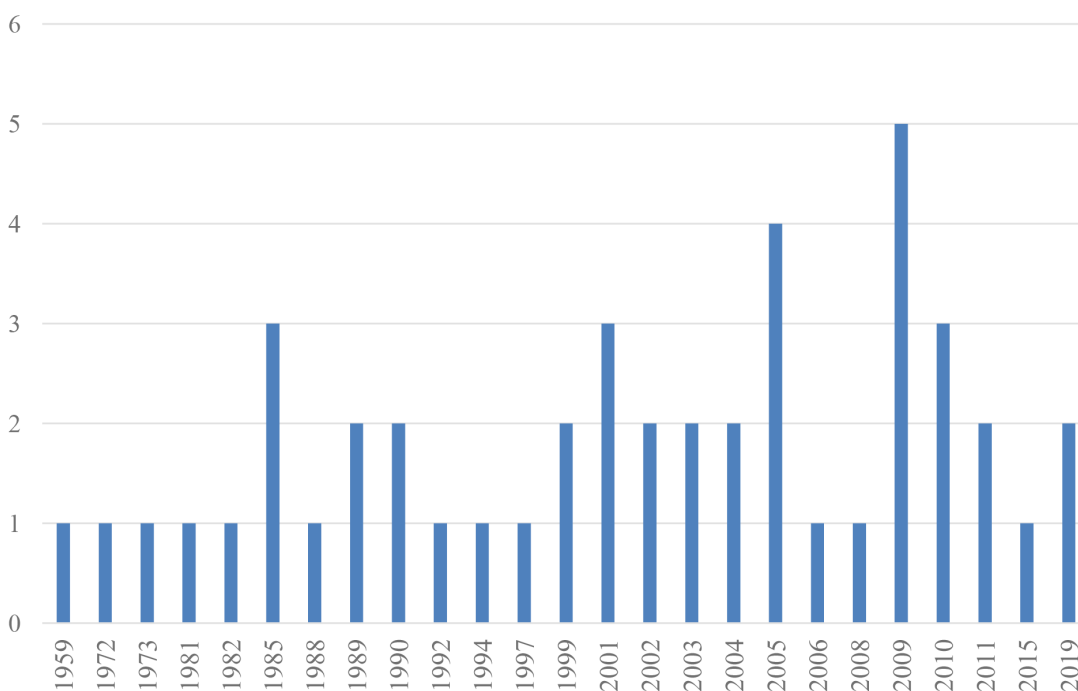


Fig. 5. Distribution of bean varieties removed from the register by year of registration

The majority of excluded varieties – 25 (54 %) – were registered from 2001 to 2010. 18 varieties or 39 % – were included in the register before 2001. The smallest number of excluded varieties – 4, were included in the register after 2010.

We analyzed bean varieties included in the State Register of Plant Varieties Suitable for Distribution in Ukraine for 2025 and their disease resistance scores, as well as seed yield and drought resistance scores (Table 1).

Table 1

Indicators of potential yield and resistance of bean varieties to adverse factors according to the State Register of Plant Varieties Suitable for Distribution in Ukraine for 2025

№	Variety	Yield, t/ha	Drought resistance, score	Disease resistance, score
1	Ariia	2,50	5	8
2	Assol	2,70	7	7
3	Bilosnizhka	2,10	7	7
4	Bukovynka	2,63	7	7
5	Halaktyka	2,45	7	7
6	Horlytsia	2,35	5	7
7	Dokuchaievs`ka	2,27	5	6
8	Elehans	2,70	8	8
9	Zhuravka	3,25	8	7
10	Mavka	2,60	7	7
11	Nadiia	2,40	7	6
12	Nata	2,75	7	7
13	Natalka	2,70	6	8
14	Nespodivanka	2,50	7	7
15	Oniks	2,50	7	7
16	Panna	2,60	7	7
17	Pervomais`ka	2,10	7	7
18	Podolianka	2,65	7	7
19	Ros`	2,80	7	7
20	Sadhorianka	2,90	7	8
21	Slaviia	2,70	7	7
22	Fresano	1,50	7	7
23	Freia	2,70	7	8
24	Yasochka	2,78	7	9
25	Apeks	2,00	7	8
26	Berggold	2,00	7	8
27	Beronia	1,50	7	7
28	Bogema	1,50	7	7
29	Borlotto lingua di fuoco nano	2,50	7	7
30	Wawelska	2,70	9	7
31	VERDIGON	1,20	7	7
32	WINSTON	1,40	7	9
33	Golden Goal	1,30	7	5
34	Holubka	1,50	7	7
35	Hotyka	2,10	7	9
36	Dar	1,40	7	7
37	Delfina	2,00	8	7

End of Table 1

38	Gina	2,20	7	7
39	ESCADRON	1,90	7	7
40	Eureka	3,00	7	7
41	Zagadka	2,50	8	7
42	Zironka	1,20	7	7
43	Zoro	2,00	7	9
44	Igolomska	3,00	8	7
45	Kaien	2,00	7	9
46	Caprika	2,20	7	7
47	Clarke	2,50	7	7
48	Contada	1,70	7	9
49	Crockett	1,50	8	7
50	Croma	2,00	7	8
51	Lunar	2,00	7	9
52	Laura	1,50	7	7
53	Messi	1,20	7	5
54	Navajo	1,40	7	5
55	Nagano	2,80	8	8
56	Olga	2,00	5	6
57	OUTLAW	2,20	7	7
58	Pike	2,30	7	7
59	Palati	2,50	7	5
60	Paloma	1,50	7	7
61	Pantera	1,50	7	7
62	Paulista	1,30	7	7
63	Pop Top	1,20	7	7
64	Rimember	1,30	7	9
65	Saxa	2,00	7	6
66	Serengeti	1,50	7	7
67	Sonestina	2,00	7	8
68	Supernano zhovte	2,00	7	8
69	Topcrop	2,00	7	8
70	Unidor	2,80	7	7
71	Festival	2,20	7	5
72	Fruidor	1,50	7	7
73	Tsarivna	1,20	7	7
74	Shakhynia	2,50	8	7
75	Jaguar	2,20	7	7

According to the results of the analysis, the varieties Aria, Gorlytsia, Dokuchaevska, Olga have low drought resistance (5 points). The variety Natalka has medium resistance (6 points). 61 varieties or 81,3 % have resistance of 7 points. 9 varieties of beans have high drought resistance, in particular 8 varieties have a resistance score of 8 and 1 variety (Wawelska) has a resistance of 9 points.

The distribution of varieties by disease resistance showed that 5 varieties of common beans had low resistance (at the level of 5 points): Golden Goal, Messi, Navajo, Palati, Festival. The varieties Dokuchaevskaya, Nadiya, Saxa and Olga had resistance of 6 points. The main part (46 varieties or 61,3 %) had medium resistance to diseases (7 points). 20 varieties had high resistance: 12 varieties with resistance of 8 points and 8 varieties with resistance of 9 points.

Only two varieties have comprehensive resistance to drought and major diseases, at a level of at least 8 points: Elegance and Nagano.

An important indicator for the producer is also the size of the possible harvest. The distribution of varieties by yield showed that 23 varieties have a yield of up to 2,0 t/ha, 50 varieties – from 2,0 to 3,0 t/ha. Only two varieties (Eureka and Igolomska) have a yield above 3,0 t/ha.

Conclusions.

The vast majority of common bean varieties listed in the State Register of Plant Varieties Suitable for Distribution in Ukraine have average resistance to adverse environmental factors – drought and diseases – at the level of 7 points. The Elegance and Nagano varieties are highly resistant to both factors, and also have a fairly high yield – 2,7–2,8 t/ha.

BIBLIOGRAPHY:

1. Голохоринська М. Г., Величко С. Й., Вихристюк М. А., Овчарук О. В. Створення нових сортів квасолі та їх впровадження у виробництво. *Селекція і насінництво: міжвід. темат. наук. зб. Ін-т рослинництва ім. В. Я. Юр'єва УААН*. 2005. Вип. 9. С. 149–152.
2. Мазур В. А., Дідур І. М., Мазур О. В., Мазур О. В. Особливості прояву господарсько-біологічних ознак квасолі звичайної (*Phaseolus vulgaris* L.) в умовах Лісостепу правобережного: монографія. Вінниця. ТОВ Друк. 2021. 256 с.
3. Мазур В. А., Дідур І. М., Ткачук О. П., Панцирева Г. В. Агроекологічна стійкість сортів квасолі звичайної до несприятливих умов вегетації. *Наукові доповіді НУБІП України*. 2021. № 2 (90). Електронний ресурс. Режим доступу: <https://journals.nubip.edu.ua/index.php/Dopovidi/uk/issue/view/630>
4. Державний реєстр сортів рослин, придатних для поширення в Україні на 2017 рік. Київ, 2017. 392 с.
5. Державний реєстр сортів рослин, придатних для поширення в Україні на 2018 рік. Київ, 2018. 447 с.
6. Державний реєстр сортів рослин, придатних для поширення в Україні на 2019 рік. Київ, 2019. 490 с.
7. Державний реєстр сортів рослин, придатних для поширення в Україні на 2020 рік. Київ, 2020. 503 с.
8. Державний реєстр сортів рослин, придатних для поширення в Україні на 2021 рік. Київ, 2021. 525 с.
9. Державний реєстр сортів рослин, придатних для поширення в Україні на 2022 рік. Київ, 2022. 547 с.
10. Державний реєстр сортів рослин, придатних для поширення в Україні на 2023 рік. Київ, 2023.
11. Список сортів рослин, які занесені в Реєстр сортів рослин, придатних до поширення в Україні та рекомендуються до вирощування в господарствах Харківської області на 2024 рік. Харків, 2024. 23 с.
12. Державний реєстр сортів рослин, придатних для поширення в Україні на 2025 рік. Електронний ресурс. Режим доступу: <https://minagro.gov.ua/file-storage/reestr-sortiv-roslin>
13. Poedinceva A. A., Turenko V. P., Stankevych S. V. et al. A review of protection measures against the principal bean diseases in Ukraine. *Ukrainian Journal of Ecology*, 2020. 10(5), 236–240. DOI: 10.15421/2020_236
14. Poedintseva A., Zhukova L., Stankevych S. Danger of fusarium wilt in bean crops. Modern trends in the development of agricultural production: problems and

perspectives: monograph. Edited by S. Stankevych, O. Mandych. Tallinn : Teadmus OÜ, 2022. P. 107–116.

REFERENCES:

1. Holokhorynska M. H., Velychko S. I., Vykhrystiuk M. A., Ovcharuk O. V. (2005). Stvorennia novykh sortiv kvasoli ta yikh vprovadzhennia u vyrobnytstvo [Creation of new varieties of beans and their introduction into production]. *Selektsiia i nasynnytstvo: mizhvid. temat. nauk. zb. In-t roslinnytstva im. V.Ia. Yurieva UAAH*. Vyp. 9. S. 149–152 [in Ukrainian].
2. Mazur V. A., Didur I. M., Mazur O. V., Mazur O. V. (2021). Osoblyvosti proiavu hospodarsko-biologichnykh oznak kvasoli zvychnoi (*Phaseolus vulgaris* L.) v umovakh Lisostepu pravoberezhnoho: monohrafiia [Features of the manifestation of economic and biological characteristics of common bean (*Phaseolus vulgaris* L.) in the conditions of the Right-Bank Forest-Steppe: monograph]. Vinnytsia. TOV Druk [in Ukrainian].
3. Mazur V. A., Didur I. M., Tkachuk O. P., Pantsyeva H. V. (2021). Ahroekologichna stiikist sortiv kvasoli zvychnoi do nespryiatlyvykh umov vehetatsii [Agroecological resistance of common bean varieties to adverse vegetation conditions]. *Naukovi dopovidi NUBiP Ukrainy*. № 2 (90). Elektronnyi resurs. Rezhym dostupu: <https://journals.nubip.edu.ua/index.php/Dopovidi/uk/issue/view/630> [in Ukrainian].
4. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2017 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2017]. Kyiv [in Ukrainian].
5. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2018 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2018]. Kyiv [in Ukrainian].
6. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2019 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2019]. Kyiv [in Ukrainian].
7. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2020 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2020]. Kyiv [in Ukrainian].
8. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2021 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2021]. Kyiv [in Ukrainian].
9. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2022 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2022]. Kyiv [in Ukrainian].
10. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2023 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2023]. Kyiv [in Ukrainian].
11. Spysok sortiv roslyn, yaki zaneseni v Reiestr sortiv roslyn, prydatnykh do poshyrennia v Ukraini ta rekomenduiutsia do vyroshchuvannia v hospodarstvakh Kharkivskoi oblasti na 2024 rik [List of plant varieties included in the Register of Plant Varieties Suitable for Distribution in Ukraine and recommended for cultivation in farms of the Kharkiv region for 2024]. Kharkiv [in Ukrainian].

12. Derzhavnyi reiestr sortiv roslyn, prydatnykh dlia poshyrennia v Ukraini na 2025 rik [State Register of Plant Varieties Suitable for Distribution in Ukraine for 2025]. Elektronnyi resurs. Rezhym dostupu: <https://minagro.gov.ua/file-storage/reiestr-sortiv-roslyn> [in Ukrainian].
13. Poedinceva A. A., Turenko V. P., Stankevych S. V. et al. (2020). A review of protection measures against the principal bean diseases in Ukraine. *Ukrainian Journal of Ecology* 10(5). P. 236–240. DOI: 10.15421/2020_236
14. Poedintseva A., Zhukova L., Stankevych S. (2022). Danger of fusarium wilt in bean crops. Modern trends in the development of agricultural production: problems and perspectives: monograph. Edited by S. Stankevych, O. Mandych. Tallinn : Teadmus OÜ. P. 107–116.

Poedyntseva A. A., Zhukova L. V., Stankevych S. V. Screening of bean varieties for resistance to adverse environmental factors

An important indicator that should be paid attention to when choosing a variety for cultivation is not only the yield, but also resistance to adverse environmental factors, among which drought resistance and resistance to major crop diseases occupy a significant place. In the article, the authors analyzed common bean varieties included in the State Register of Plant Varieties Suitable for Distribution in Ukraine for 2017–2025. Varieties are grouped according to their reaction to negative environmental factors, in particular drought and diseases, and potential yield when following technological processes when growing beans in the conditions of the Forest-Steppe of Ukraine. Bean varieties are analyzed by the year of inclusion in the State Register and the country of origin of the variety. Most of the bean varieties in the register were created in Ukraine. It is known that domestic varieties have higher agroecological resistance to adverse growing conditions, since they were created in recommended growing zones, while foreign varieties have lower agroecological plasticity. Varieties excluded from the State Register of Varieties in 2025 were also analyzed. Varieties that do not meet the requirements for a number of indicators, including resistance to diseases, pests, drought, and other adverse factors, are removed. In particular, in 2025, 46 bean varieties were excluded from the register. Growing conditions play an important role in the formation of plant resistance to diseases. To obtain stable yielding varieties of common beans, varieties with high drought resistance are required. In addition, varieties that are relatively resistant to pathogens due to moisture deficiency needed. According to the results of the analysis, the vast majority of common bean varieties included in the State Register of Plant Varieties Suitable for Distribution

in Ukraine for 2025 have average resistance to adverse environmental factors – drought and diseases – at the level of 7 points. The Elegance and Nagano varieties are highly resistant to both factors, and also have a fairly high yield – 2,7–2,8 t/ha.

Key words: beans, variety, disease, yield, resistance.

Посдинцева А. А., Жукова Л. В., Станкевич С. В. Скринінг сортів квасолі за стійкістю до несприятливих чинників навколишнього середовища

Важливим показником, на який слід звернути увагу при виборі сорту для вирощування є не лише величина врожайності, а й стійкість до несприятливих чинників навколишнього середовища, серед яких вагоме місце посідає посухостійкість та стійкість до основних хвороб культури. У статті авторами проаналізовано сорти квасолі звичайної, занесені до Державного реєстру сортів рослин, придатних до поширення в Україні за 2017–2025 роки. Згруповано сорти за їх реакцією на негативні чинники навколишнього середовища, зокрема посуху та хвороби і потенційною врожайністю при дотриманні технологічних процесів під час вирощування квасолі в умовах Лісостепу України. Проведено аналіз сортів квасолі за роком внесення до Державного реєстру та країною-походження сорту. Більшість сортів квасолі, що перебувають в реєстрі створено саме в Україні. Відомо, що вітчизняні сорти володіють вищою агроекологічною стійкістю до несприятливих умов вирощування, оскільки створені у зонах рекомендованого вирощування, а зарубіжні сорти володіють нижчою агроекологічною пластичністю. Також проаналізовано сорти, виключені з Державного реєстру сортів у 2025 році. Видаляють сорти, які не відповідають вимогам щодо ряду показників, в тому числі стійкості до хвороб, шкідників посухи та інших несприятливих чинників. Зокрема у 2025 році з реєстру було виключено 46 сортів квасолі. Важливе значення у формуванні стійкості рослин до хвороб відіграють умови вирощування. Для одержання стабільних за урожайністю сортів квасолі звичайної потрібні сорти, що характеризуються високою посухостійкістю. Крім того, необхідні сортозразки, що внаслідок дефіциту вологи є відносно стійкі до збудників хвороб. Згідно результатів аналізу, переважна більшість сортів квасолі звичайної, що занесені до Державного реєстру сортів рослин, придатних для поширення в Україні на 2025 рік, володіють середньою стійкістю до несприятливих чинників навколишнього середовища – посухи та хвороб – на рівні 7 балів. Високою стійкістю до обох чинників володіють сорти Елеганс та Нагано, які крім того мають і досить високу урожайність – 2,7–2,8 т/га.

Ключові слова: квасоля, сорт, хвороба, урожайність, стійкість, посуха.

Дата першого надходження рукопису до видання: 23.10.2025

Дата прийнятого до друку рукопису після рецензування: 28.11.2025

Дата публікації: 14.12.2025