Received: 26.09.2024 | *Accepted: 03.10.2024*

Agriculture. Plant growing

doi: 10.31210/spi2024.27.04.01
UDC 635.65:635.07(477.7)
ORIGINAL ARTICLE

Scientific Progress & Innovations
https://journals.pdaa.edu.ua/visnyk

27 (4)
2024

Productivity of varieties of spring vetch (*Vicia sativa* L.) in the conditions of the Southern Forest Steppe of Ukraine

O. Antonets[1] | S. Sylenko[2] | O. Sylenko[2] | M. Barylko[3]

Article info

Correspondence Author
O. Antonets
E-mail:
apisaaa61@gmail.com

[1] Poltava State Agrarian University,
Skovoroda St., 1/3,
Poltava, 36000, Ukraine

[2] Ustymivka experimental station of plant growing of the Institute of Plant growing named after V. Ya. Yuriev of NAAS of Ukraine,
25, akademician Vavylova str.,
v. Ustymivka, 39074, Ukraine

[3] Poltava State Agricultural Experimental Station named after M. I. Vavilov of Institute of Pig Breeding and agroindustrial production of NAAS of Ukraine,
Shvedska St., 86, Poltava,
36014, Ukraine

Citation: Antonets, O., Sylenko, S., Sylenko, O., & Barylko, M. (2024). Productivity of varieties of spring vetch (*Vicia sativa* L.) in the conditions of the Southern Forest Steppe of Ukraine. *Scientific Progress & Innovations*, 27 (4), 6–10. doi: 10.31210/spi2024.27.04.01

Among the annual leguminous grasses, spring vetch stands out, reaching harvest maturity two months after sowing. It has nodule bacteria on the root system and is able to accumulate 60 kg/ha of biological nitrogen during the growing season. This plant improves soil fertility and is a good precursor for many crops. One of the main tasks of breeding of spring vetch is to create high-yielding varieties in terms of fodder mass and grain with high adaptive potential. Therefore, the relevance of the topic lies in the identification of promising varieties of spring vetch in the conditions of the Southern Forest Steppe of Ukraine, which are high-yielding and can be used in various directions. The purpose of research is to find out adaptive potential of varieties in the conditions of the Southern Forest Steppe of Ukraine. To achieve the goal, the following tasks must be solved: 1) to evaluate varieties of spring vetch according to the yield of seeds, green mass and hay; 2) to identify varieties that can be used in production and in breeding practice to create new competitive varieties. The research was carried out in laboratory and field conditions of the Ustymivka experimental station of plant growing of the Institute of Plant growing named after V. Ya. Yuriev of the National academy of agricultural sciences of Ukraine which belongs to the central part of the Kremenchuk district of Poltava region and the southern part of the Forest Steppe zone of Ukraine. An evaluation of 17 varieties of spring vetch was carried out for the yield of seeds, green mass and hay for the years 2021–2023. 7 varieties exceeding the Bilotserkivska 88 standard (1.9 t/ha) were selected for seed yield. 7 varieties exceeding the Bilotserkivska 88 standard (28.6 t/ha) were also selected for the yield of green mass. According to the yield of hay, 10 varieties were selected, which significantly exceeded the Bilotserkivska 88 standard (3.44 t/ha). The Bilokvitkova variety reached almost the standard level (3.47 t/ha). To realize the productivity potential of spring vetch varieties, it is necessary to take into account their ecological features. Such varieties as Polinariia, Hibrydna 85, Iaroslava and Halynka are varieties of universal direction of use. These varieties are recommended for involvement in breeding practice for the creation of new competitive varieties.

Keywords: spring vetch (*Vicia sativa* L.), varieties, productivity, seeds, green mass, hay.

Продуктивність сортів горошку посівного (ярого) (*Vicia sativa* L.) в умовах Південного Лісостепу України

О. А. Антонець[1] | С. І. Силенко[2] | О. С. Силенко[2] | М. Г. Барилко[3]

[1] Полтавський державний аграрний університет,
м. Полтава, Україна

[2] Устимівська дослідна станція рослинництва Інституту рослинництва імені В. Я. Юр'єва НААН України,
с. Устимівка,
Полтавська область, Україна

[3] Полтавська державна сільськогосподарська дослідна станція імені М. І. Вавилова Інституту свинарства і агропромислового виробництва НААН України,
м. Полтава, Україна

Серед однорічних бобових трав виділяється горошок посівний (ярий), що набуває укісної стиглості через два місяці після сівби. На кореневій системі він має бульбочкові бактерії і здатний за вегетацію нагромадити 60 кг/га біологічного азоту. Ця рослина покращує родючість грунів і є добрим попередником для багатьох культур. Одним з головних завдань селекції горошку посівного (ярого) є створення високопродуктивних сортів за кормовою масою і зерном з високим адаптивним потенціалом. Тому актуальність теми полягає у вияві перспективних сортів горошку посівного (ярого) в умовах Південного Лісостепу України, що є високоурожайними і можуть використовуватися в різних напрямках. Мета досліджень – з'ясувати адаптивний потенціал сортів в умовах Південного Лісостепу України. Для досягнення поставленої мети необхідно вирішити наступні завдання: 1) здійснити оцінку сортів вики ярої за урожайністю насіння, зеленої маси та сіна; 2) виділити сорти, що можуть бути використані у виробництві та у селекційній практиці для створення нових конкурентоспроможних сортів. Дослідження проведено у лабораторних і польових умовах Устимівської дослідної станції рослинництва Інституту рослинництва імені В. Я. Юр'єва НААН України, що належить до центральної частини Кременчуцького району Полтавської області та південної частини зони Лісостепу України. Здійснено оцінку 17 сортів горошку посівного (ярого) за урожайністю насіння, зеленої маси та сіна за 2021–2023 роки. За урожайністю насіння виділено 7 сортів, що перевищують стандарт Білоцерківська 88 (1,9 т/га). За урожайністю зеленої маси також виділено 7 сортів, що перевищують стандарт Білоцерківська 88 (28,6 т/га). За урожайністю сіна виділено 10 сортів, що значно перевищують стандарт Білоцерківська 88 (3,44 т/га). Сорт Білоквіткова вийшов майже на рівень стандарту (3,47 т/га). Для реалізації потенціалу продуктивності сортів горошку посівного (ярого) необхідно враховувати їх екологічні особливості. Сорти Полінарія, Гібридна 85, Ярослава та Галинка є сортами універсального напрямку використання. Дані сорти рекомендовано для залучення у селекційну практику для створенню нових конкурентоспроможних сортів.

Ключові слова: горошок посівний (ярий) (*Vicia sativa* L.), сорти, урожайність, насіння, зелена маса, сіно.

Бібліографічний опис для цитування: *Антонець О. А., Силенко С. І., Силенко О. С., Барилко М. Г.* Продуктивність сортів горошку посівного (ярого) (*Vicia sativa* L.) в умовах Південного Лісостепу України. *Scientific Progress & Innovations*. 2024. № 27 (4). С. 6–10.

Introduction

Providing livestock with high-quality fodder in Ukraine is possible due to development of the latest strategies in fodder production. For this, "it is necessary to scientifically substantiate and introduce into production adaptive technologies for growing high-yielding legumes and leguminous crops, annual and perennial grasses" [1]. Annual leguminous grasses are a valuable group of herbaceous plants that strengthen the modern fodder base of the Forest Steppe of Ukraine."For as the earth brings forth her bud" [2], fodder leguminous grasses are still grown today.

However, as noted by V. Petrychenko, O. Korniichuk and I. Voronetska, "transformational changes in the structure and functioning of Ukrainian ecosystems negatively affected the content of organic matter which acts as the bioenergetic basis of fertility and the regulator of all life processes in agriculture" [3]. V. Sichkar claims that "leguminous crops significantly increase soil fertility without significant costs" [4]. H. Demydas and S. Weiler note that "the need for nitrogen for fodder lands of Ukraine can be half covered due to the effective use of the potential of leguminous grasses by including them in fodder agrocenoses" [5].

Annual leguminous grasses are a necessary component of grass mixtures. "They can be sown at different times and you can receive green mass throughout the growing season. In addition, annual grasses can also be used for making hay and haylage" [6]. Among the annual leguminous grasses, spring vetch stands out, reaching harvest maturity two months after sowing.

Ukrainian scientists note that spring vetch is a "high-stemmed plant. Its dry mass contains 15–19 % digestible protein, 1.1–2.2 % calcium and 23–27 % fiber" [7]. O. Zinchenko, H. Demydas and A. Sichkar note that "the yield of the green mass of the spring vetch reaches up to 350 centners/ha and up to 70 centners/ha of fodder units" [8]. H. Birta and Y. Burhu claim that "100 kg of spring vetch hay contains 46 fodder units. The green mass of spring vetch that is well-leafed is up to 70%" [9]. L. Iermakova, R. Ivanovska and M. Shevnikov write that "in terms of fodder value, spring vetch is almost not inferior to perennial legumes. In forest steppe areas, the yield of winter wheat after fertilizing spring vetch for green fodder or hay is almost the same as for pure steam" [10].

S. Sakmacsi, A. Bilal, M. Karaka note that "this culture plays a significant role in fodder production in solving the problem of fodder protein. Spring vetch is a component of the green conveyor belt and is part of most annual leguminous-cereal mixtures grown for green fodder, hay, silage, haylage" [11]. A. Babych and A. Babych-Poberezhna claim that "spring vetch fodder, due to the increased content of crude protein, carotene, essential amino acids, is a valuable feed for all types of farm animals" [12]. V. Aralov writes that "thanks to nodule bacteria on the root system, spring vetch is able to accumulate 60 kg/ha of biological nitrogen during the growing season and is therefore a good precursor for many crops" [13].

It is noted that "one of the main tasks of breeding of spring vetch is creation of high-yielding varieties in terms of fodder mass and grain with high adaptive potential" [14]. "However, the insufficient ecological plasticity and adaptability to the factors of the external environment of many varieties that are entered in the Register of varieties of Ukraine leads to a significant shortage of products in unfavorable growing weather conditions" [15]. As noted by S. Orlov, A. Hahin, S. Synohub, S. Brovko, "spring vetch is an agricultural crop that needs to be grown together with supporting crops. Therefore, in order to increase resistance to the influence of supporting crops (oats, white mustard), part of the hybrid material of the spring vetch is studied by the method of forming hybrid populations in ordinary agrocenoses" [16].

The creation and introduction into production of new varieties of spring vetch, which combine early maturity, high seed quality, resistance to extreme environmental factors, diseases and suitability for mechanized harvesting, is one of the research areas of the crop selection laboratory in Poltava state agricultural research station named after N. I. Vavilov of the Institute of pig breeding and agro-industrial production of the National academy of agricultural sciences of Ukraine» [17]. T. Aralova and I. Temchenko studied promising varieties of spring vetch, namely Volodymyr, Dionis and Vinner. These varieties are characterized by high fodder and seed productivity and high disease resistance [18]. "Involvement in the collection of the world's variety of spring vetch, study and selection of valuable economic traits among donors is the primary task of scientists of the Poltava state agricultural research station named after N.I.Vavilov of the Institute of pig breeding and agro-industrial production of the National academy of agricultural sciences of Ukraine. We studied spring vetch samples originating from: Turkey UREM 79, K17, K65, K13 and Firense Vessia; Germany – Blanchefleur and Peloponnes; Turkmenistan – K31; Serbia – K34; Spain – K44, Austria – Anhernska" [19].

Therefore, the relevance of the topic lies in the identification of promising varieties of spring vetch in the conditions of the Southern Forest Steppe of Ukraine, which are high-yielding and can be used in various directions.

The aim of the study

The purpose of research is to find out the adaptive potential of varieties in the conditions of the Southern Forest Steppe of Ukraine.

To achieve the goal, the following tasks must be solved:

1) to evaluate spring vetch varieties according to the yield of seeds, green mass and hay;

2) to identify varieties that can be used in production and breeding practice to.

Materials and methods

The research was carried out in laboratory and field conditions of the Ustymivka Experimental Station of Plant growing of the Institute of Plant growing named after V. Ya. Yuriev of NAAS of Ukraine (Ustymivka ESP), which belongs to the central part of the Kremenchuk district of Poltava region and the southern

part of the Forest Steppe zone of Ukraine. The Ustymivka ESP is located on the high, flat, open, completely treeless Poltava Plateau of the left-bank terraces of the Dnipro River. The soils of the station are medium-loamy, saline, strong chernozem with a humus content of up to 3.84 %. According to agroclimatic zoning, the territory of the experimental station is on the border of the central warm zone of insufficient moisture and the southern very warm arid zone. Therefore, this area is subject to the harmful effects of droughts which lead to a violation of the water balance.

The climate at the experimental station is moderately continental, with unstable humidity. The first autumn frosts on the soil surface are observed in September, and the last spring frosts are observed at the end of May. The average long-term air temperature is 8,2 ^{0}C. The number of days with snow cover varies from 70 to 110. The height of the snow cover is 20–60 cm. The soil freezes from 64 to 112 cm in winter. Dry spells occur 2–3 times a year. The amount of precipitation varies from 253.8 mm to 777.4 mm per year. The main amount of precipitation falls in the summer-autumn period. The water regime of the soil is provided exclusively by snow and rainwater.

The object of the research is 17 varieties of spring vetch of Ukrainian selection. These are the varieties of the Bilotserkivska Research and Breeding Station of the Institute of Bioenergy Crops and Sugar Beet, the Poltava state agricultural research station named after N. I. Vavilov of the Institute of pig breeding and agro-industrial production of the National academy of agricultural sciences of Ukraine, the State Enterprise "Scientific Innovation and Technological Center of the Institute of Fodder and Agriculture of Podillia National Academy of Sciences of Ukraine", Institute of Fodder and Agriculture of Podillia. Among them, the standard was the Bilotserkivska 88 variety that was placed after 10 numbers.

Collective crops were placed in a scientific, specially created five-field crop rotation. The predecessor is pure steam. Fertilizers and herbicides were not applied, irrigation was not carried out. The technology of soil preparation, sowing and crop care was typical for the southern Forest Steppe zone. Sowing was carried out at the optimal time, manually in three repetitions. Sowing scheme is 20 × 5 cm.

Phenological observations, assessment of resistance to adverse environmental factors, biometric analysis of samples were carried out according to methodological recommendations for the study of genetic resources of leguminous crops [20]. The study and assessment of collection samples were carried out for resistance to the most common diseases on a natural background. Research was conducted during 2021–2023.

Results and discussion

The meteorological conditions during the growing season and during the research period made it possible to analyze the varieties for adaptability to the conditions of the southern Forest Steppe and to quantitatively evaluate the material in terms of productivity. The vegetation period of the spring vetch (April – July) was characterized by contrasting hydrothermal indicators, especially the amount and distribution of precipitation. (***Table 1***).

Table 1

Meteorological conditions during the research period (2021–2023)

Month	Decade	Amount of precipitation, mm				Average monthly air temperature,^{0}C			
		Year			X*	Year			X*
		2021	2022	2023		2021	2022	2023	
April	I	0.0	0.0	9.6		11.2	9.4	7.7	
	II	26.0	3.3	5.0		8,9	10.1	10.0	8,9
	III	2.6	8.6	12.4		14.7	12.8	9.7	
	∑	28.6	11.9	27.0	44.0	348.0	323.0	274.0	267.0
May	I	49.6	15.3	15.4		14.1	15.8	14.3	
	II	7.6	13.1	14.6		20.2	14.8	17.3	15.9
	III	73.5	52.8	34.3		21.1	13.7	18.6	
	∑	130.7	81.2	64.3	50.0	574.1	456.7	520.6	492.9
June	I	61.6	17.4	36.7		23.8	19.5	16.5	
	II	0.0	4.2	64.3		25.9	26.6	22.1	19.5
	III	1.1	6.1	0.0		24.0	25.5	25.8	
	∑	62.7	27.7	101.0	57.0	737.0	716.0	644.0	585.0
July	I	5,6	15.4	4.8		22.5	25.9	25.9	
	II	4.3	16.0	16.8		20.9	21.6	26.5	21.0
	III	46.4	0.0	17.2		23.5	24.5	25.3	
	∑	56.3	31.4	37.8	72.0	692.5	744.5	802.3	651.0
Total according to vegetation		278.3	152.2	232.1	223.0	2351.6	2240.2	2240.9	1995.9

Note: X* – average multi-year indicators.

As shown in Table 1, the lowest air temperature was 7.7 ^{0}C in April 2023, 13.7 ^{0}C in May 2022, 16.5 ^{0}C in June 2023 and 20.9 ^{0}C in July 2021. The highest air temperature was 14.7 ^{0}C in April 2021, 21.1 ^{0}C in May 2021, 26.6 ^{0}C in June 2022 and 26.5 ^{0}C in July 2023. The long-term average monthly air temperature during the growing season is 16.3 ^{0}C. Precipitation by study year varied from 152.2 mm in 2022 to 278.3 mm in 2021. The long-term indicator of the amount of precipitation is 223.0 mm. According to the analysis of the data in

Table 1, the weather conditions of 2021 during the growing season were the most favorable for the growth and development of spring vetch.

As shown in ***Table 2***, on average for the years 2021–2023, 7 varieties that exceed the standard Bilotserkivska 88 variety with a yield of 1.9 t/ha have been selected for their seed yield. These 7 varieties are the following: Hibrydna 85 and Bilotserkivska 7 with a yield of 2.2 t/ha, Hibrydna 2 with a yield of 2.3 t/ha, Iaroslava and Bilokvitkova with a yield of 2.4 t/ha, Polinariia with a yield of 3 t/ha and Halynka with a seed yield of 2.8 t/ha.

Table 2

Productivity of spring vetch samples on average for 2021–2023

№ National directory	The name of the sample	Productivity, t/ha		
		seed	green mass	hay
UD0900032	Bilotserkivska 88, standard	1.9	28.6	3.44
UD0900039	Hibrydna 85	2,2	33.6	7.5
UD0900064	Krasnohradska 2	0.8	10.8	2.4
UD0900070	Hibrydna 2	2,3	34.5	1.33
UD0900165	Bilotserkivska 7	2,2	31.0	3.41
UD0900205	Prybuzka 19	1.0	21.4	5.5
UD0900305	Iaroslava	2.4	34.8	5,6
UD0900318	Mutant shyrokolystyi	0.7	18.0	3.26
UD0900437	Liliana	1.5	27.3	5.5
UD0900490	Vladyslava	1,2	25.2	5.6
UD0900545	Bilokvitkova	2.4	35.2	3.47
UD0900613	Vorskla	0.6	12.1	2.14
UD0900777	Ielizaveta	1.0	23.2	4.7
UD0900821	Nadiia Podillia	1.0	26.3	5.5
UD0900822	Pivdennobuzka	1.0	23.2	4.7
UD0900879	Polinariia	3.0	37.5	6.1
UD0900894	Halynka	2.8	37.1	5.2

According to the yield of green mass on average for the years 2021–2023, 7 varieties that exceed the standard Bilotserkivska 88 variety with an indicator of 28.6 t/ha have been selected. These 7 varieties are the following: Hibrydna 85 with a yield of 33.6 t/ha, Hibrydna 2 with a yield of 34.5 t/ha, Bilotserkivska 7 with a yield of 31 t/ha, Iaroslava with a yield of 34.8 t/ha, Bilokvitkova with a yield of 35.2 t/ha, Polinariia with a yield of 37.5 t/ha and Halynka with a yield of 37.1 t/ha.

Among the studied material, 10 varieties that exceed the standard of Bilotserkivska 88 in terms of hay productivity of 3.44 t/ha have been selected. These 10 varieties are the following: Hibrydna 85 with a hay yield of 7.5 t/ha, Prybuzka 19, Liliana and Nadiia Podillia with a hay yield of 5.5 t/ha, Iaroslava and Vladyslav with a hay yield of 5.6 t/ha, Pivdennobuzka and Ielizaveta with a hay yield of 4.7 t/ha, Polinariia with a hay yield of 6.1 t/ha and Halynka with a hay yield of 5.2 t/ha.

Conclusions

1. An evaluation of 17 varieties of spring vetch has been carried out for the yield of seeds, green mass and hay for the years 2021–2023. According to seed yield, 7 varieties that exceed the Bilotserkivska 88 standard (1.9 t/ha) have been selected. According to the yield of green mass, 7 varieties that exceed the Bilotserkivska 88 standard (28.6 t/ha) have been also selected. According to the yield of hay, 10 varieties that significantly exceed the Bilotserkivska 88 standard (3.44 t/ha) have been selected. The Bilokvitkova variety has reached almost the standard level (3.47 t/ha).

2. To realize the productivity potential of spring vetch varieties, it is necessary to take into account their ecological features. Such varieties as Polinariia, Hibrydna 85, Iaroslava and Halynka are varieties of universal direction of use. These varieties are recommended for involvement in breeding practice for the creation of new competitive varieties. Such varieties as Polinariia, Hibrydna 85, Iaroslava and Halynka are selection samples of Poltava state agricultural research station named after N. I. Vavilov of the Institute of pig breeding and agro-industrial production of the National academy of agricultural sciences of Ukraine.

Conflict of interest

The authors state that there is no conflict of interest.

References

1. Petrychenko, V. F., Korniichuk, O. V., & Veklenko, Yu. A. (2020). Naukovi osnovy rozvytku kormovyrobnytstva v Ukraini. *«Kormy i kormovyi bilok»:* Materialy XII Mizhnarodnoi naukovoi konferentsii (Vinnytsia, 15 lypnia 2020 roku) (P. 55–59). Vinnytsia: Instytut kormiv ta silskoho hospodarstva Podillia [in Ukrainian]
2. King James Version of the Bible. (n.d.). [dataset]. In Religion Past and Present. Brill. https://doi.org/10.1163/1877-5888_rpp_dum_11577
3. Petrychenko, V., Korniychuk, O., & Voronetska, I. (2018). Biological farming in conditions of transformational changes in the agrarian production of Ukraine. *Agricultural Science and Practice*, 5 (2), 3–12. https://doi.org/10.15407/agrisp5.02.003
4. Sichkar, V. I. (2015). Stan i perspektyvy rozvytku vyrobnytstva zernobobovykh kultur u sviti ta Ukraini. *Zbirnyk Naukovykh Prats Selektsiino-Henetychnoho Instytutu-Natsionalnoho Tsentru Nasinneznavstva ta Sortovyvchennia*, 26 (66), 9–20. [in Ukrainian]
5. Demidas, P., & Veiler, S. (2022). Feed productivity of the biomass of spring triticale and common vetch companion sowings depending on the elements of cultivation technology. *Feeds and Feed Production*, 94, 57–66. https://doi.org/10.31073/kormovyrobnytstvo202294-06
6. Veklenko, Y. A., Senyk, I. I., Sydoruk, H., & Pyrih, H. (1970). Formation of productivity of annual feed grass mixtures depending on technological measures of cultivation. *Feeds and Feed Production*, 93, 76–83. https://doi.org/10.31073/10.31073/kormovyrobnytstvo202293-07

7. Tsarenko, O. M., Trotsenko, V. I., Zhatov, O. H., & Zhatova, H. O. (2003). *Roslynnytstvo z osnovamy kormovyrobnytstva: navch.posibnyk*. Sumy: VTD «Universytetska knyha» [in Ukrainian]
8. Zinchenko, O. I., Demydas, H. I., & Sichkar, A. O. (2014). *Kormovyrobnytstvo*. Vinnytsia: TOV «Nilan-LTD» [in Ukrainian]
9. Birta, H. O., & Burhu, Yu. H. (2014). *Osnovy roslynnytstva i tvarynnytstva*. Kyiv: Tsentr uchbovoi literatury [in Ukrainian]
10. Iermakova, L. M., Ivanovska, R. T., & Shevnikov, M. Ia. (2008). Kormovyrobnytstvo. Kyiv: Intas [in Ukrainian]
11. Cakmakci, S., Aydinoglu, B., & Karaca, M. (2003). Determining relationships among yield and yield components using correlation and path coefficient analyses in summer sown common vetch (*Vicia sativa* L.) genotypes. *Pakistan Journal of Botany*, 35 (3), 387–400.
12. Babych, A. A., & Babych-Poberezhna, A. O. (2010). Zernovi bobovi kultury u vyrishenni hlobalnoi prodovolchoi problemy. *Zbirnyk Naukovykh Prats*, 15 (55), 153–166. [in Ukrainian]
13. Aralov, V. I. (1997). Napriamky stvorennia vysokoproduktyvnoho selektsiinoho materialu vyky yaroi. *Zbirnyk Naukovykh Prats*, 93–97. [in Ukrainian]
14. Barylko, M. G., Kolisnyk, I. V., Zakharenko, V. A., & Kolisnyk, A. V. (1970). Estimation ecological plasticity and stability of perspective selected samples of spring pebble vetch. *Feeds and Feed Production*, 89, 66–73. https://doi.org/10.31073/kormovyrobnytstvo202089-06
15. Aralov, V. I. (2012). Metody i rezultaty selektsii horoshku (*Vicia sativa* L.). *Kormy i Kormovyrobnytstvo*, 73, 93–96. [in Ukrainian]
16. Orlov, S. D., Hahin, A. O., Syniohub, S. V., & Brovko, S. M. (2022). Selection of vetch (*Vicia sativa* l.) genotypes resistant to abiotic environmental factors in the agrocoenoses with various supporting crops. *The Scientific Journal Grain Crops*, 5 (2), 218–225. https://doi.org/10.31867/2523-4544/0179
17. Barylko, M. (2023). Inheritance of valuable economic characters in F1 hybrids of spring pebble vetch in the eastern part of the forest steppe of Ukraine. *Feeds and Feed Production*, 95, 65–73. https://doi.org/10.31073/kormovyrobnytstvo202395-05
18. Aralova, T. S., & Temchenko, I. V. (2019). Promising pea varieties submitted for the State Variety Testing during 2017-2018. *Feeds and Feed Production*, 87, 34–38. https://doi.org/10.31073/kormovyrobnytstvo201987-05
19. Barylko, M. H. (2023). Sources of economically valuable traits of spring vetch samples. *Genetični Resursi Roslin (Plant Genetic Resources)*, 33, 44–51. https://doi.org/10.36814/pgr.2023.33.04
20. Kobyzieva, L. N., Bezuhla, O. M., Sylenko, S. I., Kolotylov, V. V., Sokil, T. V., Dokukina, K. I., Vasylenko, A. O.,Bezuhlyi, I. M., & Vus, N. O. (2016). *Metodychni rekomendatsii z vyvchennia henetychnykh resursiv zernobobovykh kultur*. Kharkiv. [in Ukrainian]

ORCID

O. Antonets https://orcid.org/0000-0001-6741-9023
S. Sylenko https://orcid.org/0000-0001-7248-5463
O. Sylenko https://orcid.org/0000-0001-8879-3663
M. Barylko https://orcid.org/0000-0003-4231-2064

2024 Antonets O. et al. This is an open-access article distributed under the Creative Commons Attribution License http://creativecommons.org/licenses/by/4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.