Установлено специфічність контролю стійкості до вовчка, що визначено наявністю генетичних факторів. Отже найкращим методом боротьби з вовчком є генетичний метод. Але в літературі не висвітлено закономірностей успадкування стійкості до нових вірулентних рас вовчка, поширених в Україні, що важливе для створення комерційних гібридів. Також потребують розвитку дослідження зв'язку між стійкістю до нових вірулентних рас вовчка, які поширені в Україні, та цінними господарськими ознаками в гібридів першого покоління. Враховуючи зафіксовані останніми роками зміни клімату в напрямі підвищення температури повітря та інші наслідки цього глобального процесу, можна передбачити зростання інтенсивності ураження соняшнику паразитом, що спрямовує селекцію культури на поєднання стійкості до несприятливих абіотичних чинників зі стійкістю до вовчка.

Ключові слова*: соняшник, селекція, стійкість, вовчок, вірулентність, раси, гени*

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VALUABLE REPRESENTATIVE OF TRITICUM POLONICUM L. FOR GROWING IN UKRAINE

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The article presents the botanical and agronomic characteristics of *Triticum polonicum var. pseudocompactum* studied in the eastern forest-steppe zone of Ukraine.

Keywords: *Triticum polonicum*, *performance, biometric and technological parameters, chemical composition, pasta quality*

Introduction. *Triticum polonicum* (also known as the Polish wheat, which is a confusing name, because it did not originate or was not cultivated on an industrial scale in Poland) is spring wheat. It is an allotetraploid (genome formulae *AABB*) species with 28 chromosomes [1]. *T. polonicum* was traditionally grown in small areas of the Mediterranean region, Ethiopia, Russia and in other parts of Asia. [2] S. Maysoun [3] even mentioned that this species was cultivated in Ukraine. This species is characterized by longer glumes and grains in comparison with other wheat species [1, 4].

Literature review and problem articulation. Nowadays when agrarians reopen neglected and underutilized wheat species, *T. polonicum* is in the focus of researchers and breeders. Popular sites even call it 'grain of hope'. It is seldom cultivated as an independent food crop; it is rather considered as material for breeding. Polish wheat can be a source of resistance to Fusarium head blight [5] and a material for the biofortification of wheat with essential

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micronutrients [6]. Recently, it has been evaluated for bread-making and pasta properties [7, 8]. However, being cultivated in different locations, a crop may change its technological and biochemical parameters.

Given the above considerations, we set a **purpose** to investigate performance, biometric and technological parameters, chemical features of grain, and pasta quality indicators of *T. polonicum* grown in the Forest-steppe zone in Ukraine.

Materials and methods. The analyses were carried out on *Triticum polonicum var. pseudocompactum* (*UA 0300337*, PRT) from a collection of the NationalCenter for Plant Genetic Resources of Ukraine. The plants were grown on typical black soil using traditional farming techniques. The record plot area was 10 m^2, in three replications. Grain harvested in 2019, 2020 and 2021 was used in analyses. Three samples of freshly-harvested (to avoid the storage effect) grain were analyzed for each year.Whole kernels were milled on a laboratory mill LZM. The protein content was determined by Kjeldahl digestion [9, 10]. The carotenoid level was spectrophotometrically assessed in acetone extracts as described in [11]. The total antioxidant activity was investigated by DPPH assay [12, 13]. Fatty acid methyl esters were prepared by the modified Peisker method [14] and analyzed by gas chromatography [15]. The performance and its elements were assessed as described in [16]. The test weight and vitreousness were evaluated in compliance with the State Standard of Ukraine [17]. The grain hardness was determined on a YPD-300 hardness tester (Ltpm China) (measuring force applied to crush kernels) by the method developed by A.V. Yarosh et al [18] and expressed in newtons. Pasta was made and assessed in compliance with the methodical guidelines [19]. The weight increase index (WII) was calculated by dividing the weight of pasta after cooking by the weight of uncooked pasta. The volume increase index (VII) was calculated in a similar way: the volume of cooked pasta was divided by the volume of an uncooked product [20].Pasta color was evaluated by express-method [21]. The water absorption index (WAI) was determined using the following equation: WAI = [(Weight of cooked pasta (g) − Weight of uncooked pasta (g))/ Weight of uncooked pasta (g)] × 100 [22]. The yellowness index (YI) and whiteness index (WI) were calculated by formula 1 and 2 [23]:

$$YI = 142.86\ b/L \quad (1)$$
$$WI = 100 - [(100 - L)^2 + a^2 + b^2]^{0.5} \quad (2),$$

where L, a and b are color coordinates measuring lightness, redness and yellowness, respectively. Data were statistically processed in StatGraphWin and presented as the mean ± standard deviation.

Results and discussion. As Polish wheat is grown on a small scale, constituents of its performance were not studied in detail. In our plots, Polish wheat was much inferior to the check durum wheat cultivar (Spadshchyna) in terms of kernel number per spike (Table 1), though there was no significant difference in the kernel weight per spike between these accessions because elongated *T. polonicum* kernels are much bigger than in durum wheat. This also explains a lower density of Polish wheat spikes. Low density of spikes can be regarded as a positive feature because loose spikes are more resistant to fungal infections, in particular to Fusarium pathogens [24]. However, other researchers investigating Polish wheat found no differences in the spike density between *T. polonicum* and *T. durum* (14.91–13.16 spikelets per 10 cm of spike vs. 13.35–13.20 spikelets per 10 cm, respectively) [25]. Taking into account that these authors used a different measure of the spike density, spikelet number per 10 cm of spike (not kernel number per 10 cm of spike as it is accepted in local studies), we also recalculated the spike density in spikelets per 10 cm and obtained 20.0 and 26.9 spikelets per 10 cm for *T. polonicum var. pseudocompactum* and *T. durum*, respectively, confirming a significant difference in this parameter between the two species. One thousand kernel weight in the Polish wheat accession under investigation was considerably higher than that in cv. Spadshchyna, though it did not reach the maximum, as E. Suchowilska et al. reported that it could amount to 80 g [26]. Still, it can be involved in crossings as a source of large seeds. There were also upward trends in the kernel number and weight per plant in *T. polonicum* var. *pseudocompactum* in comparison with cv. Spadshchyna (though differences did not reach statistical significance) due to greater productive tillering capacity (number of fertile spikes per plant) of Polish wheat. The kernel number per spike in the Polish wheat accession under investigation was much higher than the published data (29.56–25.56)[25]. The kernel weight per spike in our study was also higher than that obtained by E. Suchowilska et al. for Polish wheat: 1.35–1.32 g [25]. *T. polonicum* var. *pseudocompactum* did not differ from the check durum wheat cultivar in the spikelet number per spike or in the kernel number per spikelet. The spike length was also similar in both species. The spike length of the Polish wheat accession from our collection was also in agreement with the value reported by E. Suchowilska et al.: 8.66–8.14 cm[25]. As to the plant height, Polish wheat plants were slightly shorter than Spadshchyna plants (Table 1), though the difference was not statistically significant. Polish wheat plants in our study were shorter than those in E. Suchowilska et al.'s study (112.96–108.54 cm) [25]. Tall plants are often prone to lodging. Although Polish wheat is not a dwarf species, its lodging resistance was exceptionally high: 9 points on a 9-point scale (where 1 corresponds 100% lodging and 9 means no lodging at all).

Some authors reported that Polish wheat grain could contain up to 27% of protein [3]. The protein content in grain of the Polish wheat accession under investigation was much lower, but significantly higher than in the check durum wheat cultivar (Table 2). Our data is in exact agreement with Suchowilska et al.'s study of *T. polonicum:* they reported that the protein content in this species amounted to 17.33±0.88% [26].

Table 1

Performance and biometric characteristics of *T. polonicum* var. *pseudocompactum*

Trait		*T. polonicum* var. *pseudocompactum*	Spadshchyna (check durum wheat)
Protein content, %		17.6±0.8*	12.7 ± 0.4
Carotenoid content, mg/kg FW		1.98±0,3	2.29±0,3
TAOA, CGAE/g FW		546.2±22	525.6±12
Fatty acids, %	Palmitic	18.4±0.16*	14.9±0.39
	Palmitoleic	0.64±0,08	0.42±0.09
	Stearic	1.05±0,07	1.21±0,11
	Oleic	21.1±1.02*	24.4±0,33
	Linoleic	53.4±0,81	54.3±0,45
	Linolenic	4.84±0.41	4.32±0.16
	Eicosanoic	0.10±0,04	0.13±0,04
	Eicosenoic	0.09±0,04	0.12±0,04
	Behenic	0.32±0,08	0.30±0,1

Note: *significant difference in comparison with cv. Spadshchyna ($p<0.05$).

The carotenoid content in the Polish wheat accession under investigation was disappointing low (Table 2), because other researchers obtained a significantly higher value of 3.17 mg/kg for this species [27]. It was also lower than that in cv. Spadshchyna. Since high content of carotenoids is a prerequisite of good pasta wheat, the investigated accession of *T. polonicum var. pseudocompactum* cannot be classed as such.

The antioxidant activity in Polish wheat grain was similar to that in the check durum cultivar (Table 2), which is high enough through the lens of data on other tetraploid species [28]. We can hardly compare our results with other studies, as other researchers used a different method for estimating antioxidant activity (not DPPH assay, but ABTS assay). Nevertheless, E. Suchowilska et al. [27] did not find significant differences in the antioxidant activity between *T. polonicum* and *T. durum* either.

The unsaturated fatty acid content in *T. polonicum var. pseudocompactum* grain was not beneficial in comparison with that in the check durum wheat cultivar: the polyunsaturated fatty acid content was similar in the both accessions under investigation: PUFA (58.24% vs. 58.62% in *T. polonicum var. pseudocompactum* and cv. Spadshchyna, respectively); the monounsaturated fatty acid content in *T. polonicum var. pseudocompactum* grain was even lower than in the check durum wheat cultivar (21.83% vs. 24.94% in *T. polonicum var. pseudocompactum* and cv. Spadshchyna, respectively), primarily due to a significantly lower content of oleic acid. As to saturated acids, the palmitic acid content in *T. polonicum* var. *pseudocompactum* grain was lower than in cv. Spadshchyna (Table 2). Since palmitic acid is thought to promote development of cardiovascular diseases [29] and cancer [30, 31], this resultis noteworthy.

Table 2

Biochemical parameters of *T. polonicum var. pseudocompactum* grain

Trait		*T. polonicum* var. *pseudocompactum*	Spadshchyna (check durum wheat)
Protein content, %		17.6±0.8*	12.7 ± 0.4
Carotenoid content, mg/kg FW		1.98±0,3	2.29±,3
TAOA, CGAE/g FW		546.2±22	525.6±12
Fatty acids, %	Palmitic	18.4±0.16*	14.9±0.39
	Palmitoleic	0.64±0,08	0.42±0.09
	Stearic	1.05±0,07	1.21±0,11
	Oleic	21.1±1.02*	24.4±0,33
	Linoleic	53.4±0,81	54.3±0,45
	Linolenic	4.84±0.41	4.32±0.16
	Eicosanoic	0.10±0,04	0.13±0,04
	Eicosenoic	0.09±0,04	0.12±0,04
	Behenic	0.32±0,08	0.30±0,1

Note: CGAE = chlorogenic acid equivalent; FW = fresh weight; TAOA = total antioxidant activity. *significant difference in comparison with cv. Spadshchyna ($p<0.05$).

Test weight is widely used as a primary specification in wheat production and generally as an indicator of milling qualities [32]. The test weight of *T. polonicum var. pseudocompactum* was comparable to that of cv. Spadshchyna and high enough (Table 3) to class it as the highest grade wheat not only by the standard of Ukraine (75.0 kg/hL) [17] but also by standards of other countries. For example, in Canada, test weight of ≥ 80.0 kg/hL is required to qualify durum wheat for grade 1 [33]. According to the US Standards for durum wheat, at least 72.5 kg/hL is required for grade 1 [34]. Grain hardness is also important in relation to the milling process. *T. polonicum var. pseudocompactum* kernels were harder than check durum wheat kernels (Table 3).While comparing our data with published ones, we should be cautious, as different methods are used to determine grain harness. However, Veha et al. [35] cross-checked the hardness index produced Perten SKCS 4100 equipment against maximum breaking force in Newtons produced by Lloyd 1000R Testing Machines. Using their data, we can assume that 187 N (Table 3) measured on a YPD-300 hardness tester corresponds roughly a hardness index of 38. This means that *T. polonicum var. pseudocompactum* is closer to medium hard wheats according to Haraszi et al's classification [36,37]or to semi-hard wheat cultivars (7 points) according to the grain hardness scale [18] than to durum wheat. This explains the fact that despite being tetraploid wheat, *T. polonicum* is traditionally is used in bread-making industry [3] and evaluated as an ingredient in bread production[7].

In durum wheat, the degree of kernel translucency, i.e. vitreousness of grain, is often used to predict the cultivar quality. The vitreousness of *T. polonicum var. pseudocompactum* was 76±2.1%. This corresponds class 1 wheat (at least 70% of vitreous kernels)according to the Standard of Ukraine [17], though it was significantly lower than the check durum wheat vitreousness (Table 3). *T. polonicum var. pseudocompactum* is grade 1 wheat by this parameter according to the US Standard for durum wheat, as it requires ≥75% vitreous kernels for grade 1 wheat [34]. However, Vittera set a higher receival standard for durum wheat in 2019/2020: ≥80% of vitreous kernels for grade 1 [38]. Thus, the vitreousness of the Polish wheat accession under investigation in the study years was just at the lower limit of acceptance for grade 1 and then only by standards of some countries. Given that the contribution of environmental factors to the vitreousness variability amounts to 26.2% [28] (hence, vitreousness can be even lower in some years), *T. polonicum var. pseudocompactum* cannot be a source of high vitreousness.

Despite the traditional use of*T. polonicum* as bread wheat, it was also assessed as material for pasta. It was shown that the starch in T. polonicum pasta was less digested than that in dicoccum or in durum wheat pasta[8].*T.polonicum* pasta also had a lower glycemic index, while there were no significant differences in the protein digestibility between the three types of pasta. Thus, *T.polonicum* seems to be quite promising for pasta industry.

Table 3

Pasta and technological qualities of *T. polonicum* var. *pseudocompactum*

Trait		*T. polonicum* var. *pseudocompactum*	Spadshchyna (check durum wheat)
Kernel hardness, N		187±9*	152±13
Test weight, kg/hL		84.4±0,8	82.6±0,6
Vitreousness, %		76±2*	85±3
Pasta color	L*a*b*	66*4*15*	76*2*10*
	YI	32,5	18,8
	WI	62,6	73,9
Stickeness		Absent	Absent
WII		3.11±0,05	3.20±0,05
VII		3.77±0,08	3.90±0,07
WAI, (g/100 g raw pasta)		216 ± 4*	235 ±8
Firmness		Very good	Very good
Cooking loss, %		5.79±0,16	6.60±0,14

Note: *significant difference in comparison with cv. Spadshchyna ($p<0.05$).

Cooking loss is among main indicators of pasta quality. A cooking loss of ≤12% is considered acceptable and indicative of good quality pasta [39]. Therefore, pasta from *T. polonicum var. pseudocompactum* can be classed as excellent by this parameter (Table 3). Pasta quality is also assessed by weight and volume increase indices. The WII and VII for *T. polonicum var. pseudocompactum* and cv. Spadshchyna pastas were very similar (Table 3). The WII for *T. polonicum var. pseudocompactum* pasta was higher than values usually reported for durum wheat pasta (2.63–3.00) [40–42]. Similar differences (indicating against *T. polonicum pseudocompactum)* can be traced for the VII (3.77 for *T. polonicum var. pseudocompactum* pasta vs. 1.8-2.66 in published papers [42–44]). Nevertheless, we should judiciously interpret such comparisons since these indices are affected not only by wheat species/cultivar, but also by a lot of other factors such as kneading and drying modes, diameter and shape of product, cooking time, etc. The WAI measures the degree of starch swelling in excess water. As a rule, low water absorption is considered as high pasta quality. Through the lens of this parameter, *T. polonicum var. pseudocompactum* pasta was very good, better than pasta from cv. Spadshchyna (Table 3) and than published data for durum wheat pasta (252 g/100 g raw pasta [22], though the latter comparison should also be judged with reserve). However, it should be toted that some authors find high WAI values to be an advantage as products with high WAI values quickly satisfy hunger and maintain satiety for a long time [45]. Pasta color is also an important indicator of quality. Pasta color is usually assessed in color coordinates L*, a*, b*, where L* measures lightness, a* – redness, and b* – yellowness. Lower L* values corresponds darker and browner products. In literature, L* values for durum wheat pasta vary a lot: from 88 [46] to 51 [41]. Given this, L* of 66 for *T. polonicum var. pseudocompactum* pasta (Table 3) seems to be acceptable, though worse than for pasta from cv. Spashchyna (76). There are two main causes ofbrown color, enzymatic and non-enzymatic [47]. The non-enzymatic origin of brownness is attributed to Maillard reaction, which in fact combines several reactions in presence of reducing sugars and free amino group associated with lysine. These reactions result in formation of melanoidin (a brown pigment). Oxidative enzymes (polyphenol oxidases and peroxidases) are enzymatic cause of brownness. a* (measure of redness) negatively affects pasta color. An increase in redness may be also related to Maillard reaction and melanoidin accumulation [48], i.e. increased a* values are undesirable. Hence, a* of 4 (in comparison with 2 for pasta from the check durum cultivar) is not a beneficial feature for pasta from *T. polonicum pseudocompactum.* It is difficult to compare a* (and b*) values in our study with other researchers' data because in foreign studies Minolta chromameters are usually used for color estimation. Our express-method uses PhotoShop for measurements in *L* a* b** color space and, in PhotoShop, the *a* and b components (green-red and blue-yellow axes, respectively) can range from +127 to –128, while Minolta colorimeters measure redness and yellowness from -60 to 60. In literature, a* varies from 0.2 [49] to 41 [41]. b* is acknowledged as a very important indicator of past quality as the b* value is directly linked to carotenoid content, determining variations in the yellow intensity [50]. The b* of 15 seems rather beneficial for pasta from*T. polonicum var. pseudocompactum* in comparison with 10 pasta from cv. Spadshchyna. The published data range from 7 [41] to 25 [47]. The discrepancy between the low content of carotenoids in *T. polonicum var. pseudocompactum* grain and the high value of b* for pasta from*T. polonicum var. pseudocompactum* is noteworthy. The pasta yellowness is known to be related not only to the content of yellow pigments in pasta but also to lipoxygenase activity during processing [47]. Lipoxygenase oxidizes unsaturated free fatty acids to form hydroperoxides generating free radicals. Free radicals are quenched by carotenoid pigments, which result in loss of color (bleaching). Hence, being low-carotenoid,*T. polonicum var. pseudocompactum* grain may be still of good color for pasta manufacturing due to low activity of lipoxygenase (more carotenoids remain unoxidized). However, this assumption requires further investigation of carotenoid levels both in grain and in pasta. In addition to the L*, a* and b* components of color, the YI and WI are used. The YI of 32.5 (Table 3) for pasta from T. *polonicum var. pseudocompactum* appears to be much more beneficial than 18.8 for pasta from cv. Spadshchyna, though some researchers reported an incomparably higher value of the YI (92.5 [51]). The WI for pasta from T. *polonicum var. pseudocompactum* was lower than that for pasta from cv. Spashchyna (Table 3). Some authors published even a lower value of the WI for durum wheat pasta (55.9) [44].

Conclusions. Being grown in Ukraine, *T. polonicum* var. *pseudocompactum* formed more kernels per spike than the check durum wheat cultivar (36.1±2.74 kernels vs. 46.0±10.2 kernels) and had a higher thousand-kernel weight than cv. Spadshchyna (62.0±1.13 g vs. 48.8±4.78 g). It also showed high values of the kernel weight per spike (2.23±0.22 g) and per plant (3.79±0.37 g). *T. polonicum* var. *pseudocompactum* can be involved in crossings as a source of large seeds. The protein content in grain of the Polish wheat accession under investigation was higher than in the check durum wheat cultivar (17.6±0.8% vs. 12.7 ± 0.4%), which makes it a source of high protein content. *T. polonicum* var. *pseudocompactum* grain contains less detrimental for health palmitic acid than cv. Spadshchyna grain. *T. polonicum var. pseudocompactum* is suitable for pasta industry and can be involved in hybridization as a source of some pasta quality indicators: its cooking loss was very low (5.79±0.16%), b* value and YI were fairly high (15 and 32.5, respectively), and the WAI was low (216 ± 4 g/100 g raw pasta). At the same time, most of the other parameters were comparable to those of the check durum wheat cultivar; thus, crossing with *T. polonicum var. pseudocompactum* aimed at improving certain performance, technological and biochemical parameters is not expected to deteriorate major pasta scores or it may even enhance some of them.

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ЦІННИЙ ПРЕДСТАВНИК TRITICUM POLONICUM L. ДЛЯ ВИРОЩУВАННЯ В УКРАЇНІ

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Мета і задачі досліджень. Сьогодні, коли аграрії відновлюють інтерес до забутих та малопоширених видів пшениці, *Triticum polonicum* привертає увагу селекціонерів. Проте при вирощуванні в різних кліматичних умовах культура змінює свої технологічні та біохімічні показники. Враховуючи ці міркування, ми поставили за мету дослідити особливості вирощеного в Україні зерна *T. polonicum*.

Матеріали та методи. Аналізували зерно *T. polonicum var. pseudocompactum*, вирощене за традиційною агротехнологією. Вміст білка визначали методом К'єльдаля. Рівень каротиноїдів визначали спектрофотометричним методом в ацетонових екстрактах. Загальну антиоксидантну активність досліджували за допомогою DPPH-аналізу. Жирнокислотний склад аналізували методом газової хроматографії. Масу 1000 зерен та склоподібність оцінювали згідно з ДСТУ. Твердість зерна визначали на твердомірі YPD-300. Оцінку макаронних виробів проводили відповідно до методичних рекомендацій. Розраховували індекс збільшення за масою та об'ємом, індекс водопоглинання, індекс жовтизни та індекс білизни макаронів. Колір макаронів оцінювали експрес-методом.

Результати і обговорення. Маса тисячі зерен польскій пшеницібула значно вищою, ніж у сорту Спадщина (сорт-стандарт твердої пшениці). Відмічено тенденції до перевищення кількості і маси зерен з рослини у *T. polonicum* var. *pseudocompactum* порівняно з сортом Спадщина (хоча відмінності не досягли статистичної значущості) за рахунок більшої продуктивної кущистості. Вміст білка в зерні *T. polonicum* var. *pseudocompactum* був значно нижчим, ніж деякі опубліковані дані, але значно вищим, ніж у зерні сорту-стандарту твердої пшениці (17,6±0,8% і 12,7±0,4%). Вміст каротиноїдів у зерні польської пшениці був низьким (1,98±0,3 мг/кг), однак значення b* (показник жовтизни) для макаронних виробів було відносно високим (15). Вміст пальмітинової кислоти в зерні *T.polonicum* var. *pseudocompactum* був нижчим, ніж у сорту Спадщина. Твердість зерна на рівні 187 Н означає, що *T. polonicum* var. *pseudocompactum* відноситься скоріше до середньотвердих або навіть м'яких ХЛІБНИХ пшениць, ніж до твердих. Макарони з *T. polonicum* var. *pseudocompactum* можна класифікувати як відмінні за рівнем втрат при варінні 5,79±0,16%. За показником WAI (216 ± 4 г/100 г сирих макарон) макарони із зерна *T. polonicum* var. *pseudocompactum* також були кращими, ніж макарони із зерна сорту Спадщина.

Висновки. Зразок *T. polonicum* var. *pseudocompactum* мав більшу кількість зерен з колосу та масу тисячі зерен ніж у сорт пшениці твердої Спадщина. Також у *T. polonicum* var. *pseudocompactum* установлено високі значення маси зерен з колосу і з рослини. Це дає підстави вважати *T. polonicum* var. *pseudocompactum* джерелом крупності зерна. Вміст білка в зерні *T. polonicum* var. *pseudocompactum* був істотно вищим, ніж у сорту Спадщина, що робить польську пшеницю джерелом високого вмісту білка. *T. polonicum* var. *pseudocompactum* придатна для виробництва макаронних виробів і може бути залучена до гібридизації як джерело деяких показників якості макаронних виробів: втрати при варінні були дуже низькими, значення b* і YI були досить високими, а значення WAI було низьким. Водночас більшість інших показників були на рівні з показниками сорту твердої пшениці Спадщина. Таким чином, залучення *T. polonicum* var. *pseudocompactum* у селекційні програми дозволить покращити продуктивні, технологічні та біохімічні параметри зерна, а також певні показники важливі для виробництва макароних виробів.

Ключові слова: *Triticum polonicum, продуктивність, біометричні і технологічні параметри, хімічний склад, якість макаронів*

VALUABLE REPRESENTATIVE OF TRITICUM POLONICUM L. FOR GROWING IN UKRAINE

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Purpose and Objectives. Nowadays when agrarians reopen neglected and underutilized wheat species, *Triticum polonicum* is in the focus of researchers and breeders. However, being cultivated in different locations, a crop may change its technological and biochemical parameters. Given these considerations, we set a purpose to investigate features of *T. polonicum* grain grown in Ukraine**.**

Materials and methods. The analyses were carried out on *Triticum polonicum var. pseudocompactum* grown by traditional farming techniques. The protein content was determined by Kjeldahl digestion. The carotenoid level was spectrophotometrically assessed in acetone extracts. The total antioxidant activity was investigated by DPPH assay. Fatty acids were analyzed by gas chromatography. The test weight and vitreousness were evaluated in compliance with the State Standard of Ukraine. The grain hardness was determined on a YPD-300 hardness tester. Pasta was assessed in compliance with the methodical guidelines. Pasta color was evaluated by express-method. The weight increase index, volume increase index, water absorption index, yellowness index, and whiteness index were calculated.

Results and discussion. One thousand-kernel weight in Polish wheat was considerably higher than that in check cv. Spadshchyna (check durum wheat variety), though it did not reach the maximum because *T. polonicum*. There were upward trends in the kernel number and weight per plant in *T. polonicum* var. *pseudocompactum* in comparison with cv. Spadshchyna (though differences did not reach statistical significance) due to greater productive tillering capacity. The protein content in Polish wheat grain was much lower than some published data, but significantly higher than in the check durum wheat cultivar (17.6±0.8% vs. 12.7 ± 0.4%). The carotenoid content in Polish wheat grain was low (1.98±0.3 mg/kg), however the b* value (indicator of yellowness) for pasta was relatively high (15). The palmitic acid content in *T. polonicum* var. *pseudocompactum* grain was lower than in cv. Spadshchyna. The kernel hardness of 187 N means that *T. polonicum* var. *pseudocompactum* is closer to medium hard or even soft BREAD wheats than to durum wheat. Pasta from *T. polonicum* var. *pseudocompactum* can be classed as excellent bythe cooking loss value of5.79±0.16%. Through the lens of the WAI value (216 ± 4 g/100 g raw pasta), *T. polonicum* var. *pseudocompactum* pasta was also better than pasta from cv. Spadshchyna.

Conclusions. Being grown in Ukraine, *T. polonicum* var. *pseudocompactum* formed more kernels per spike than the check durum wheat cultivar and had a higher thousand-kernel weight than cv. Spadshchyna. It also showed high values of the kernel weight per spike and per plant. It can be a source of large seeds.The protein content in Polish wheat grain was higher than in cv. Spadshchyna, which makes it a source of high protein content. *T. polonicum* var. *pseudocompactum* is suitable for pasta industry and can be involved in hybridization as a source of some pasta quality indicators: its cooking loss was very low, b* value and YI were fairly high, and the WAI was low. At the same time, most of the other parameters were comparable to those of the check durum wheat cultivar; thus, crossing with *T. polonicum* var. *pseudocompactum* aimed at improving certain performance, technological and biochemical parameters is not expected to deteriorate major pasta scores or it may even enhance some of them.

Key words: *Triticum polonicum, performance, biometric and technological parameters, chemical composition, pasta quality*