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PROSPECTS FOR TARTAR BUCKWHEAT INTRODUCTION INTO CULTURE IN UKRAINE

Summary. *The main theme of our research is the necessity of the world plants gene pool usage. One of such crops is Tartar buckwheat (Fagopyrum tataricum) regarded as weeds in Ukraine till present time but it was used successfully for food and medical production in South East Asia 4 thousand years ago and is still used nowadays.*

The article deals with characteristics of promising Tatar cultures numbers, the attention is paid to their morphological description. Tatar buckwheat (Fagopyrum tataricum) has certain peculiarities of separate signs that positively affect the formation of seeds. This species showed the highest productivity of plants among other species of the Fagopyrum genus.

It was grounded that samples collections of the Tartar buckwheat K-1208 (Peremoga), K-1167 (Kalyna), K-1552 (Ruslana), K-1192 (Lira) should be used in selection programs by bringing new varieties of this type of buckwheat to enter this plant into the production in Ukraine.

Keywords: *Tartar buckwheat (Fagopyrum tataricum), common buckwheat, introduction into culture, productivity, morpho-biological characteristics.*

Statement of the problem in general and its relationship to important scientific and practical tasks. The success of modern agricultural production is not possible without purposeful introduction of plants. Taking into account the tasks set in the present time in front of the agricultural science and production it is necessary to carry out the work on attraction of the world genetic resources to solve the pivotal problems of mankind to supply all the people with high quality food. A promising way of this problem solving is an introduction to the culture of such species which till the recent times considered wild and were not widely used in agricultural production in Ukraine. One of these crops is Tatar buckwheat, in considered as cultivated species the world is. It is grown in South-East Asia, where it is used for healthy nutrition. It contains higher concentrations of the routine confronting the fragility of blood capillaries, helps patients with hypertension. There is an information of Chinese scientists [1], that the use of flour from Tatar buckwheat or extract from its seeds allows you to treat such a heavy disease as diabetes.

Previously, this plant was of little attention from the point of view of the domestic researchers, because buckwheat species F. tataricum was considered as weed that can clog a field. Although there is evidence that it was used even in ancient times, not only in Asia, but in Europe and Siberia. For example Professor L. Kerner fon Morylaun describing food plants of Europe stressed that ecxept cereals for flour the buckwheat plants such as Polygonum tataricum and Polygonum fagopyrum were also grown; they had short vegetation period, were cultivated in moderate climate and matured even in mountain regions [2]. In XIX century in Siberia for such weeds as Tatar buckwheat you should have an insurance in case of crop failure. In these years peasants glorified «Providence» for the fact that instead of the dead harvests their fields were full of the «wild buckwheat» ((F. tataricum) [3]. There are a lot of products for healthy meals such as : spaghetti, liqueurs, jams, integrated flour, beer, sauces that are produced in China from Tatar buckwheat they also eat young seedings [4].

Analysis of last research and publications. There is a tendency and considerable scientists interest in the world to the problem of identifying and use of the positive properties of a little used crops for health of the human body. One of such plant is the Tatar buckwheat regarded as weeds in Ukraine till present time and in South East Asia it was used successfully for food and medical production 4 centuries ago, in particular by peoples of Yue and Bu inhabiting the province of Ûnnan in China [1].

In the Scientific Research Institute of Groats Crops named after O. Alekseieva of the State Agrarian and Engineering University in Podilya there is the collection of the worlds gene pool of buckwheat Fagopyrum tataricum amounting near 100 numbers of different geographic origin. In 1999-2002 A. Nikitchuck under the direction of O. Alekseieva conducted the detailed study of this buckwheat type according to special numbers of features. For continuation of selection work it was grounded 4 promising examples of buckwheat. From 2006 we began to introduce the Tartar buckwheat into culture in conditions of West Forest Steppe of Ukraine.

Tartar buckwheat is a rich source of biologically active substances – flavonoids, especially routine (vitamin p) that is not in the grain of other grain crops. Very important is the fact that Tatar buckwheat can be used for the treatment of diabetes. This can be used as extracts, and

flour with Tatar cultures. Chinese scientists found that using flour and extracts from the Tatar buckwheat in the above mentioned doses, recovery of patients with diabetes of the first type (not ìnsulìnozaležna form) was over 75%.

It should be noted that these drugs do not have negative effects on the body, do not change the performance of blood composition, do not contribute to the occurrence of changes in internal organs and the reproductive functions, i.e. they are not toxic. Positive effect on the body (lower levels of glucose and lipids in the blood) has been proven also on animals (rats and mice) in the application of alloksan [2, 3].

Tatar buckwheat grain contain 9,3-14,9% of protein. Tatar cultures protein is different from proteins of conventional cereals, it looks like the components of soy protein. Proteins are composed of 18 amino acids, including the 8 essential acids for the human body. Lysine content is much higher than in other cereals: 66,3% higher than that in rice, 64,4%-than in corn, 62.2%-than in wheat, and 15.5 percent higher than in the usual buckwheat. Flour of Tatar buckwheat is characterized by high content of starch, it is 73%.

Tartar buckwheat contains many pìcrates having antipyretic effect, as well as contribute to the treatment of diseases of stomach, according to traditional Chinese medicine.

The content of magnesium (Mg) in Tatar buckwheat is 2-4 times higher than in wheat or rice. The iron content in the grain of Tatar cultures is 2-5 times higher than in other crops, so in such a way they prevent anemia. Such chemical element as selenium is presented in Tartar buckwheat. It performs the function of preventing oxidation and regulates the immune system. Se is in form of protein-mineral complex, which displays toxic compounds from the human body. The level of vitamin B2 is 4-24 times higher than in the flour from wheat, rice or corn.

In some countries of South-East Asia Tatar cultures leaves and shoots are used as a vegetable. They are fried with salt, used for the preparation of soups, salads, marinades, and in dry form can be applied as a seasoning for meat dishes. Tartar buckwheat is also fermentated for the preparation of local beer called Chang or Pechuvì [4].

Manufacturing products with Tatar buckwheat has reached considerable success in China. According to Wei Y-M. [5] tests on animals and clinical surveillance in the hospital Bendzhin-Tone-Ren revealed that the flour from the Tatar buckwheat has a significant positive effect in the treatment of diabetes, sclerosis of brain vessels, heart

diseases and hypertension. It also has the function of strengthening the work of the stomach, digestion of food, increasing the body's immunity to diseases, and reduces susceptibility to cancer. A number of food products were received from the Tatar buckwheat in China, for example complex flour, granular flour, macaroni, spaghetti, jam, liqueur, and also a series of cosmetic products is being developed. Tatar buckwheat Flour is a good healthy food for people affected by radiation [6].

Tatar buckwheat should be used in food products to use for recovery of the population. This is especially true now, when the world observed adverse environmental conditions caused by pollution of the natural environment of the various toxic compounds, and radionuclides. Very important is that this culture is grown on the basis of ecologically pure technologies without the use of herbicides and pesticides.

In Ukraine, this kind of crop is not yet widespread in the culture, it is considered a weed, which clogs the sowing of spring crops. But in the mountainous regions of China, India, Nepal, Pakistan, with large grains forms, plants of this species are grown in culture [7]. In the collection of the world's gene pool of buckwheat Fagopyrum species tataricum Gaertn, there are several numbers originated from China and belonged to the cultural type. Because of the great need for products that have health-improving effect on the human body, this kind of buckwheat needs to be a culture that involves the creation of domestic varieties. For the detection of the positive features of these little spread buckwheat species, they were compared with usual buckwheat Fagopyrum esculentum Mill.

The aim of research was to study the morpho-biological and economic properties of the collection of samples of the kind of Fagopyrum tataricum Gaertn in the selection of promising material for introduction into the culture in Ukraine.

Objectives of research:

- to summarize research results and highlight the selective material, promising to engage in agricultural production;
- to give the morpho-biological characteristics of different genetic types of Tatar buckwheat from the collection of the world's gene pool;
- to determine the direction of the commercial use of this culture.

The method of research. 80 collection numbers of F. tataricum, ancestors form of F. tataricum ssp. potanini and F. giganteum type were examined. For comparison of their properties with the usual

buckwheat through 20 numbers of Tatar buckwheat the variety of the usual crop – Victoria was sown. The size of the plots was 1,5×1,8 m, the area was 2,7 m^2, without repetitions, the number of rows in the area was 4. Among the numbers of Tatar cultures the sample K-1167 had the best indicators for the period of studies, which we used for comparison. To determine the main quantitative indicators at the end of the growing season we selected a test sheaf of 20 randomly derived plants of each studied species of buckwheat. Biometric analysis of plants was conducted on 14 indicators (table) according to the methodological recommendations on conducting an analysis of the structure of plant cultures [8]. The results obtained were processed by mathematical statistics methods.

The results of the research. The analysis showed that plants of Tatar and usual buckwheat cultures had the average height under 128,9 and 115,9 cm. Forefront form of Tatar buckwheat has an extensive habitus, the largest number of branches that have poorly developed mechanical tissue with occurred lodging. This pattern has also the least height of the first branch attachment – 1,68 cm, very short zone of brunching indicating on its adaptation to in harsh climatic conditions of mountains (table 1).

Table 1

Characteristics of buckwheat species patterns as for the different signs and their variabilities

Feature	Buckwheat species			
	F. tataricum		**F. esculentum**	
	X	V, %	X	V, %
Plant's height, cm	128,9	12,0	115,9	11,08
The number of first-order shoots, nmb.	4,65	22,37	3,20	29,73
Total shoots, nmb.	6,10	78,51	4,05	38,81
The height of the first branch attachment, cm	31,40	38,42	21,75	29,87
The height of the first inflorescence attachment, cm	82,15	15,52	49,50	17,11
The length of the brunching zone (BZ), sm	72,30	17,67	40,25	18,62
The length of the grain formation zone (GFZ), cm	56,30	31,02	72,10	18,07
The ratio of the BZ to GZ	1,59	73,34	0,58	28,27
Number of nodes in BZ, nmb.	9,80	11,28	5,15	18,12
Number of nodes in GZ, nmb.	9,70	16,76	8,55	13,93
The number of inflorescences per plant, nmb.	44,05	58,16	42,05	22,82
The number of leaves per plant, nmb.	51,45	49,80	41,05	23,37
The mass of the grains from plants, g	3,56	43,35	2,61	53,96
The number of full grains, nmb.	196,9	43,35	93,95	53,96

Note: X is arithmetic mean, V,% coefficient of variation

Analyzing such indicators as «length of the brunching zone «(72,3 cm) and «length of the grain formation zone « (56.3 cm) in Tatar buckwheat, as well as taking into account the value of the nodes number indicators in the respective areas, you can argue about the processes of fading growth in transition to the generative period of vegetation. The usual buckwheat brunching zone length is less than the length of the grain formation zone (the ratio BZ to GFZ is equal to 0.58), greater number of nodes is formed in the grain formation zone than in the brunching zone – 8.55 and 5.15, indicating intense growth processes in the generative period of vegetation. That is, there is competition for nutrients between shoots, which continue to grow, and the grains that are forming affecting the plants productivity. A similar trend appears even stronger in progenitor forms of Tatar buckwheat (BZ/GFZ= 0,23), for which a lasting growth of the vegetative organs are essential for survival in conditions of wild nature. In buckwheat type F. tataricum such kind of competition is weakened promoting better grain formation.

Important indicators characterizing plants productivity of studied types is the number of full seeds and grains weight from plants. The largest number of full grains on the plant generates a sample of Fagopyrum tataricum type – 196,9 PCs. This kind of buckwheat gave also the greatest weight of grain from one plant – 3,56 g. Usual buckwheat turned out to be less productive, forming 93,95 pieces of full grains on one plant weighting 2,61 g.

Variability of the presented buckwheat types individual signs such as the height of the plants, the height of attachment of the first inflorescence, the length of the brunching zone, the number of nodes in the brunching and grain formation zones is mainly medium (10-20%). Variability of the other signs is significant, the coefficient of variation was more than 20%.

The main criterion for the selection of promising numbers was their productivity. On this basis four samples of Tatar buckwheat which productivity not only dominated the other samples of this kind but also exceeded the usual buckwheat F. esculentum were identified. These are the samples K-1208, K-1159, K-1552 and K-1192 named respectively: Peremoga, Kalyna, Ruslana and Lira. Their characteristics is provided in table 2.

Table 2

Characteristics of the Tatar buckwheat promising numbers

Agronomic-valuable properties	level of signs expression				
	Standard	Promising number			
	Type Victoria	K-1208 Peremoga	K-1167 Kalyna	K-1552 Ruslana	K-1192 Lira
Productivity, g/m^2	211,0	301,0	227,0	240,0	255,0
Vegetative period, day and night	85	97	87	83	87
Plant's height, cm	100,0-105,0	122,0-126,0	125,0-130,0	100,0-105,0	105,0-110,0
Quality					
1000 grains weight, g	25,3	17,6	16,3	16,4	17,9
Membrane quantity, %	19,5	22,0	22,7	25,3	24,3
Resistance to diseases					
Gray mold	3	1	3	5	3
False downy mildew	3	1	1	3	1
Bacteriosis	5	3	3	5	3
Viral burn	3	5	3	5	3
Resistance to abiotic factors					
Frost resistance	3	5	3	5	7
Draught resistance	3	3	3	7	3
Resistance to shattering	3	3	3	5	5
Resistance to lodging	3	5	3	5	5
Other signs					
Simultaneous ripening	5	5	5	7	5

Given in the table samples of Tatar cultures exceeded normal buckwheat as for productivity up to 16-90 g/m2, indicating the potential abilities of those numbers in obtaining high yields of grain.

Collection number K-1208 originating from China, belongs to the nipple-type variety. The grains are brown elongated, curved in the middle of facets. The stem coloring is dark green with anthocyanin, leaves coloring is dark green, cotyledons are dark green with average demonstration of anthocyanin coloring. It has increased resistance to diseases and adverse environmental factors, low level of seeds membranes.

Collection sample K-1167 Kalina also comes from China, refers to the roundish variety. Grains are rounded gray with convex facets. The stem is green without anthocyanin manifestation, poorly edged, fragile. Leaves coloring is green. The leaves are greatly wavy, heavily fluffy.

Cotyledons are green with average demonstration of anthocyanin. This collection number has high grain productivity, quantity of seeds membrane, it is plastic and has stable performance over the years of research. Among the other studied samples it showed the greatest resistance to shattering of grains.

Collection sample K-1552 Ruslana originating from China, belongs to the nipple-type variety. Grains are elongated of very light brown color with grayish tint. The stem is light green with anthocyanin in color, poorly edged, flexible. Leaves coloring is green, cotyledons are green with weak anthocyanin. This number has good ratio of friendly simultaneous seeds ripening.

Collection sample of the world's gene pool K-1192 Lira originating from Germany, refers to the nipple-type variety. The grain is elongated, light brown. Stems are green with display of anthocyanin at the end of the growing season. Coloring of leaves is green, Cotyledons are green with a weak manifestation of anthocyanin. Plants of this number have high rates of grains in inflorescences. This number has high resistance to extreme conditions of the environment.

The further work on introduction of Tatar buckwheat in culture is carried out with the above mentioned species from the collection of the world's gene pool.

Conclusions. 1. Tatar buckwheat has certain peculiarities of separate signs that positively affect the formation of seeds. This species showed the highest productivity of plants among other species of Fagopyrum genus.

2. Collection of Tatar buckwheat samples K-1208 (Peremoga), K-1167 (Kalina), K-1552 (Ruslana) and K-1192 (Lira) should be used in selection programs of bringing new varieties of this buckwheat type to enter this plant into the production in Ukraine.

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ПЕРСПЕКТИВИ ВВЕДЕННЯ В КУЛЬТУРУ ГРЕЧКИ ТАТАРСЬКОЇ В УКРАЇНІ

Анотація. *Висвітлено питання необхідності використання ресурсів світового генофонду рослин. Однією з таких культур є татарська гречка (Fagopyrum tataricum), яка в Україні до теперішнього часу вважалась бур'яном, а в країнах Південно-Східної Азії вона ще IV тисячоліття тому і до теперішнього часу успішно використовувалась для виготовлення харчових та лікувальних продуктів.*

У статті подана характеристика перспективних номерів татарської гречки, приділено увагу їх морфологічному опису. Гречка татарська (Fagopyrum tataricum) має певні особливості окремих ознак, що позитивно впливають на формування насіння. Цей вид показав найвищу продуктивність рослин серед інших видів роду Fagopyrum.

Узагальнено, що колекційні зразки татарської гречки К-1208 (Перемога), К-1167 (Калина), К-1552 (Руслана) та К-1192 (Ліра) необхідно використовувати у селекційних програмах по виведенню нових сортів цього виду гречки для введення цієї рослини у виробництво в Україні.

Ключові слова: *гречка татарська (Fagopyrum tataricum), гречка звичайна, введення в культуру, продуктивність, морфо-біологічна характеристика*