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SCIENTIFIC ACHIEVEMENTS OF I.M. YEREMEIEV – A SIGNIFICANT CONTRIBUTION TO THE DEVELOPMENT OF THE NATIONAL PLANT BREEDING

НАУКОВІ ЗДОБУТКИ І.М. ЄРЕМЕЄВА – ВАГОМИЙ ВНЕСОК У РОЗВИТОК ВІТЧИЗНЯНОЇ СЕЛЕКЦІЇ РОСЛИН

Майя Костюк,
кандидат історичних наук, доцент, доцент кафедри соціально-гуманітарних і правових дисциплін
E-mail: majjja@ ukr.net
ORCID: https://orcid.org/0000-0002-8484-2074
Уманський національний університет садівництва,вул. Інститутська, 1,м. Умань, Україна, 20305

Maiia Kostiuk,
Ph.D. in Historical Science, Associate Professor of Department of social, humanitarian and legal disciplines
E-mail: majjja@ ukr.net
ORCID: https://orcid.org/0000-0002-8484-2074
Uman National University of Horticulture1, Instytutska St., Uman, Ukraine, 20305

ABSTRACT

The article deals with the contribution of Professor I.M. Yeremeiev to the development of domestic science and practice, based on the references and publications. The urgency of the research is determined by the fact that the driving force of the social and economic level of the country is the development of science and technology. Achievements of domestic scientists are one of the determining factors of technical progress and economic development of the state.

The general scientific principles and methods are the methodological basis of the research.

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In the process of the research, the scientific activity of I.M. Yeremeiev, the outstanding scientist and breeder, on the creation of plastic, durable, high-protein and high-yield varieties, development of theoretical bases and methods of the breeding process was analyzed.

It is emphasized that he went down in the history of breeding as a leading co-author of the winter wheat «Ukrainka 0246», which is the pride of domestic breeding and a calling card of Ukraine. It is noted that the variety received its name in 1920, was regionalized in 1929 and in 1956 was approved by the UN as an international standard for strong wheat, thanks to its high yield and good baking qualities, it became an important article of Soviet export and recognized worldwide bread quality standard. It is pointed out that «Ukrainka 0246» was used in crossbreeding directly and through varieties bred with its participation. Its descendants are more than 300 varieties.

It was found out that the Leninhrad Breeding Station under the leadership of I.M. Yeremeiev bred and handed over to the state commission for testing the varieties of wheat, oats, barley and peas. The winter wheat DC 2444, the spring wheat varieties – Tulun 3A/32 and Tulun 70B/8 and Alhausen buckwheat were regionalized. However, the main achievement of I. M. Yeremeiev's life is the creation and distribution of «Ukrainka 0246» variety.

Keywords: *Professor I.M. Yeremeiev, scientist and breeder, scientific activity, breeding in crop production, Myronivska Breeding Station, winter wheat varieties, «Ukrainka 0246», department of plant breeding, Uman Agricultural Institute.*

Articulation of issue. Since the beginning of the 21st century and until now, the reproduction of the historical image of Ukrainian scientists and their contribution to the formation and development of national science takes an important place in the solution of modern scientific issues.

In the conflux of outstanding scientists in the field of plant breeding of the first half of the 20th century, a special place belongs

to Professor Ivan Maksymovych Yeremeiev, who devoted his entire life to the creation of new varieties of winter and spring wheat, oats and other field crops.

Analysis of recent research and publications. The significant role of I.M. Yeremeiev in the development of breeding was noted in the anniversary collections of Uman Agricultural Institute (Karasiuk, 1994; Uman State Agrarian University: History, Present, Famous Names, 2009), scientific studies about Myronivska Research and Breeding Station (Historical sketch of the organization and activities of Myronivska Research and Breeding Station, 1927). Some general information about I.M. Yeremeiev can be found in the encyclopedic editions and biographical dictionaries (Biologists: biographic reference book, 1984; Borsuk, 2009; Russian botanists. Biographic and bibliographic dictionary, 1950). Special attention should be paid to the works of O.M. Levshyn (Levshyn, 1927) and D.V. Litovkin (Litovkin, 1931), I.K. Bobyr (Archive funds of the History Museum of Uman National University of Horticulture. Memoirs of Bobyr N.K., the former director of Myronivska breeding station, about I.M. Yeremeiev. RP – 350), V.M. Remeslo (Mironovskie pshenitsy, 1972; Remeslo, 1971), V.A. Verhunov (Verhunov, 2011). The contribution of I.M. Yeremeiev to the development of plant breeding was noted in the publications of O.I. Zdorovtsov, O.I. Zinchenko, Yu.F. Tereshchenko (Zdorovtsov & Zinchenko & Tereshchenko, 1987), O.I. Zinchenko, Yu.F Tereshchenko L.O. Tsymbrovska (Zinchenko & Tereshchenko & Tsymbrovska, 2007), S.S. Rubin, S.M. Buhai, P.P. Kitsno (Rubin & Buhai & Kitsno, 1957), V.P. Syhyda (Syhyda, 2007), L.O. Tsymbrovska (Tsymbrovska, 1987), I.M. Karasiuk (Karasiuk, 1994). Scientific studies by S.I. Chernetskyi (Chernetskyi, 2013; 2014), O.A. Demydov, V.M. Hudzenko, H.P. Kuzminska (Demydov & Hudzenko & Kuzminska, 2017) and others are devoted to this issue. As a result, a high assessment of his contribution to domestic breeding science acquired a new development.

The source base of the research consists of the materials of the archive of Uman National University of Horticulture (hereinafter referred to as the UNUH), archive funds of the History Museum of the UNUH and scientific works of I.M. Yeremeiev (Yeremeiev, 1912; 1935)

Research Objective. The purpose of the article is to determine the contribution of I.M. Yeremeiev to the development of breeding science and to show the role and place of his scientific work for the further development of domestic breeding.

Statement of basic materials. Ivan Maksymovych Yeremeiev, an outstanding Ukrainian scientist and breeder, was born on January 19, 1887 in the city of Romny, former Poltava province (now Sumy region). After the death of his father in 1892, the mother with five children, among whom Ivan was the eldest, had to move to the city of Kursk for permanent residence. There, in 1897, Ivan entered a nonclassical secondary school. From 1904 to 1907, Ivan Yeremeiev studied at Kharkiv Institute of Technology at the Faculty of Chemistry; took an active part in the revolutionary events of 1905-1907. In order to avoid persecution, Yeremeiev immigrated through Switzerland to France, where he successfully studied (1907-1909) and received a diploma of «higher agronomic sciences» from the agronomic institute of the University of Nancy (Archival Funds of the History Museum of Uman NUH. Diploma of the University of Nancy (Institut agricola de l'Université de Nancy). RP – 556). Until 1912, he lived in Paris, continuing his studies at the Sorbonne, the Louis Pasteur Institute and the Museum of the Botanical Garden (Archives of Uman National University of Horticulture. Curriculum vitae, Sheet. 164; Archive Funds of the History Museum of Uman National HUH. Biography (Curiculum vitae). RP – 12), where he gained deep theoretical knowledge, practical training and experience in breeding and seed production, agronomy, technology, botany, chemistry, plant protection etc. In addition, the young agronomist visits the famous firm of Vilmoren brothers in France, where he got acquainted with the results of genetic selection and seed work.

At this time, Ivan Maksymovych conducted independent theoretical and experimental research. In 1909-1913, he published his first scientific works on fruit growing, vegetable growing and phytopathology in the Russian agricultural periodicals «Progressive Horticulture and Vegeculture», «Fruit Growing», «Host». His scientific work «Diseases of fruit trees and struggle with them» was the most extensive (1912) (Yeremeiev, 1912). While living abroad, Ivan Maksymovych began in-depth research in genetics, breeding, plant physiology, which in the future became the basis for the development of a system of measures aimed at the development of domestic crop production, in particular, the selection of new varieties.

In 1912, I.M. Yeremeiev, knowing that a network of experimental fields and stations was being created in Ukraine, joined the selection work, temporarily worked in Serbia as an agronomist at the experimental station in the city of Topcider (Archives of Uman National University of Horticulture. Curriculum vitae, Sheet 165). In 1916, he worked as the assistant director of Ivanivka Breeding and Research Station (now Ivanivka Research and Breeding Station of the Institute of Bioenergy Crops and Sugar Beet of the National Academy of Sciences of Ukraine). In 1917 as a senior specialist in the Department of Selection and Seed Production of Winter Wheat, Oats and Sugar Beet of Myronivska Research and Breeding Station (now Myronivskyi Wheat Institute named after V.M. Remeslo of the National Academy of Sciences of Ukraine) (Archive funds of the History Museum of Uman NUH. Biography (Curiculum vitae). RP – 129).

Under the leadership and direct participation of I.M. Yeremeiev, winter wheat varieties «Ukrainka 0246» and «Yuvileyna 0103» were bred at Myronivska breeding station. At the same time, the oat varieties № 90 and № 70 were bred at the station.

I.M. Yeremeiev described the history of the world-famous «Ukrainka» in the monographic essay «Winter wheat «Ukrainka» 0246 Myronivska station» (Yeremeiev, 1928). Ivan Maksymovych studied and described its features, its advantages and disadvantages

equally objectively, and defined the task of selection for the future (Archive funds of the History Museum of Uman NUH. I.M. Yeremeiev. How I bred «Ukrainka». RP – 548).

For the accelerated reproduction of Ukrainka 0246, Yeremeiev managed to attract to the cooperation the individual and collective farms and famous scientists-professors A.M. Levshyn, D.M. Prianishnikov, S.M. Bohdanov, V.M. Vasyliev, M.M. Kuleshov, V.V. Kolkunov, L.P. Maksymchuk, V.Ye. Pysariev, I.V. Yakushkin, P.I. Bohdan, K.M. Chinho-Chinhas etc.

In 1920, after recording the harvest (the advantage reached 20-25%) and other characteristics for all years, in accordance with the wish of S.L. Frankfurt, the first director of the station, it was decided to name the first created variety Ukrainka, combining the name with its number (№ 0246) (Archive funds of the History Museum of Uman NUH. I.M. Yeremeiev. How I bred «Ukrainka». RP – 548; Pipan, 2013: 76).

Since 1921, I.M. Yeremeiev has been using the method of repeated selection and progeny tests to obtain the original super elite material. According to the test results of 1921-1922, Ukrainka was characterized as a high-yielding, frost-resistant and drought-resistant variety with excellent grain quality. Ukrainka also showed high results in the test at other stations – in Poltava, Ivanivka, Illintsi. Since that year, Ukrainka was included by the Sorting and Seed Department in the assortment of the collective test, and the further identification of its biological and economic characteristics is connected with the work of a number of research and sorting institutions (Archive funds of the History Museum of Uman NUH. I.M. Yeremeiev. How I bred «Ukrainka». RP – 548; Demidov & Gudzenko & Kuzminska, 2017: 230-232).

According to the results of the State variety testing on June 18, 1923, the Seed and Variety Department recognized «Ukrainka 0246» as a universal, high-yielding and drought-resistant variety with high baking qualities for introduction in Left- and Right-Bank Ukraine and a record holder in Ukraine. The certificate for the variety was approved in Kyiv and was entered in the book «Variety

Stations of the Sakharotrest. Ed. S.S.U.K., 1923» (Archive funds of the History Museum of Uman NUH. Materials on the state variety testing of the winter wheat variety «Ukrainka» (manuscript by I.M. Yeremeiev). RP – 545).

In 1923, Ukrainka was exhibited at the All-Union Agricultural Exhibition in Moscow, among other varieties created at the stations of the Seed and Variety Department. In the same year, I.M. Yeremeiev gave two more varieties of winter wheat – Yuvileina № 103 and Myronivska 095, but they were inferior to Ukrainka in terms of yield and grain quality and quickly lost their economic importance.

In 1925-1927, the additional collection of grain from its introduction amounted to 277 thousand tons. It became the pride of domestic selection and a calling card of Ukraine (Levshyn, 1927: 321; Litovkin, 1931: 32).

In 1927, Ukrainka 0246 was exhibited at the international Leipzig Trade Fair (Germany) as a «record holder» among wheats tested in collective experiments under the conditions of a peasant farm.

In 1929, Ukrainka 0246 was zoned in the former Soviet Union, and in the mid 1930s, it occupied the largest area (over 7 million hectares) and was sown in many countries: except Russia and Ukraine, the variety was grown in Transcaucasia, Kazakhstan and Kyrgyzstan. Its yielding capacity was 30 t/ha, while before Ukrainka, the highest harvest barely reached 18 t/ha (Demydov & Gudzenko & Kuzminska, 2017: 234).

In 1956, the UN approved Ukrainka 0246 as the international standard for strong wheat. Due to its excellent baking qualities and yield capacity, it has become an important export item (Pipan, 2013: 79).

In the first volume «Theoretical Foundations of Plant Breeding» (1935), the following works of Ivan Maksymovych in collaboration with other scientists were published: «Current State of the Pure Lines Doctrine» and «Intraspecific Hybridization» (Yeremeiev & Yakubtsiner & Basova, 1935: 165-180; Yeremeiev &

Fedorov, 1935: 165-180). The academician M.I. Vavilov expressed a high opinion of his merits, as well as the advantages of Ukrainka 0246, its excellent flour and bread-making qualities, high productivity and significant distribution (Theoretical Foundations of Plant Breeding, 1935: 62). It was used in crosses directly or as a hybrid with other varieties. Its descendants are more than 300 varieties of winter and spring wheat, including the winter wheat variety Bezosta 4, the descendants of which, in turn, became the masterpiece of world selection Bezosta 1, as well as Aurora and Kavkaz – parental forms of more than a thousand wheat varieties selected by various scientific institutions of the world (Syhyda, 2008: 28).

The great tribute of I.M. Yeremeiev was that, with his skillful and clear work, he finally identified the future Ukrainka as not only a variety undemanding to growing conditions, but also as high-yielding and stable one, which previous breeders could not do during the first comparison of the sample with others on small areas. In addition, I.M. Yeremeiev accelerated the propagation of a valuable variety and formalized its transfer to the state variety testing (Archive funds of the History Museum of Uman NUH. Materials on the state variety testing of the winter wheat variety «Ukrainka» (manuscript of I.M. Yeremeiev). RP – 545; Chernetskyi, 2014: 84).

Ivan Maksymovych was an active participant of the organization of Masliv Agricultural Technical School (1921) and its reorganization into the K.A. Timiriazev Breeding and Seed Production Institute in 1928 (now Masliv Agricultural Technical School named after P.Kh. Harkavyi). As a second job, he taught a course on breeding and seed production with educational practice in Myronivka and was elected a professor (Archives of Uman National University of Horticulture. Curiculum vitae, Sheet 165; Tereshchenko & Kitsno, 1987).

In the monographs published in Kharkiv in 1930, Ivan Maksymovych gives the convincing results from the scientific report of the station's research on the causes of the wheat and rye

death (Archive funds of the History Museum of Uman NUH. Yeremeiev I.M. Study of agricultural technology varieties of winter wheat: Extended abstract of candidate's thesis. Kyiv, 1963. RP – 575; Zdorovtsov & Zinchenko & Tereshchenko, 1987: 137 – 138; Zinchenko & Tereshchenko & Tsymbrovska, 2007: 8-9). I.K. Bobyr, director of Myronivska breeding and research station in 1926-1932, highly appreciated Ivan Maksymovych's contribution to the breeding and distribution of Ukrainka 0246, his talent, ability, ingenuity and ability to cooperate. He confirmed that the accusations were fabricated, because at that time wheat and rye varieties died in experiments and production crops (Archive funds of the History Museum of Uman NUH. Memories of Bobyr N.K., the former director of Myronivska breeding station about I.M. Yeremeiev. RP – 35).

After his unjustified arrest and release from Lukianivska prison in 1931-1933, Ivan Maksymovych headed the breeding department of the All-Union Research Sugar Beet Institute (now the Institute of Bioenergy Crops and Sugar Beet of the National Academy of Sciences of Ukraine). Academician M.I. Vavilov, highly appreciating him as a scientist, invited Yeremeiev to work as a scientific specialist, head of the wheat department and deputy director in the Pushkin branch of the All-Union Institute of Plant Breeding (1934-1937). Later he worked as a Head of the department of Leninhrad State Breeding Station (Archive funds of the History Museum of Uman NUH. Biography (Curiculum vitae). RP – 129; Borsuk, 2009: 427). M.I. Vavilov entrusted him with difficult and responsible tasks. I.M. Yeremeiev propagated the varieties bred by V.E. Pysariev, the seeds of which were in short supply, established seed production, launched scientific and research work with the aim of creating such a variety for the North, as «Ukrainka» for the South. It was the period of the development of the All-Union Research Institute of Plant Breeding.

Under Yeremeiev's leadership and with his direct participation, the winter wheat varieties DC 2444/2 and spring varieties Tulun 3A/32 and Tulun 70 B/8 were bred (Archive funds

of the History Museum of Uman NUH. Yeremeiev I.M. Study of agricultural technology varieties of winter wheat: Extended abstract of candidate`s thesis. RP – 575). However, Ukrainka 0246 was beyond example. In 1936, Ivan Maksymovych was awarded the scientific degree of Doctor of Agricultural Sciences due to the set of published works without a dissertation defense and the academic title of a valid member of the All-Union Research Institute of Plant Breeding. For his participation in the All-Union Agricultural Exhibition of 1939-1940, he was awarded a gold medal (Archive funds of the History Museum of Uman NUH. Biography (Curiculum vitae). RP – 129; Biologists: biographic reference book, 1984: 816).

In 1941-1944, I.M. Yeremeiev worked as a deputy director and head of the wheat selection and seed production department of the North Dvina breeding station of Arkhangelsk region, where he significantly improved the seed production work (Archives of Uman National University of Horticulture. Curiculum vitae. Sheet 171).

In 1945-1951, Ivan Maksymovych headed the Department of Selection and Seed Production of Bila Tserkva Agricultural Institute (now Bila Tserkva National Agrarian University). By the decision of the State Commission for Academic Degrees and Titles of the USSR in 1946, I.M. Yeremeiev was awarded a diploma of Doctor of Agricultural Sciences and a professor's certificate (Archives of Uman National University of Horticulture. Curiculum vitae. Sheet 173; Tsymbrovska, 1987).

In 1951, due the initiative of Professor S.S. Rubin, I.M. Yeremeiev was invited to Uman Agricultural Institute, where he worked as the head (1951-1955) and professor (1956-1957) of the plant-breeding department. In Uman, I.M. Yeremeiev continued his work on the improvement of Ukrainka 0246 and its varietal agricultural technology (Archive funds of the History Museum of Uman NUH. Yeremeiev I.M. Study of agricultural technology varieties of winter wheat: Extended abstract of candidate's thesis. RP – 575; Uman State Agrarian University..., 2009: 52; Chernetskyi,

2013: 102). Together with professors S.S. Rubin and S.M. Buhai, they significantly strengthened the work of the graduate school and the scientific student society. Ivan Maksymovych's son – Mykola Ivanovych Yeremeiev – under the guidance of Professor S.M. Buhai, in 1963 prepared and defended a dissertation on the peculiarities of varietal agricultural technology of the new variety Bilotserkivska 198 compared to «Ukrainka 0246». In cooperation with I.M. Yeremeiev, Professor S.K. Rudenko, the head of the Department of Botany, applying the spring-summer nitrogen fertilization of Ukrainka 0246 and, if necessary, sprinkling, in critical periods of organ formation of productivity elements according to the method of Academician A.O. Sapiehin, obtained the record yield of high-quality grain «Ukrainka 0246» – 60 t/ha. In addition, V.A. Ilchenko, graduate student of Professor S.S. Rubin, first investigated and mounted on the stand the peculiarities of the root system of Ukrainka 0246. It is still used in the educational process.

His students – well-known graduates of Uman Agricultural Institute, continued the lifework of the outstanding scientist and breeder. These are famous scientists: Hero of Socialist Labor F.H. Zahoruiko, Hero of Ukraine L.Ya. Yakovyshyn, Doctors of agricultural sciences, Professors F.M. Parii, O.I. Zinchenko, Yu.F. Tereshchenko, Candidate of agricultural sciences, associate professor V.P. Syhyda, whose scientific research is successfully used nowadays.

Conclusions. The work of this outstanding scientist on the creation of high quality and intensive varieties of grain crops, the solution and development of theoretical foundations and methods of conducting the breeding process belong to the heritage of domestic and world selection science. His main research works are devoted to theoretical and methodical issues of selection, intraspecific hybridization and obtaining pure lines. The scientific achievements of I.M. Yeremeiev were a significant contribution to the development of breeding science in Ukraine in the first half of the 20th century. Ivan Maksymovych entered the history of breeding

as the creator and decisive co-author of Ukrainka 0246, which is the pride of the domestic selection and the calling card of Ukraine abroad. The contribution of I.M. Yeremeiev to the development of plant breeding is invaluable and multifaceted. It needs further research and study.

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АНОТАЦІЯ

У статті на основі джерел та публікацій досліджується внесок професора І.М. Єремеєва у розвиток вітчизняної науки та практики. Актуальність теми дослідження зумовлена тим, що рушійною силою соціально-економічного рівня країни є розвиток науки й техніки. Досягнення вітчизняних науковців є одним із визначальних факторів технічного прогресу та економічного розвитку держави.

Методолологічну основу дослідження становлять загальнонаукові принципи та методи.

В процесі дослідження проаналізовано наукову діяльність видатного вченого-селекціонера – І.М. Єремеєва по створенню пластичних, життєстійких, високобілкових і високоврожайних сортів, розробці теоретичних основ і методів селекційного процесу.

Наголошено, що в історію селекції він ввійшов як провідний співавтор озимої пшениці «Українка 0246», яка є гордістю вітчизняної селекції й візиткою України. Відзначено, що в 1920 р. сорт отримав свою назву, був районований у 1929 р., а у 1956 р. – затверджений ООН як міжнародний стандарт для сильних пшениць, завдяки високій урожайності

та добрим хлібопекарським якостям, став важливою статтею радянського експорту та визнаним світовим стандартом якості хліба. Зазначено, що «Українка 0246» використовувалась у схрещуванні безпосередньо та через виведені з її участю сорти. Її нащадками є понад 300 сортів.

З'ясовано, що під керівництвом І.М. Єремеєва Ленінградською селекційною станцією виведено й передано держкомісії на випробування сорти пшениці, вівса, ячменю й гороху, районовано озиму пшеницю ДС 2444, ярі – Тулун 3А/32 і Тулун 70В/8 та гречку Альгаузен, проте головним досягненням життя І.М. Єремеєва є створення й поширення «Українки 0246».

Ключові слова: *професор І.М. Єремеєв, вчений-селекціонер, наукова діяльність, селекція в рослинництві, Миронівська селекційна станція, сорти озимої пшениці, «Українка 0246», кафедра рослинництва, Уманський сільськогосподарський інститут.*