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### **I. L. SERBINOV: MULTIFACETED PERSONALITY OF A SCIENTIST**

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**Abstract.** The article is dedicated to the 150th anniversary of the outstanding Ukrainian scientist Ivan Lvovich Serbinov (1872–1925). The life and activity of the researcher took place during a rather difficult time. It includes several revolutions, the First World and civil wars, fundamental changes in social and political spheres. But despite all the difficulties, this period was also marked by significant scientific achievements, emerging a large number of outstanding scientists, in particular, in the field of biology. Having studied the scientific heritage of the investigator, it is possible to prove the exceptional versatility of his activity. I. L. Serbinov worked in the field of mycology, microbiology, phytopathology, studied insect and fish diseases. He wrote more than 100 works and twice as many essays and abstracts dedicated to phytopathology. However, the biggest breakthrough in science is his research on bacterial plant diseases. Serbinov developed a method of studying plant bacteriosis; described and studied causative agents of diseases on potatoes, beets and other garden plants, fruit trees and grapes; discovered new species of bacteria parasitic on plants. Formulated by Serbinov’s doctrine on mixed infection is a valuable contribution to the theoretical and practical achievements in microbiology. In addition to the research field, the authors emphasize the lecturing and popularizing activities of the scientist. The main directions of research in various periods of Serbinov’s life such as St. Petersburg, Crimea and Odesa are also analyzed. It is noted that the scientist’s priority in many fields of biological science was recognized not only by his contemporaries – A. A. Yachevsky, M. S. Voronin, A. S. Bondartsev, but also the following generations of researchers, among which were M. V. Horlenko, K. H. Beltyukova, R. I. Hvozdyak etc.

**Key words:** infectious diseases, bacteriosis, microbiology, phytopathology, mixed infection.

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## І. Л. СЕРБІНОВ: БАГАТОГРАННА ОСОБИСТІТЬ ВЧЕНОГО

**Анотація.** Стаття присвячена 150-річчю від дня народження видатного українського вченого Івана Львовича Сербінова (1872–1925). Життя і діяльність дослідника випала на досить складний час. Він охоплює кілька революцій, Першу світову та громадянську війни, кардинальні зміни в суспільно-політичному житті. Але попри все цей період відзначився також значними науковими досягненнями, появою плеяди видатних вчених, зокрема в галузі біології. Дослідивши наукову спадщину вченого, можна стверджувати про виняткову різносторонність його діяльності. І. Л. Сербінов працював у галузі мікології, мікробіології, фітопатології, вивчав хвороби комах та риби. Тільки з питань фітопатології він написав понад 100 праць і вдвічі більше нарисів і рефератів. Однак найбільший прорив в науці становлять його дослідження бактеріальних хвороб рослин. Сербінов розробив методики вивчення бактеріозів рослин; вивчив і описав збудники захворювань картоплі, буряку та інших городніх рослин, плодівих дерев та винограду; відкрив нові види бактерій, що паразитують на рослинах. Сформульоване І. Л. Сербіновим вчення про змішану інфекцію є цінним внеском у теоретичний та практичний арсенал мікробіології. Окрім дослідницької сфери, автори акцентують на викладацькій та популяризаторській діяльності науковця. Аналізуються основні напрями досліджень у різні періоди життя Сербінова – Петербурзький, Кримський та Одеський. Зазначається також, що пріоритет вченого в багатьох галузях біологічної науки був визнаний не лише його сучасниками – А. А. Ячевським, М. С. Вороніним, О. С. Бондарцевим, але й наступними поколіннями дослідників, серед яких: М. В. Горленко, К. Г. Бельтюкова, Р. І. Гвоздзяк та ін.

**Ключові слова:** інфекційні хвороби, бактеріози, мікробіологія, фітопатологія, змішана інфекція.

**Introduction.** Starting from the middle of the 19th century in the Russian Empire, mycology and related to it phytopathology was actively developed, the role of mycology in phytopathological research increased significantly. This process was also observed on the territory of Ukraine. Thus, in the first quarter of the 20th century, there were already three mycological and phytopathological centers in Ukraine – Kyiv, Kharkiv and Odesa. The last of them was directly connected with the name of I. L. Serbinov.

**Sources and methods.** Життя та діяльність вченого розглядається на основі низки архівних документів та джерел науково-історичного характеру. Автори аналізують архівні джерела та історіографічні праці, присвячені життю та діяльності Сербінова

The scientist's life and activities are considered on the basis of a number of archival documents and scientific-historical sources. The authors analyze archival sources and historiographical works devoted to Serbinov's life and activities. That is why special methods were used in writing the work, among them historical-biographical, historical-chronological, retrospective and methods of source analysis

Thus, **the aim of the article** is a more complete reproduction of scientists' life and his activity in the field of mycology and phytopathology.

**Basic material and results.** According to autobiography, Ivan Lvovich Serbinov was born on July 12, 1872 in St. Petersburg [4, sh. 56]. He came from the nobles of the Kherson province. Primary education I. L. Serbinov received in the St. Petersburg Historical and Philological Gymnasium. Then he studied at the natural science department of the physics and mathematics faculty of St. Petersburg University. Archive information shows that on May 30, 1898, Serbinov graduated from the university with a second-degree diploma [5, sh. 23].

Soon, the future scientist received an offer from the superintendent of the St. Petersburg educational district, and from May 1, 1899, he assumed the position of freelance curator at the Botanical Cabinet of St. Petersburg University. In the same year, his first scientific works devoted to lower fungi were published. In 1900, speaking at the 11th Congress of Russian Naturalists and Doctors, he made a report on the morphology of chytrid fungi [18]. According to the data from one of the little accessible sources [14], among his colleagues at the university during this period were honored professors of the Botany Department A. M. Beketov, Zoology and Comparative Anatomy Department M. P. Wagner, Chemistry Department M. O. Menshutkin. Zoologist O. M. Nikolsky, plant physiologist D. Y. Ivanovsky, microbiologist G. A. Nadson, botanist and geographer G. I. Tanfiliev worked at that time as private docents at the Faculty of Physics and Mathematics.



In October 1900, I. L. Serbinov was transferred to the full-time position of an assistant at the Botany Department of the Military Medical Academy. In 1901, he began teaching at the Women's Medical Institute, founded in 1872 as the Women's Medical Course at the Medical and Surgical Academy. In 1876, the four-year teaching course was replaced by a five-year one, which already corresponded to university education in duration. In the same year, the courses were separated from the Academy, and classes were held at the Mykolaiv Military Hospital. For this purpose, the hospital building was equipped with special classrooms, offices and laboratories [3].

In 1902, I. L. Serbinov began to work as botanist-horticulturist of the Nikitsky Botanical Garden. He took this position instead of A. O. Potebnya, who by that time had already returned to Kharkiv. While in Yalta, I. L. Serbinov during 1902–1905 taught a special course on viticulture and vine diseases at the Higher Courses of Viticulture and Winemaking. Later, the courses were transferred to Odessa. During this period, the sphere of Serbinov's scientific interests changed from the study of the morphology and development of lower fungi to the researching their parasitism on plants. He investigated fungal diseases of potatoes, grapes and tobacco seedlings. This is evidenced by a number of articles published during 1902–1906 in the monthly "Leaflet for the control of diseases and damage to cultivated and wild useful plants".

In March 1906, I. L. Serbinov was retired at his own will from the position of botanist-gardener. According to proposition the scientist began to teach the private docent courses "Agricultural bacteriology" and "Phytopathology" at the Botany Department of the St. Petersburg University from July 1, 1906. Following another proposal, in May of the same year, he again received the position of freelance keeper in the university's botanical office. In 1907, at a meeting of the Faculty of Physics and Mathematics, I. L. Serbinov defended his thesis on the topic "Organization and development of the fungus *Chitridineae Schröter*" and on May 21, he was approved by the University Council as a Master of Botany. In this work, according to A. A. Yachevsky, "Serbinov provided detailed information on the history of organisms he studied and contributed a lot to the clarification of the phylogenetics and systematics of this complex group" [10, p. 117].

While working at St. Petersburg University (1906–1916) among the colleagues of I. L. Serbinov at the Faculty of Physics and Mathematics were ordinary professors of the Chemistry Department V. I. Palladin and O. Ye. Favorsky, Botany Department M. Ye. Vvedensky, Department of Applied Mathematics V. A. Steklov; doctor of Zoology V. O. Wagner, master of Zoology O. S. Shchepotiev, master of Chemistry V. O. Kistiakivsky, masters of Botany S. P. Kostychev and V. L. Komarov, bacteriologist B. L. Isachenko and zoologist O. K. Mordvilko [13].

An interesting fact is that in May 1909, I. L. Serbinov received an appointment for a trip abroad at the expense of the university. He worked in the German city of Heidelberg, in the laboratory of Professor Klebs. Here he dealt with issues related to the topic of his doctoral dissertation. And at the end of the year, Serbinov was delegated to the XII congress of naturalists and doctors, which was held in Moscow from December 28, 1909 to January 6, 1910. At the suggestion of the trustee of the St. Petersburg educational district I. L. Serbinov worked as a full-time laboratory assistant in the cryptogamic office of St. Petersburg University from March to September 1911 [5, sh. 27].

At the beginning of the 20th century frequent outbreaks of plague epidemics took place in the Russian Empire. Therefore, in 1912, the Ministry of Internal Affairs and the St. Petersburg Institute of Experimental Medicine sent I. L. Serbinov to the Ural region. There he participated in the expedition of Professor D. K. Zabolotny to solve a number of problems related to the natural science, in particular for the study of the plague microbe [4, sh. 57].

It is worth noting that for conscientious service at St. Petersburg University I. L. Serbinov got several awards. Finally, in 1906, for years of work, he received the rank of titular adviser, and in 1913 – the rank of external adviser and the right to wear a light bronze medal, which was engraved in memory of the 300th anniversary of the Romanov family reign [5, sh. 25, 28].

In addition to working at the University, I. L. Serbinov taught a course on microbiology and infectious diseases of fishes at the Kamianoostriv agricultural courses at the same time. Here he created a microbiological laboratory and a museum dedicated to fish diseases. It should be emphasized that Serbinov took a direct part in the organization of this institution and worked here from the moment of its opening until 1916. He developed and taught an original course on infectious bacterial and fungal diseases of commercial fishes. In an abbreviated form, this course was included as an integral part of the microbiology textbook published in St. Petersburg under the general editing of Professor S. I. Zlatohorov [24]. At the same time, Serbinov studied bacterial and fungal diseases of bees. The scientist devoted a number of works to these problems, one of which became the first capital work on this topic [19]. Elected as a board member of the Russian Beekeeping Society, he organized and headed the society's honey research laboratory. And in the village of Mala Izhora near Oranienbaum, on his initiative, a research station for the study of infectious bee diseases was opened. During 1913–1915, I. L. Serbinov also worked at A. A. Yachevsky at the Central Phytopathological Station, and in 1916 he moved to Ukraine.

It is also worth emphasizing that in 1912 I. L. Serbinov began researching bacterial plant diseases. This is evidenced by four articles devoted to bacterial cancer of grapevines, fruit trees, berry bushes and other garden plants. The scientist not only noted the similarity of the structure of some types of cancerous tumors in plants, animals and humans. In these works, he noted that the cause of cancer in plants were bacteria [6, p. 184].

As far back in 1901, at the Main Botanical Garden in St. Petersburg, on the initiative of A. A. Yachevsky, the Central Phytopathological Station was founded. And in November 1913, I. L. Serbinov was appointed assistant director of this station. Here he began to manage the newly created department of bacterial and functional plant diseases. It was the first scientific unit in Russian Empire specializing in this direction. During three years (1913–1916), Serbinov discovered a significant spread of bacterial cancer on fruit and mulberry trees and grapes from the Baltic Sea to the shores of the Black Sea, in the Crimea and the Caucasus. It turned out that bacteria affect different varieties of sugar beet, tomatoes, potatoes, and cause pear bark necrosis and sorghum humosis.

As already mentioned above, Serbinov began researching bacterial plant diseases as early as 1912, before he moved to the Main Botanical Garden. Now, managing and personally engaged in these studies, the scientist has published a number of works describing the causative agents of bacteriosis and methodical approaches to their study. In this regard, one should agree with the following conclusion of A. S. Bondartsev: “After joining the Phytopathology Department of the Main Botanical Garden in 1913, Ivan Lvovych finally devoted himself to the study of bacterial plant diseases. This period is the most fruitful in his activity” [2, p. 32]. I. L. Serbinov together with A. S. Bondartsev prepared the second part of the publication of

the Imperial Russian Society of Fruit Growing “Fungal Diseases of Fruits and Vegetables”, which was launched in 1912. In this work authors noted, that it is impossible longer to ignore the presence of plants bacterial diseases: “Taking into account that some of the ... plants often suffer from bacterial diseases that cause significant damage, the authors considered as necessity to give in this brochure a brief description of some bacterial diseases, the external signs of which resemble fungal ones” [2, p. 3].

In 1914, I. L. Serbinov was on a business trip at the expense of the Central Botanical Garden in Austria-Hungary and Germany. The purpose of the trip was to get acquainted with the organization of the work in phytopathological and mycological institutions. And in 1915, Serbinov was sent on a business trip to St. Petersburg and neighboring provinces for phytopathological research. In the same year, the scientist was appointed to the position of senior specialist in the agricultural department (mycology and phytopathology).

In 1915, I. L. Serbinov studied bacterial diseases of potatoes and cruciferous plants; published two articles devoted to methods of combating plant bacteriosis and a big popular work “Bacteria and fungi in agriculture”. He discovered new types of bacteria: *Bacillus Omelianskii Serb.*, *Andropogon sorghum Brot* which causes humosis of sorghum, *Bacterium amylovorum (Bur.) Serb.* – causative agent of bark necrosis of fruit trees, and *Bacterium beticola Serb.* (later renamed by A. O. Potebnya to *Bacterium Serbinovi (Serb.) A. Pot.*), affecting seeds, stems, and especially roots of sugar beet *Beta vulgaris L.* A new species of bacteria *Proteus Nadsonii Lobik n. sp.*, which affects *Solanum tuberosa* potato tubers, was described by A. I. Lobik – one of the employees of the subdivision of I. L. Serbinov [7, p. 89].

Of great interest is the very informative I. L. Serbinov’s work, dedicated to bacterial cancer of fruit and other plants, which presents a thorough review of foreign and native literary sources on the specified issue. The nature of bacterial plant cancer, writes I. L. Serbinov, remained unknown until the beginning of the 20th century. Currently, the author notes, the existence of bacterial cancer is beyond doubt, and, moreover, it can be considered proven that various types of microbes are capable of causing it [1].

From January to April 1916, Serbinov headed the Phytopathological Department of the Don Bureau for the fight against pests of agricultural plants [5, sh. 28]. However, three months later he was transferred to Odesa for performing the duties of a phytopathologist at the Odesa winemaking station. At the station, he headed the Department of Phytopathology and again began to lecture general microbiology and grapevine diseases at the Higher Courses on Viticulture and Winemaking, as in Yalta before. His entire family came to Odesa: his wife Zinaida Ivanivna (maiden name Nazarova), two sons – Volodymyr and Mykhailo, and three daughters – Natalia, Lidia and Zinaida [5, sh. 24].

After moving to Odessa in 1916, I. L. Serbinov began working as a private associate professor at the Department of Botany at Novorossiysk University. There he lectured the courses “Fundamentals of phytopathology” and “Practical course of mycology”. His colleagues at the Faculty of Physics and Mathematics were honored ordinary professors – doctors of Chemistry Y. F. Klymenko, S. M. Tanatar and doctor of Zoology Y. M. Lebedynsky. Among the ordinary professors in 1916–1918, there were doctor of Geography and master of Botany G. I. Tanfiliev, doctor of botany B. B. Hrynevetskyi, doctor of Astronomy and Geodesy O. Ya. Orlov, doctor of Agronomy O. H. Nabokykh. Doctor of Botany F. M. Porodko, who started his career as an assistant in the botanical laboratory, served as an extraordinary professor since 1916. In addition to Serbinov himself, private associate professorships were held by doctor of Medicine Ya. Yu. Bardakh, who in 1895 introduced courses in general and special bacteriology for the first time in Russia for students of the university’s Faculty of Natural Sciences; future academician of the Ukrainian Academy of Sciences, zoologist D. S. Vorontsov and others [12].

While in Odessa, Serbinov also lectured at the Higher Women’s Courses. In December 1917, he turned to the committee of the Odesa Winemaking Station with a request to allow him to concurrently serve as the head of the Department of Phytopathology of the specified station and a full-time position as a senior assistant at the Botany Department of the Novorossiysk University. But the committee decided that such co-operation would not be useful for the

performance of Serbinov's duties as the head of the phytopathology department at the Odesa winemaking station. Therefore, Serbinov was given permission for completely transfer to Novorossiysk University [17].

However, the following year, the scientist was offered the position of professor at the newly established Odesa Agricultural Institute. It is worth noting that as far as in the middle of the 19th century, the Agricultural Society of Southern Russia raised the question of the need to organize an educational institution of an agronomic profile in regions with an arid climate. In 1914, the State Duma approved the opening of agricultural institutes in Omsk and Odesa. But the First World War interrupted this project. However, scientists continued to insist on the need for specialized training of agronomic personnel.

Finally, in November 1917, the establishment of the Odessa Agricultural Institute was officially announced, and at the beginning of 1918 it was opened [16]. In this educational institution I. L. Serbinov was elected professor of two departments at the same time: general microbiology and phytopathology. He gave lectures on phytopathology for 4 hours a week, along with courses of A. A. Yachevsky, S. I. Rostovtsev, L. I. Kursanov, M. O. Naumov and M. I. Vavilov. Lectures and practical classes, such as identification of mushrooms according to A. A. Yachevsky, I. L. Serbinov conducted using 150 visual samples from the "Museum of Phytopathology" created by him, and an atlas of 150 color tables made under his guidance. At the end of the academic year, he took practical tests and exams from about 60 students in phytopathology [22].

In addition to I. L. Serbinov, other famous scientists worked at the agricultural institute. The director of the institute in 1919–1921 was professor A. O. Sapegin (1883–1946), who at the same time continued lecturing at Novorossiysk University. The organizer and first dean of the Zootechnical Faculty was professor O. O. Browner (1857–1941). One of the founders of the Institute, professor G. A. Borovikov (1881–1958), conducted research on the anatomy and physiology of the grapevine [15].

However, the Odessa period of I. L. Serbinov's life was noted for his activity not only in the field of lecturing, but also in research. Among the purely mycological works of this period, it should be mentioned an article devoted to the study of the morphology and biology of fungus from the chytrid genus – *Lagenidium sacculoides*, which is parasitic on the desmidium algae and was first described by this scientist [8]. I. L. Serbinov studied microbial diseases of bees and other insects, pathogens of commercial fish, tadpoles and caviar of Ukrainian reservoirs. But his scientific interests focused mainly on bacterial diseases of plants: eggplant, Sudanese grass, sweet pepper, corn, wheat, cotton, etc. His development of the doctrine of mixed infection was an indisputable contribution to science.

According to I. L. Serbinov, bacteria can cause either a "pure infection" or a "mixed infection", depending on whether they infect plants by themselves or in symbiosis with fungi. For the first time, he established the presence of a mixed infection while studying the bacteriosis of barley caused by *Micrococcus tritici* Pr. This disease was first discovered in 1908 in the vicinity of Stockholm in Sweden, where it destroyed large batches of barley. In 1920–1921, I. L. Serbinov ascertained its presence in the south of Russian Empire, in the vicinity of Odesa, where it moved from seeds to barley leaves and created the conditions for a new, mixed disease of this crop that he identified – brown spotting caused by the bacterium *Micrococcus tritici* Pr. and fungi *Helminthosporium gramineum* Rab. and *Helminthosporium teres* Sacc. In an article published in 1925, he noted that for the first time in Europe he managed to discover a permanent symbiosis on a grape leaf affected by mildew (the *Plasmopara viticola* fungus) and a bacterium capable of causing wine fermentation (*Micrococcus acidovorum*). Developing this opinion in a work published after his death, he wrote that "...the massive development of *Alternaria* and *Macrosporium* fungi occurs due to the previous strong development of bacteria that prepare the soil for the mentioned fungi" [23].

However, since the pathological symptoms in the case of pure and mixed infection were similar, not all researchers agreed with the conclusions of I. L. Serbinov. "His works in this regard are completely original and definitely outline new paths," – wrote A. A. Yachevsky, – "... there is no doubt that the role of bacteria in plant diseases is very large and that in many

cases they act as amplifiers of pathological phenomena caused by parasitic fungi, entering into some symbiosis with them. It is a great merit of I. L. that he was the first, it seems, not only in Russia, to point out this circumstance and thus gave a new direction to research” [9, p. 77]. Currently, the phenomenon of mixed infection is the subject of study not only by phytopathologists, but also by specialists in the field of medical and veterinary microbiology.

During Serbinov’s work at the institute, he has also published a short course in agricultural microbiology, in which students were given specific information about bacterial diseases of plants: “Most infectious diseases of humans and animals are caused by bacteria, as well as fungi... Plants also have bacterial diseases. So, for example, gray ring rot of tomatoes is caused in tomatoes and eggplants by a special bacterium *Bacterium (Phytobacter) lycopersicum (Groen.) Lem. et Neum*” [21, p. 77]. He created several works of a popular nature for wide circles of agricultural workers. Very interesting is the work “Bacterial and fungal diseases of seeds” – a true encyclopedia of information on microbial diseases of plants, in which, as can be seen from the title itself, the emphasis is placed on the detection of bacterial nature pathogens [20].

On the occasion of the 25th anniversary of L. V. Serbinov’s lecturing activity, on November 16, 1924, a solemn celebration was held at the Odesa Agricultural Institute. Later, the scientist was sent on a business trip to an entomological and phytopathological congress in Moscow, where he talked about his work and communicated with colleagues. But in the fall of 1925, his health deteriorated, and on October 26 he died.

**Conclusions.** Until the last days of his life, L. V. Serbinov continued to work, leaving behind a number of unpublished manuscripts. His scientific works on various issues continued to be published even after his death: on bacteriosis of Sudanese grass, actinomycosis of sweet pepper, macrosporiosis of grapes, bacteriosis of corn and wheat seeds, homosis of cotton.

However, a real event marked a whole stage in the development of the science of plant bacteriosis became the publication in 1935 of A. A. Yachevsky’s fundamental work “Bacteriosis of plants”. In his monograph, the scientist summarized all the world literature on this issue and stated: “Despite the growing importance of bacteriosis in phytopathology, very little attention is paid to the issue of bacteriosis in general guidelines on plant diseases and only a few pages are devoted” [11, p. 11]. The author paid attention to the works of Ukrainian scientists: research on sugar beet bacteriosis performed by Y. M. Trzebinsky, floristic work on bacteriosis of plants in the Kharkiv region, carried out by A. O. Potebnya. Nevertheless, in his opinion, the works of L. V. Serbinov deserve the highest rating in this field.

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