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BRILL

When Alexander Eig met Nikolai Ivanovich Vavilov – an influential meeting for Israeli botany

Suembikya Frumin[a], Mitia Frumin[b] and Ehud Weiss[a]

[a]Archaeobotanical Laboratory, The Martin (Szusz) Department of Land of Israel Studies and Archaeology, Bar-Ilan University, Ramat Gan, Israel; [b]Hadassah Academic College, Jerusalem, Israel

ABSTRACT

Dr. Alexander Eig is a figure of major importance in the history of botany in Israel. This paper attempts to evaluate, for the first time, personal contacts that influenced his academic development. Archival research reveals that his meeting with one of the greatest plant researchers of the 20th century, N.I. Vavilov, in 1926 had a great impact upon him. It was Vavilov who stimulated the young Alexander Eig to undertake his first taxonomic work and write his first monograph. This article reproduces and discusses a newly discovered letter, written by Vavilov to Yitzhak Volcani, the head of the Institute of Agriculture and Natural History in Israel, under whose leadership Eig began his academic work. This document points to the existence of a mutual understanding and cooperation between Vavilov and Volcani. Furthermore, Vavilov's letter explains why Eig's academic work, and that of generations of Israeli botanists who followed in his footsteps, chartered the path it took.

Introduction

Alexander Eig (born Schedrin, 1895 – died Jerusalem, 1938, Fig. 1) is a figure of major importance in the history of botany in Israel as the first academic plant scientist, and as the co-founder of the first botanical department in a university, the first university botanical garden and the first Israeli botanical journal. The inscription on his gravestone – Founder of Plant Science in Israel (see Supplementary Fig. S1) – evidences this appreciation, even though Eig's research was a continuation of work undertaken by several researchers who preceded him, and by colleagues who worked with him (e.g. Oppenheimer 1935/36; Tidhar 1950; Eshbal 1991). His scientific work and his personal charm had both direct and an indirect influence on generations of scientists in Israel, even many years after his death. Information on Eig can be found in his obituaries (e.g. Anonymous 1938; Feinbrun 1938; Zussman 1938), papers on advances in Israeli botany (e.g. Oppenheimer 1935/36) and on the history of the Hebrew University (Eshbal 1991).

This article focuses on the relationship between Eig and N.I. Vavilov (born Moscow, 1887 – died Saratov, 1943; Fig. 2), who visited Mandatory Palestine in 1926, and tries to reconstruct the personal relations between them. These two prominent scientists died prematurely, at the peak of their scientific careers (Eig from an illness and Vavilov from torture and starvation in Stalin's prison), without leaving any autobiography or archives, and very few photographs. We present new discoveries, which indicate that a Russian-Soviet scientist's visit to Mandatory Palestine in the autumn of 1926 had a lasting influence on the history of the Zionist enterprise, as well as a forgotten personal aspect on Eig (Frumin and Frumin 2015).

Nikolai Ivanovich Vavilov was a pioneering researcher in several fields of genetics, botany and agriculture (e.g. Reznik 1968), and he is considered one of the greatest scientists of the early 20th century. Vavilov came on a scientific expedition to Israel, where he met and became friends with many of the local researchers and agronomists, starting with the director of the Agricultural Research Station (The Zionist Organization, Institute of Agriculture and Natural History) – Yitzhak Elazari-Volcani (1880-1955) and the Station's employee – the botanist Alexander Eig. An unknown letter that sheds light on the relationship between Volcani and Vavilov was found in the archives of the Hebrew University

CONTACT Suembikya Frumin suembikya.frumin@biu.ac.il

Figure 1. Learning tour of Alexander Eig. His assistant – Michael Zohary is standing to the right, holding a bag.

(HUJI – the central archive of the Hebrew University, file 80; HUJ – archive of the Israel National Herbarium) and the Central Zionist Archives (CZA A210/54, Jerusalem). The original of the letter date to 24 November 1926, which Vavilov wrote to Volcani, is published here for the first time. It reveals a high level of mutual understanding between these two researchers and directors of the agronomy in such different countries, namely Mandatory Palestine and the Soviet Union.

The study of these archives as well as Eig's forgotten library (HUJ, Herbarium Library, E. Safra Campus, Givat Ram, Jerusalem), reveals information on his personal contact with Vavilov and colleagues in Russia. These data indicate how important the meeting with Vavilov was for Eig as a scientist, and for the formation of the scope and interest of his subsequent research. The meeting between Eig and Vavilov significantly influenced botanical and geobotanical research in Israel and the Middle-East to this day.

Figure 2. Nikolai Ivanovich Vavilov (left) with Ivan Vladimirovich Michurin (right) (Archive of VIR).

Alexander Eig: Short biography up to 1926

A. Eig (Eig, Alexander Ben Zvi [Grigorievitch]) was born in 1895 in Schedrin, Republic of Belarus (then part of the Russian Empire). He immigrated alone to Palestine

(then part of the Ottoman Empire) in 1909, at the age of 14. Here he began his studies in the Miqve Israel Agricultural School of the Alliance Israélite Universelle organization. Eig, a descendent of a family of non-religious, Russian-speaking revolutionaries, found himself in the Holy Land at a French-speaking school. This was the beginning of Eig's long journey to scientific research as an autodidact.

Actually, until his studies for a Ph.D., Eig hardly attended academic studies at all. On his way, he met Haim Bograshov (1876-1963), the principal of the Herzliya Hebrew Gymnasium in Tel-Aviv, who persuaded him to return to his studies and accepted him to the Gymnasium. There, Eig met Eliezer Faktorovsky (1897-1926) who became his best friend and confrere. Together, Eig and Faktorovsky collected plants around the country, described them and learned to classify them. Later they also served together in the British army (Jewish Legion). Eig collected plants intensively and participated in the N. Naftolsky's expedition to Upper Galilee, where this "diligent collector of plants" (Eig 1926: 7) found for the first time natural habitat of the Madonna lily, *Lilium candidum* in Palestine (Eig 1926: 40; see more in Kushnir 1975). In 1925, Professor Otto Warburg, an expert in tropical agriculture and, *inter alia* the founding director of the first academic institutions in the country – the Agricultural Research Station in Tel-Aviv and later the Institute for Agriculture and Natural Sciences of the Zionist Organization in Tel-Aviv – invited Eig to work for him (Feinbrun 1938). Together with Faktorovsky, Eig prepared the first Hebrew scientific key of the families of plants of Palestine, published that same year in the Institute's journal (Eig and Faktorovsky 1925). When the Institute was transformed into several departments of the Hebrew University in Jerusalem (HUJ) and to the Agricultural Research Organization (ARO, Volcani Center), Eig and Faktorovsky began to work at the Botany department of the Hebrew University. At the university, Eig had the opportunity to delve into the expansive scientific library that had been donated by Warburg. Here, Eig met his two assistants (Supplementary Fig. S2) – the future professors and renowned botanists – Michael Zohary (1898-1983; Fig. 1) and Naomi Feinbrun-Dothan (1900-1995; Supplementary Fig. S3). In the autumn of 1926, the first year of his work at the University, Eig met Vavilov who was on a visit to Mandatory Palestine (Feinbrun 1938).

Nikolai Vavilov: Short outline of scientific career up to 1926

Nikolai Ivanovich Vavilov was a geneticist, botanist and geographer. As a scientist, Vavilov acted in several spheres in order to increase the efficiency of agricultural work and in order to find plant species and varieties that would serve as the basis for crop improvement. Vavilov worked in the field of genetics of plant resistance (Vavilov 1914); formulated The *Law of Homologous Series in Variation* (Vavilov 1922) in related species and genera, and formulated the theory of centers of plant domestication (Vavilov 1926).

Thus, his research efforts had significant implications for coping with world hunger. For this, he organized and headed scientific missions that went to all corners of the globe, except for Australia and Antarctica, in order to carry out botanical-agronomical research on the local environment and agriculture. These expeditions had a twofold goal: to identify and collect beneficial local plants, and to study the ancient centers of domesticated plants. The underlying research hypothesis for these expeditions was based on the identification of the geographical centers of the origin of plant species, following Charles Darwin (1809-1882), of whom Vavilov considered himself a disciple. Following his research in Iran in 1916,[1] Vavilov proposed that plant cultivation first started in mountainous regions. Furthermore, Vavilov was the first to propose that there were different and independent centers of plant domestication throughout the world (Vavilov 1926). He also established the world's largest collection of seeds, fruits and bulbs of edible and useful plants, and their related species from around the world (Reznik 1968). Concomitantly to these activities, Vavilov formulated the main principles of the agricultural sciences and established in the USSR a nation-wide network of agricultural experimentation stations with a scientific orientation, where controlled cultivation and field tests of diverse varieties of field crops were carried out. In 1920 Vavilov founded the Institute for Research on Agricultural Crops (today, The N.I. Vavilov All-Russian Institute of Plant Genetic Resources, VIR) and administered it

1 In Iran Vavilov investigated the cause of poisoning among Russian soldiers. Vavilov discovered that it was caused by consumption of local wheat infested by darnel (*Lolium temulentum*) – a toxic weed that grows with cereals. Consequently, wheat supplies were provided from Russia, which saved many soldiers' lives.

until 1940 (Ibid.). Thus, although Vavilov was exempt from military service (due to an eye injury because of chemical experiments during childhood), and even though he was not a member of the Communist Party, he succeeded in winning recognition as an essential and beneficial scientist for his country, before the Revolution and under the Bolshevik regime, during World War I and during the period of the establishment of the Soviet Union. At the age of 36 he headed the All-Union Academy of Agricultural Sciences of the Soviet Union (1929-1940).

Testimonies of his acquaintances and relatives (e.g. Reznik 1968; Esakov 1980; Dragavzev 1994) indicate that Vavilov was a charming broad-minded person with boundless energy, a generous person who exuded *joie de vivre*. He mastered 20 languages and conducted extensive scientific correspondence with colleagues from dozens of countries. He worked without taking time off for vacations, weekends or holidays, and continued to work even during his travels, which were for him an opportunity for thinking and discussion. He slept only 4-5 hours a day, and his unique work method was to devote only 30 minutes a day to any issue, since, according to him: *"Life is short, we must hurry*" (Pringle 2008: 8). Vavilov was also greatly esteemed for his contribution to science outside the Soviet Union, and in 1942 was even appointed a member of the prestigious Royal Society of London for the Improvement of Natural Knowledge.

Vavilov in Mandatory Palestine

A period of severe drought during 1921-1922 coincide with the famine in the southern Ukraine, Volga area, southern Ural, and Western Siberia, which are the main agricultural regions of the Soviet Union. It is estimated that 6 million people died following the famine (e.g. Wheatcroft 1984). Thus, within the framework of his research efforts to advance plant sciences, Vavilov searched for a food plant with high yielding potential under arid conditions in order to increase the efficiency of Russian agriculture (Vavilov 1962). The importance of this goal would have been clear to everyone in the Soviet Union at that time.

Following his research, Vavilov claimed that the best place to look for such a drought-resistant food plant was in one of the original centers of cultivated plants, because that is where the greatest genetic variation of the cultivated species will occur. Vavilov began his travels to study and collect beneficial plants in Afghanistan in 1924. During this visit, he learnt about the existence of diverse traditional agricultural methods, which are adapted to arid regions and documented them. He described the soil treatment methods, the designated tools and the local useful plants in his book *Agricultural Afghanistan* (Vavilov and Bukinich 1929). Vavilov claimed that the success of agriculture in arid regions with poor soil depends on fertilization, and described designated dove towers for collecting their droppings for field fertilization. After Afghanistan, Vavilov travelled to another center of origin of cultivated plants, the Fertile Crescent, where, according to his description, about 4% of all useful plants were domesticated, including wheat (einkorn and emmer), barley, rye, oat, lentil, pea, flax, grapevine, olive, and fig (Vavilov 1926). Vavilov arrived to Palestine in the autumn of 1926, after touring Syria and Lebanon (Supplementary Fig. S4A-B). His trips are described in his book *Five Continents* (Vavilov 1962). Additional information on his trips can also be found in his published letters – to his many colleagues and to his wife, Yelena Barulina (1895-1957), who was also a botanist (Esakov 1980).

Vavilov arrived in Israel by car on 8 October 1926 from Beirut (Supplementary Fig. S4A-B; Vavilov 1962). His correspondence with his colleague Prof. Mikhail Grigorievitch Popov (1893-1955), an expert in Mediterranean flora, shows that the two planned to tour the region together (Esakov 1980: letter N 376, 12.03.1926). However, Vavilov arrived alone, apparently because of budgeting difficulties. Vavilov toured the country for about two months, collected plants, met with fellow scientists and lectured to them. Vavilov's visit in Palestine was apparently a very important event for the entire scientific community, as a general article, summarizing his research, was published in his honor in the then main local agricultural journal, *HaSadeh* (Piner 1926). The article was published in several parts (end of 1926 – beginning of 1927). The *HaSadeh* journal was published by the Agricultural Laborers' Union and was found in almost every library then.

Documents in the Zionist Archive indicate that the visit was coordinated with researchers of the Agricultural Research Station in Tel-Aviv, with the Mandatory Ministry of Agriculture, and with the Zionist General Council, and that the people of the Station hosted him. The coordinator of the Agricultural Research Station wrote to Prof. Otto Warburg on 18 October 1926:

Prof. Vavilov from Russia has arrived. *Mr. Volcani went with him to Ben-Shemen, Rehovot, Ness Ziona, etc*. (CZA A210/54). Vavilov stayed for some time in Jerusalem, toured the coastal region and the Gaza Strip, and expressed admiration of the date palms in the Sinai, and the oranges of Jaffa. He visited Hebron, the Jericho area, the banks of the Jordan River, sailed the Dead Sea, and toured the Galilee and the Gilboa (Supplementary Figs. S4-S5; Vavilov 1962; Esakov 1980). Vavilov's visit to Mandatory Palestine lasted for about 40 days, before he continued to Ethiopia.

The first reason that enticed Vavilov to come to Mandatory Palestine was Aaron Aaronsohn's discovery of the *mother of wheat* (*Triticum dicoccoides*), a wild species of emmer found near Rosh Pinna in the Galilee in 1906 (under the direction and funding of Prof. Otto Warburg, e.g. Katz 1977). Vavilov hoped that this wild species, which, apparently, grows in poor soils in an arid and hot climate, would be able to serve as a source for improving bread wheat varieties that are resistant to drought (Vavilov 1962). Due to the tragic death of Aaronsohn in an aircraft crash in 1919 (Katz 1977), botanists of the Agricultural Research Station as well as other people related to agronomic and botanical research were called upon to assist Vavilov. Many of these were immigrants from Russia and in his book, Vavilov mentioned, with great pleasure, the popularity of the Russian language in Mandatory Palestine: both among the Jews, most of whom were former citizens of the Russian Empire, and among the Arabs, following many years of activity of the Imperial Orthodox Palestine Society's schools (e.g. Zivkin 1987). For example, the Russian born agronomist Akiva Ettinger (1872-1945), head of the Land Division of the Jewish National Fund at the time, took Vavilov on a tour of the Jezreel Valley to show him the *mother of wheat* under natural conditions. On this tour, it became clear to Vavilov that, unfortunately, although the *mother of wheat* grows in an arid climate, the ecological niche in which it develops is not a desert. Rather, it grows in pockets of soft, moist and fertile soil between the rocks. After Vavilov understood that the growing conditions of the local wheat were unsuitable for the development of wheat varieties adapted to arid regions, he turned his attention to study and collect local landraces of wheat and barley, which produce a reasonable yield in semi-arid regions. Baruch Chizik (1885-1955), who was Ettinger's student, apparently also met Vavilov on these tours and helped him collect local varieties (Chizik 1965). In addition to cereals, Vavilov also collected approximately 1000 samples of useful plants during his tour, which he sent to his institute in Leningrad (today VIR, St. Petersburg). He sent 55 plant packages – 14 almond varieties, 40 castor bean varieties (at the time, a local study was conducted on the use of *Ricinus communis* as a cultivated plant, e.g. Galun 2012), 100-200 varieties of lentils and many additional species (Reznik 1968). Moshe Yakubziner (1899-1979) was studying the wheat landraces collected by Vavilov at this time and his first publication appeared already in 1927. Remarkably, Yakubziner, a researcher at the Vavilov's Institute who became an international expert on wheat, published his works based on Vavilov's collection in Hebrew, in the journal *HaSadeh* (Yakubziner 1927, 1928, 1929, 1932, 1933).

In the lecture concluding his visit, on Sunday, 21 November, Vavilov received additional proof of the prevalence of the Russian language among those who during that period were called the *local scientific intelligentsia* (Reznik 1968). Colonel Reginald Sawyer, a representative of the British Mandate authorities and head of the Agricultural Department of the Mandatory government in Palestine, was supposed to attend. It was planned that Vavilov would give his lecture in English, in honor of the British representative. When it became clear to those present that Sawyer was not coming, the question of what language the lecture would be held in was discussed. A general vote was held, and in light of the fact that 90% of those present understood Russian (there were some 120 people present), it was decided to ask Vavilov to lecture in Russian and to have a simultaneous translation into Hebrew since "knowledge of which is obligatory for the Zionist" (Vavilov 1962: 83). In our research we found that the whole event was conducted in Russian, starting from the opening welcome speech by Volcani, and closing speech by Shlomo Kaplansky (1884-1950), director of the Zionist Organization Settlement Department (Supplementary Figs. S6-S7; CZA A210/57). However, it is especially interesting to note that we did not find even one document written in Russian among the documents of the Botany Department of that period in the Hebrew University archive. It is thus possible that the event was conducted mainly in Russian due to the respect which those present felt for Vavilov. Noteworthy is the fact that in this lecture Vavilov presented his pioneering theory on the centers of origin of cultivated plants, which was published later that year (Vavilov 1926).

Vavilov's letter to Dr. Elazari-Volcani

During our research, we discovered a letter from Prof. Vavilov in the archive of Dr. Yitzhak Elazari-Volcani, the founder of the Agricultural Research Station [today the Agricultural Research Organization (ARO) known to the public as the Volcani Institute] and the Faculty of Agriculture of the Hebrew University in Rehovot (CZA A210/57). The handwritten letter is in Russian and covers seven pages. At the time, Volcani was the director of the Agricultural Research Station in Tel-Aviv, and as indicated in the letter, had asked his Russian colleague to express his opinions on agriculture and agricultural research in the country at the end of his lengthy visit. The letter is testimony to the personal relationship between the two founders of modern agriculture in their respective countries, Volcani and Vavilov. The letter is published here in its original form for the first time (Supplementary Fig. S8).

In this letter, Vavilov did as requested and evaluated the agricultural research and practice in Palestine and indicated directions for future research. It should be borne in mind that Vavilov had been taught by the greatest experts in biology, genetics and agriculture of that time, such as W. Bateson, A. Jaczewski, A. Haeckel, D. Pryanishnikov and R. Regel. He had traveled in many countries and was familiar with the level and organization of agricultural research around the world. Moreover, he was head of the main Institute for Research of Agricultural Crops in the USSR. Thus, the document provides insights as to the importance of Vavilov's visit to the development of agriculture in Palestine.

Vavilov, opened his letter (written on the writing paper of Pinchas Horowitz's Herzliya Hotel – Jaffa, Tel-Aviv – 115 Allenby St.), addressing Volcani as "my very dear colleague". The letter was apparently written directly, without a draft, with a few corrections and erasures. In the letter, Vavilov revealed detailed knowledge, such as the progress of research in Mandatory Palestine, articles that were published and which were about to be published as well as the desired budget for the Agricultural Station. The fact that Vavilov entered into these details shows that the letter was probably coordinated and agreed upon between him and Volcani. Indeed, in a letter to his wife from 26 November 1926, Vavilov wrote: I wrote an article by request, on the organization of scientific research in Palestine, as a token of thanks for the assistance [during the visit]. I sent more packages (up to 70), books (Reznik 1968: 209).

It is very interesting that Volcani's archive contains several copies of the letter that were printed on a typewriter – in Russian, next to the original letter, but also translations into Hebrew,[2] English (Supplementary Text S1; HUJI archive, file 80), and German, with several copies in each language, including highlighting of the sections as in the original letter. The names of those who typed and translated the letters are written on the Russian and German copies. Translation corrections can be seen on the documents. It is possible, although there is no direct evidence for this, that Volcani went over the translations and corrected them. These details indicate the importance which Volcani attributed to the letter, as does his investment in its being translated into three languages. The numerous copies also indicate that Volcani obtained reinforcement for his managerial and scientific activities from Vavilov's opinions, and perhaps tried to use his recommendations in order to advance the sciences of agriculture and biology. Indeed, among the main figures in the early agricultural settlement in Mandatory Palestine, Volcani always emphasized the development of local agronomic research in order to advance agriculture. This distinguishes Volcani from Akiva Ettinger and Eliezer Joffe (1882-1942), who focused more on the organizational side of agriculture. Ettinger, who studied agriculture in Russia, promoted pre-revolutionary Russian innovative experiment – private farming and cooperation of farmers on a regional level. In contrast, Joffe, after studying and gaining organizational experience in the United States, promoted establishment of centrally governed settlements based on joint work (e.g. Amiur 2016).

The special letter expresses Vavilov's great appreciation for the new Jewish settlement in Israel, its scientific approach to research and the type of research being carried out. Vavilov wrote (The quote and its orthography follows the English version of the letter present in the HUJI archive, file 80; Supplementary Text S1):

> My acquaintance with the conditions of experimental research in Palestine convinced me <u>that the right course was adopted.</u>

Further on, Vavilov indicated that of the entire Mediterranean region, Mandatory Palestine is richest in educated people and in first-rate research institutes:

2 The translation into Hebrew is interesting from linguistic point of view, as an example of early stages of development of modern Hebrew.

> The concentration of intellect which characterizes modern Palestine is an immense intellectual source…

Beyond the great esteem he expressed for the research and the researchers, Vavilov urged the researchers not to make do with local research only, but rather to expand their research to the entire region:

> The Institute will soon have to reach outwards beyond the boundaries of its small country. For Eretz-Israel to retain its great intellectual powers, it will have to contemplate the creation of conditions for work on a broader basis. Up to the present day with the exception of archaeology, history, and to some extent geology, scientific work in Mediterranean and Near-Eastern countries is very feebly developed. The plant and animal world and the whole field of physic-chemical phenomena is hardly explored. The task of exploring the Mediterranean one and the Near East is incumbent on the new cultural center which is springing up in Palestine.

He continued, taking a philosophical-historical approach:

> In the process of creating a firm agricultural settlement as the foundation of the National Home, New Israel must do as the Old and undertake a portion of the task of a universal world mission.

Vavilov's recommendations can be summarized as follows:

- Vavilov wrote that research is necessary in order to supply a farmer with efficient and field-tested solutions. For this, scientific-agricultural research must be based on experimental research in diverse fields, which are related to agriculture – such as plants, animals and fungi.
- It is important to invest money in a library and in scientific equipment for the further development of research.
- Vavilov stressed that advancement of agriculture involves a detailed scientific description, including a description of the environment, the flora, the fauna, as well as the traditional agriculture in the different regions of the country.
- Vavilov urged scientists to prepare maps of both natural and agricultural divisions. In his opinion, serious and comprehensive research requires fieldwork conducted according to the natural distribution of the studied species and not according to political borders.
- Vavilov also stressed the importance of regular publication of the research being performed in Mandatory Palestine and praised the way in which the Institute published articles.
- Vavilov claimed that the immense number of highly qualified specialists in Mandatory Palestine should pave the way for research in the entire Mediterranean and Near East region.

Vavilov described three important aspects for the success of any scientific-agricultural research: (i) Investment in equipment for experimental research; (ii) Focusing the research on the development of appropriate and practical work methods; (iii) Development of the natural sciences such that the created knowledge will advance agriculture.

It is important to note that in light of Vavilov's tours of the region, he could compare the scientific research in Mandatory Palestine to parallel research taking place in the neighboring countries and in the Middle East in general. Significantly, at that time, only scarce botanical-agricultural or other research was carried out in these countries, and mostly by non-local researchers. In contrast, Mandatory Palestine abounded with scientific research in many fields. Also, while farmers in other countries were less educated, here they knew different languages and tried to learn, develop, and improve the agriculture and adapt it to the place and time. Vavilov ended his letter with a wonderful statement, which seems to be still relevant today:

> The enthusiasm which pervades in it [Land of Israel], will overcome all difficulties.

Vavilov's influence on Eig and on local botany

It is important to note that at that time, agronomists and botanists worked together, and therefore Eig, a botanist, was among those who welcomed Volcani's visitor. Eig spent quite some time in Vavilov's company. He accompanied him on his botanical tours (Map 1), gave Vavilov several samples from his earlier collections of the *mother of wheat* (numbers in Vavilov's collection stored in Herbarium WIR of N.I. Vavilov Institute of Plant Genetic Resources (VIR) – NN 17221, 17273, 17307, 17373,) and traveled with him to collect plants in Transjordan (Supplementary Fig. S9; Vavilov

1968). In our opinion, the meeting with Vavilov was auspicious for Alexander Eig, perhaps even fateful. Vavilov's dedication to science, his broad-mindedness and his success, in spite of his life circumstances that were described above, were apparently an example and an ideal for his development as a scientist.

Eig's loyal student, Naomi Feinbrun (Supplementary Fig. S3) wrote the following about this meeting:

> At the end of 1926, the famous Russian professor N. I. Vavilov visited our land. Vavilov's prominent and charming personality could not help but have a great influence on Eig, on the direction of his work and on the course of his scientific development. Eig would say that Vavilov's visit was equivalent to studying abroad (Feinbrun 1938).

The esteem between them was mutual. This esteem is apparent in the manner in which Vavilov signed his book, which he gave to Eig just before leaving Mandatory Palestine. Vavilov wrote the dedication to Eig in Russian, addressing him with deep respect and using his full name: Dear Alexander Grigorievitch Eig, for a good remembrance, from the author, 23 November 1926 (Supplementary Fig. S10; HUJ Library). Vavilov noted Eig's name both in his book and in his letters to colleagues, and referred to his research as being very professional (Vavilov 1962; Andrejev 1997: letter N 30).

That very year the Hebrew University bought Eig's entire plant collection from him amounting 50,000 specimens. The university appointed Eig as the person in charge of the collection, where his job was to care for, preserve and complete it. This collection comprises the basis for the Herbarium of the Hebrew University (HUJ), a part of Israel's National Natural History Collections (today it is located on the E. Safra Campus, Givat Ram, Jerusalem).

Following an invitation from Vavilov, in early 1927, Eig traveled to Leningrad and Moscow. On his way back, he visited the botanical institutes in Berlin and Geneva (e.g. Frumin and Shammash 2008). Already in May 1927, Eig, Zohary and Feinbrun traveled together abroad, to Transjordan, for a botanical tour and for plant collection (Anonymous 1938). On his visits to the Soviet Union, Eig had the opportunity to meet new colleagues who worked in similar fields. Dedications from friends in books in his library show that they also found Eig an honorable colleague and a true friend. One of these was the curator of the herbarium at the Moscow University, after whom the herbarium is named today, Dmitry Petrovich Syreischikov (1868-1932; e.g. Palibin 1933). Syreischikov resembled Eig in being a brilliant autodidact and a devoted plant collector. In 1927 he gave Eig his *Flora of the Moscow Area* in four volumes (1906-1914), which he wrote and illustrated (Supplementary Fig. S11). It appears that Eig also befriended another important figure in the development of botany, geobotany and plant ecology research of Central Asia – Prof. Evgenii Petrovich Korovin (1891-1963; e.g. Lipshitz 1952). In 1935, Korovin, who described over 100 species of plants and mapped the flora of Central Asia, called Eig: friend and brother (Supplementary Fig. S12).

In 1929 Eig published his first monograph – taxonomical revision of *Aegilops* – the closest relative of wheat (Eig 1929). In January of 1979, in the jubilee speech on the 50th anniversary of the Botany Department at HUJ, Prof. Michael Evenari (1904-1989) – head of the department at that time, recalled that it was Vavilov who encouraged Eig in his study of *Aegilops* (HUJ Archive, Lecture of M. Evenari of January 1979, p. 2, rows 6-9). Also, it turns out that Vavilov invited Eig to move back to Russia and to work together. Although the offer to work with Vavilov and his team could have brought Eig possibilities for advancement in the Soviet Union, and to rejoin his family (his mother and siblings remained in the USSR), Eig declined the offer. One of Vavilov's colleagues and assistants, Prof. Vasilii Vasilevicz Marcowicz (1865-1941), visiting Mandatory Palestine, complained to his friend the local agronomist, Avraham Zussman (1861-1943) [both were graduates of the Novoaleksandrinsky Institute of Agriculture and Forestry, Puławy, now eastern Poland]:

> We would be charging your Eig with responsibility for a great project in Central Asia, but he belongs entirely to this country and its people (Zussman 1938).

Notably, albeit large part of Eig's scientific library consists of books in Russian, and Eig published his studies in German, French, and English, he did not see himself as leaving the Land of Israel.

In 1930, Eig traveled for his Ph.D. studies to Montpellier University, France. There Eig studied with Prof. Josias Braun-Blanquet (1884-1980), the founder of the European school of phyto-sociology and founder of the theory for classification of plant associations. Eig submitted his thesis in 1931, graduated with honors.

This was the first work on plant geography of Palestine (Eig 1931).

After returning from France, Eig continued to study the geography of Palestine's flora, published the first phytogeographic map of Palestine, and was the first to identity the country's three main phytogeographic regions: the Mediterranean region, the Irano-Turanian region and the Saharo-Arabian region (Eig 1931; Heller and Alon 1983). In 1931, Eig founded the university's botanical garden on Mount Scopus in Jerusalem, which was the first of its kind worldwide. His garden was planned according to phytogeographic regions, a kind of floristic miniature of Palestine, where landscapes of the flora and the plant associations are represented. This was an essential change from other botanical gardens, which were traditionally planned as a taxonomic collection, and/ or collections of rare and beautiful plants.

In addition to studying local vegetation, Eig began to travel and learn about the flora of the neighboring countries as well. In this, he acted on Vavilov's recommendations laid out in his letter, and undoubtedly discussed in their conversations, that it is impossible to study local plants without a full understanding of their complete geographic distribution, regardless of political borders. Eig surveyed Transjordan (in 1927, 1929, 1936), North Africa (in 1931), Lebanon (1931, 1934), Turkey (1930, 1931), Syria and Iraq (1931, 1933). Indeed, Eig's articles from this time on include descriptions and taxonomic revisions of species and their natural area of distribution in the entire Near East. Eig together with his students and colleagues published studies on the flora of different regions in the area as well as numerous papers on plant systematics.

The relationship with Vavilov was not severed, and at the request of the Hebrew University, Vavilov wrote the recommendation necessary for promoting Eig from his technical position – curator of the herbarium – to the position of lecturer in plant systematics and biogeography (Archive of the Herbarium HUJI). In addition, Eig's work pace is reminiscent to that of Vavilov – he taught, researched, published and traveled incessantly, and in general worked without vacations (Anonymous 1938; Zohary 1938).

Salient similarities can be found between Vavilov and Eig in their work pattern and in their research directions. Understanding the geographical distribution of the flora in Palestine enabled Eig to work on classification of many species of plants whose distribution range was not clear beforehand. During the twelve years of his scientific research, Eig worked on systematic description of plant species in Palestine and described new 150 species (such as *Aaronsohnia factorovskyi*, different species of *Allium*, *Anthemis*, *Cichorium*, *Echinops*, *Salsola*, etc.). He classified dozens of plant associations during the course of the phytosociological researches carried out on Palestinian plants and wrote 50 scientific publications. He prepared the ground for a scientific plant key intended for the general public as well as for the scientific community. He helped teachers and farmers, as well as advised different bodies in Mandatory Palestine and abroad on problems in the fields of applied botany, agriculture and forestation. Eig was also among the founders of the Israel Society of Botany and its scientific journal *Palestine Journal of Botany* (today *Israel Journal of Plant Sciences*) and taught with vigor and devotion during all his working years.

The last task that Eig took upon himself was related to the activity of the Royal British Commission for inquiry into the Arab-Jewish conflict in Mandatory Palestine. The Commission, headed by Lord William Robert Peel (1867-1937), convened for several months during 1936-1937, and at the end of its work recommended the partition of Mandatory Palestine into a Jewish state and an Arab state. Representatives of the British Mandate and representatives of the Jewish and the Arab public appeared before the committee in order to put forth their claims. At the request of the Chairman of the Jewish Agency and the future second president of the state of Israel, Yitzhak Ben-Zvi, Eig worked in order to prepare an answer to one of the important and crucial questions that were discussed by the Commission: Will the Jewish state be able to feed itself within the new borders? During his work on this issue (e.g. Eig 1938b, 1939), Eig was diagnosed with cancer. Despite his illness, he fulfilled his obligations and continued his scientific work in his home in the Beit HaKerem neighborhood, Jerusalem, until his death at the age of 43, on 30 July 1938.

Vavilov apparently learned of Eig's death with some delay, as he sent a condolence letter only in May 1939 (HUJ archive). Notably, Feinbrun published many of Eig's works after his premature death, hence his active life in science continued until the last printed edition of the *Analytical key of the Flora Palestina* in 1960 (Eig, Zohary, Feinbrun, 1960). This led to confusions and even in the 1990's there were people looking for an opportunity to meet Dr. Eig in the Jerusalem Herbarium.

During the Stalinist repressions of genetics and geneticists, Vavilov was persecuted, arrested (1940) and died in prison (1943); and his name and scientific achievements were forgotten in the USSR for decades (Reznik 1968; Pringle 2008). Notably, Michael Zohary and Naomi Feinbrun did not change their work pattern and their research directions. They continued Vavilov's and Eig's work; each published more than 50 articles on diverse geobotanical and taxonomy issues addressing vegetation of the whole Near Eastern region. Their most impressive collaboration was preparing and publication of the four volumes of the *Flora Palaestina* – compendium of the plant taxa of the Land of Israel with taxonomical and ecological descriptions for each taxa and with four complementary volumes of botanical drawings. Furthermore, being productive researchers, they also were teaching professors, and nurtured a new generation of botanists that continued to work on taxonomy, ecology, history and evolution of Near-Eastern vegetation.

Conclusion

We have presented here, for the first time, an original letter of Vavilov's, which sheds light on his personal contact with Yitzhak Volcani and Eig, and his influence on the direction and development of agronomic and botanical research in Mandatory Palestine and in Israel today. Specifically, it reveals, in our opinion, the remarkable role and magnitude of Vavilov's influence in shaping Alexander Eig as a scientist, and so generations of Israeli botanists. This is exemplified in their research on local flora balanced by the large regional scope of their studies, and the equal investment given to theoretical advances and experimental verification.

There are several possible reasons to explain why, until now, the personal contacts between Vavilov and Eig were unknown to the general public. Firstly, the history of both Russia/USSR and Israel in the 20th century is rich in critical events, and tense relationships. Secondly, both scientists did not leave autobiographies. Thirdly, persecution of geneticists in USSR as well as the slandering and oblivion of Vavilov's name, did not encourage dissemination of this story. Nonetheless, to our knowledge, this meeting and the mutual understanding and cooperation between scientists from different countries and ideologies, offers important insights, both for the history of Israel and for science in general.

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