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by

N.I. Vavilov

Finally published in English, this book contains descriptions by Academician N.I. Vavilov of the expeditions he made between 1916 and 1940 to five continents, in search of new agricultural plants and confirmation of his theories on plant genetic diversity. Vavilov is ironic, mischievous, perceptive, hilarious and above all scholarly. This book is a readable testament to his tenacity and belief in his work, in the face of the greatest adversity.

This book is dedicated to the memory of Nicolay Ivanovich Vavilov (1887–1943) on the 110th anniversary of his birth

N.I. Vavilov Research Institute of Plant Industry ▪ International Plant Genetic Resources Institute
United States Agency for International Development ▪ American Association for the Advancement of Science
United States Department of Agriculture ▪ Agricultural Research Service ▪ National Agricultural Library

THE MEDITERRANEAN COUNTRIES

INTRODUCTION

Documents reaching us from antiquity regarding agricultural crops link the Mediterranean countries of Egypt, Syria and Palestine with the ancient Etruscan civilization on the Apennine Peninsula and ancient Hellas. The oldest remains of wheat and barley crops are connected with Egypt, Syria and Palestine . Detailed information about the agricultural crops of these countries has reached us through the writers of ancient Rome and Greece, who were active during the last centuries before Christ and the first century of the Christian era. One can still read with awe the course in plant breeding by Columella, written during the first century BC. Its content could be successfully taught even in our time. Valuable statements on how to make selections for improving strains are given by Virgil, Pliny and Theophrastes.

In 1926 I applied myself to the problem of visiting, if possible, all the countries around the Mediterranean to be able to collect a full set of material of crops and to study the conditions for their cultivation. I began with the complicated activity of obtaining visas. With the help of friends in London, especially Dr. Daniel Hall, the foremost agronomist of England, I obtained visas for Palestine and the island of Cyprus. A trip to London and all the trouble to obtain visas for Sudan and Egypt was unsuccessful in spite of assistance from many influential friends. Egypt was more or less independent when it came to issuing visas and it was necessary to apply directly to Cairo. London could be used mainly for letters of recommendation and for studies of the most recent literature on the Mediterranean countries in the excellent libraries of the Department of Colonial Affairs, the Science Library and the British Museum. Here I also succeeded in obtaining most valuable maps for the expedition. According to my experience, repeatedly verified later on, London and especially the wellknown Standford Company, offer the very best opportunities for this purpose.

Obtaining French visas turned out to be much simpler than anticipated. Diplomatic relations with France at that time did not give cause for much hope. L. B. Krasin, then Soviet Ambassador to Paris, considered it hopeless to get any visas. An appeal to the Department of Foreign Affairs, he said, confirmed the futility of my attempts. However, the fact that I had worked for several weeks in 1914 near Paris in the famous seed company of Vilmorin and Andrier, was in my favour. The de Vilmorins are a dynasty of plant breeders that has existed for almost 200 years. In the world history of plant breeding the name of de Vilmorin is associated with the invention of a method for breeding sugar beets and introducing them into cultivation. Theirs is a complete institute with an excellent museum, a beautiful library and valuable manuscripts. In the opinion of my friend, the botanist August Chevalier, director of the Laboratory of Applied Botany in Paris and later an academician, the only thing that could help would be intervention in the matter by, in his words, "the most energetic of all the women in the world" Madame F. de Vilmorin, the main asset of the seed firm, who had travelled around the world with her husband. Chevalier held out the prospect of convincing Madame de Vilmorin to help me by showing that the Soviet botanist and plant breeder without fail must necessarily visit Algeria, Tunisia, Morocco and Syria.

After listening carefully to all the arguments, that it was necessary for me to visit all the agricultural areas of the French colonies without fail, that life is short and that it was impossible to put off this matter, Madame de Vilmorin declared that she agreed fully and

was convinced that I had to go. There was no question that during the next 2 days exceptional diplomatic talents would be required in addition to all the influence of the de Vilmorin name. Madame de Vilmorin went to the president, Raymond Poincare and the prime minister at that time, Aristide Briand. The matter was complicated by a rebellion in the Rif district of Morocco and an uprising among the Druse in Syria. The main problem was, of course, not to have a Soviet professor make Bolshevik propaganda and allow him into the colonies at such a perilous time, a time of revolt.

Contrary to what I expected, the mission of Madame de Vilmorin was successfully carried out. "My friend," she said to me, "you shall be allowed to travel where you want. Go to the Department of Foreign Affairs, where you shall obtain visas and to the prefecture and come then to us to say goodbye."

At the Department of Foreign Affairs more detailed explanations were requested from me. Where, when and for what period of time was this Soviet traveller going and whom did he know in Algeria, Tunisia, Morocco and Syria? But to my surprise no restrictions were put on me. In the prefecture, where I went with my passport for the final endorsement of the visas, it was declared that this was beyond belief, that there must be some mistake, since even French citizens were at this time forbidden to travel to Morocco and Syria without special permission. "Do you know what is going on there?" the official asked. I had to reply that it would be necessary to turn to the Department of Foreign Affairs, which had sent me to the prefecture, for an explanation. A lengthy negotiation over the telephone apparently convinced even the prefect and after an hour the passport with the four visas was in my pocket, opening the road for me into the Mediterranean countries.

Now only Egypt remained to be secured. Friends at the Pasteur Institute, with whom I had worked earlier [1913-14] within the field of immunity, tried to help obtain a visa to Egypt. Mr. Roux himself, director of the Institute, Bezredko and other associates of the great I. I. Mechnikov all came to my assistance. The case was extraordinary. Relations between England and Egypt were at this time rather tense. The normal diplomatic road turned out to be inefficient. However, my Parisian friends devised another approach: to use an Egyptian banker, who at that time was being treated at the Pasteur Institute. However, the matter was not simple; it seemed necessary to wait. But since the summer was passing, it was imperative to be in the field. Somehow a visa had to be obtained, and quickly. The 'almighty' banker Mossar, I use the words of the 'Pasteurians' who was the brother of an important Egyptian agronomist, was convinced that they would grant a visa, even to a Bolshevik, on his recommendation.

At this time my associate, I. I. Ivanov, was getting ready for an expedition to West Africa, also with assistance from the Pasteur Institute. A speedy outfitting of his expedition was begun and equipment was purchased. In addition to the journey to the countries around the Mediterranean my own intention was to go to Abyssinia after completing the Mediterranean mission. It was also necessary to provide for that complicated expedition, although at this time it seemed unlikely to come about. But it was nevertheless imperative to secure in advance the required maps, reference books and the most important literature devoted to Abyssinia.

By the middle of June all the preparations were completed. After bidding farewell to my good fairy, Madame de Vilmorin and promising to inform her of the results of the research in every country, and carrying the letters of recommendation from her and the Pasteur Institute, I left for Marseilles, where steamers belonging to the Messenger Company depart for destinations all over the Mediterranean.

Southern France belongs indeed to the Mediterranean area. The narrow coastal belt of southern France, the Riviera, with its mild climate and subtropical crops, of course belongs to the Mediterranean area *sensu stricto*. Its main characteristics are mild winters and hot summers. The precipitation falls mainly during the late autumn, winter and early spring. Since the summers are hot, irrigation is often used for crops. The mild climate allows the growers in this area to concentrate on the exceptional wealth of the subtropical flora.

The French Riviera is one of the most densely populated areas of France, with a multitude of villas covered by climbing roses and surrounded by palms. Among the crops especially grapes, olives and exotic fruits are characteristic here.

But when speaking of the Mediterranean it is also necessary to take into account the mountainous nature of a considerable portion of its. The mountains that approach the coastal belt cause a great change in the composition of the flora, which is sharply different from that of the Mediterranean Riviera.

The coast, with its inlets and bays, mild climate, fertile soil and abundance of precipitation, as well as the comparatively calm sea, have created absolutely exceptional conditions for the development in general of the great Mediterranean civilizations. The extensive development of the shoreline, the presence of the Iberian, Apennine and Balkan peninsulas and that of Asia Minor, the many large and small islands, as well as the indented coastal belt, were favourable for the establishment just here of large populations consisting of small, isolated groups, who independently and comparatively peacefully for a long time successively developed their civilizations. Indeed, it is hard to imagine more ideal conditions in the past for the development of major agricultural civilizations than those in the Mediterranean area.

No doubt fruit-bearing trees played a great role in the development of the Mediterranean civilizations. Olives, which are able to grow in stony soils and are exceptionally tolerant of drought and very hardy, are important plants in respect of nourishment. The fruits serve at present, just as in the past, as one of the basic nutrients. No less important, particularly on such islands as Cyprus and Crete, are carob trees [*Ceratonia siliqua* L.], the wild thickets and plantations of which produce valuable nutrients and fodder, so-called St. John's bread. Forests and groves of chestnut trees [*Castanea sativa* Mill.] are still the mainstay of life in some areas of Portugal, Spain and Italy. If figs [*Ficus carica* L.], grapes [*Vitis vinifera* L.] and, among nut-bearing trees, walnuts [*Juglans regia* L.] and filbert nuts [*Corylus maxima* Mill.] are added to this, it can be understood what an exceptional role fruit-bearing trees played in the settlement of the Mediterranean area. Apparently they preceded cereals here.

The mild climate and mountainous character caused a rich flora to develop around the Mediterranean, in total determined to not less than 20 000 species. Even if measured on the scale of a worldwide flora, the Mediterranean is distinguished by an exceptional richness. Within the wild flora primitive farmers found a multitude of valuable plants, which were at first utilized in the wild state but were subsequently taken into cultivation. The Mediterranean area is the native land of a major part of European vegetable crops. Within the composition of the wild flora valuable plants were found which could be utilized both as grain crops and as fodder, such as lentils [*Lens culinaris* Med.], Spanish gorse [*Ulex europeus* L.], berseem or Egyptian clover [*Trifolium alexandrinum* Juslen], vetchlings [*Lathyrus* or *Vicia* spp.], 'gorgon vetch' [*Lathyrus gorgonii* Parl.], sulla [*Hedysarum coronarium* L.], large-flowered white clover [*Trifolium repens* L. var. *giganteum* Lag.-Foss.]

and fodder vetch [*Vicia ervilia* Willd.] and so on. Here a number of farm animals were domesticated as well.

At the same time the tranquil and enclosed Mediterranean Sea promoted development of maritime communication and navigation. The variety of crops furthered an exchange of products and, starting at the time of the Phoenicians, marine trade prospered with an exchange of experience, products and crops. The settled, peaceful, long-lasting and successful character of the different states favoured the rise of civilizations to extraordinary heights, which later on had an enormous effect on the culture of all the world. As will be demonstrated below, also with respect to agriculture and elaboration of cultivated crops, it is in general a question of specific Mediterranean crops.

EXPEDITION IN SYRIA

It was difficult to select a less suitable time for an expedition to Syria. When I presented my passport with the French visa in the port of Beirut it provoked great suspicion. Nobody wanted to believe that any French authority had issued a visa to a Soviet citizen (according to the authorities somebody definitely a 'Bolshevik') when not even French citizens were admitted. Under military escort I was taken through the city to a prefecture for verification of my documents. A very thorough examination of my luggage and letters and additional telegraphic information apparently at long last put the receiving Prefect at ease and I went to one of the largest tourist hotels. Later I came to understand the cause for the anxiety of the authorities.

Beirut is situated within the coastal subtropical belt, i.e. in a typical Mediterranean area. It is surrounded by enormous plantations of bananas [*Musa paradisiaca* L.] and sugarcane [*Saccharum officinarum* L.], gardens and vineyards. The coastal part of Beirut is represented by a European-type city with beautiful, straight avenues, comfortable homes and wonderful parks. There is a large American university where American professors teach. Nearby is a Jesuit educational institution of special interest to me since, according to earlier information, the enormous herbarium of the Jesuit Bouloumou is preserved there.

I had planned the route of the expedition when preparations for it were being made in London and Paris. Syria is a complex country for studies of cultivated plants and agriculture. The coastal Mediterranean belt of the country stretches from Beirut to Latakia. It is represented mainly by introduced crops such as bananas, sugarcane and citrus fruits, which were of no special interest to me. It was important to penetrate deep into the country, to southern Syria in the neighborhood of the border of Palestine, where the botanist Aaronsohn in 1906 had collected wild wheat in the mountains. Khoran was reportedly one of the most important territories of cultivated wheat and at the same time the native land of wild wheat.

When leaving Beirut I understood right away the cause for the anxiety of the authorities. All the mountainous land south and southeast of Beirut was under martial law. Rebellious mountain tribes of the Druse had started a guerrilla war against the French forces and launched a successful assault. All the sites most subject to attack were defended and barricaded by French soldiers. Our train had an armoured engine. On my arrival at the final destination in Khoran, I had to present myself and the appropriate documents to the military authorities and obtain permission for travelling farther. One of the teachers at the American University, spending his holidays by going on trips, had joined me as a travelling companion.

The very first excursions to Arabian villages revealed fields which displayed wheats of a peculiar composition. Here I collected for the first time the basic subspecies which I later named the 'Khoranka'. This is a remarkable, large-grained, hard wheat with stiff straw and highly productive, compact ears. At present the Khoranka has already been introduced on to tens of thousands of hectares of cropland in the highlands of Azerbaidjan. And right here, on the slopes and at the edges of the fields I saw for the first time stands of the wild wheat.

The entire problem is linked to the 1906 discovery by the botanist Aaronsohn of a wild wheat in Syria and Palestine. With exaggerations typical of an investigator of the East,

he proclaimed in a flight of fancy a new era for the breeding of wheat. The wild wheat, distributed in semidesert areas, definitely drought tolerant and with comparatively large grains, was represented by Aaronsohn as a wonderful material for improving cultivated wheat and for raising its drought resistance. The modest requirements of the wild wheat (able to grow among stones on waste land) indicated that new opportunities had been opened up. No less enthusiastically, a representative of the US Department of Agriculture, Dr. Cook, who in 1913 made a special trip to Syria and Palestine for studies of the wild wheat, also ascribed excessive importance to it. Wild wheat was sent to the USA in the form of ears in a great number of boxes.

Unfortunately we arrived at the site where the wild wheat occurs when the ears to a great extent had fallen off. It was only with difficulty that we could locate them by clearing away the stones, although they had fallen to the ground in large quantities. The drought tolerance and straw-stiffness of the wild wheat proved, however, to be considerably exaggerated. Detailed investigations showed that the wild wheat grew among the stones in soft, fertilized soil, retaining water. In this respect it is little different from cultivated wheat. It became necessary to make severe corrections of the exaggerated statements made by Aaronsohn and Cook. Furthermore, the Syrian subspecies of wild wheat actually turned out to be small-grained and its ears were not very large either. No doubt the drought resistance of the locally cultivated wheat, widely grown by the Arabian settlers, was of much more interest and of course we concentrated our attention on it.

The wild species of wheat [*Triticum dicoccoides* [Koern.] Aarons.] was naturally of interest as an evolutionary link. Subsequently, however, when studying the wild wheat and experimenting with attempts at hybridization, we encountered still more drawbacks for its utilization for practical purposes. But, the exaggerations of Aaronsohn had one positive effect: the generous Americans built up a special research station near Haifa, where great work on breeding field crops is done.

Severe bouts with malaria hampered my own work considerably. Instead of trying to collect the crumbling wild wheat and wild barley [*Hordeum vulgare* L. subsp. *spontaneum* [K. Koch] Asch. & Graebn.] under difficult circumstances, it was necessary to rest in bed for several hours a day. The warlike state of affairs in Khoran made it necessary to hasten the investigation and to head for where I could obtain medical assistance under emergency conditions. To my surprise, a French officer declared that since it was necessary for me to penetrate deeper into the area, there were no major objections to it. I had only to tie a white handkerchief to a stake as sign of peaceful intentions and I could go where I wanted, since meeting with the Druse was dangerous only for the French but not for Russians or, even better, Bolsheviks.

Taking advantage of this exceptional advice, I proceeded, together with the teacher from the American University, into the mountains, to a Druse village. There we actually had a most cordial reception, obtained exhaustive information, went around on horseback over a considerable area of fields and peacefully, in the company of a Druse guide, returned to the railway station, where we took a train to Damascus.

There we were in the oldest city in the world, famous Damascus. Its geographical location is really remarkable. It is situated in the centre of desertlike mountains at an altitude of 1500 metres and in a depression where water streams down the slopes. Surrounded by a sterile desert, Damascus itself is like a sea of green. Everywhere it is full of gardens and surrounded by fertile fields. After completing long caravan routes lasting for

days through the desert, the traveller enters Damascus and finds there a kind of 'Eldorado' with water and greenery. The ancient city is strongly built with a large number of mosques and minarets and a multitude of caravansaries. All crops there are irrigated. This is in the fullest sense of the word an oasis in a mountainous desert. Thanks to its elevated situation, the climate is temperate and favourable for the production of fruit trees, grapes and cereals.

Unfortunately, Damascus was also under martial law; it was threatened with an assault by the Druse. The outskirts of the city were defended by barricades and to go far from the city into the surroundings was not recommended by the authorities. I had to limit myself to studying the grain market in the city itself and to visit only a few fields.

Damascus is the centre of Arabian learning. Here the famous Arabian Academy of Science is situated. I soon became acquainted with its president, Professor Kurdali. We had friends in common. Some time ago the Soviet academician I. Yu. Krachkovskiy worked here, about whose knowledge within the field of Arabists Kurdali stated with delight: "Your Krachkovskiy", he said, "amazes us. He both knows the Arabian literature and reads it as few of us can do."

Since Damascus is at an intersection of many roads the cultivated plants here have an alien character. But no doubt there are also endemic plants here. I had never expected to see such large, thick-skinned grapes as I encountered in the markets of Damascus. The composition of wheat strains turned out to be extremely varied, reflecting influences from both southwestern Asia and the Mediterranean area. Peculiar endemic peas of a montane and Mediterranean type were present there in large amounts. There are important forage plants, which replace barley in the fodder of horses.

According to documents, Damascus has existed for not less than 4000 years. It is possible that its history goes even farther back. This antiquity is demonstrated by the durability of its streets, which seemed to be paved with stones that are rooted in the ground. Even the shops in the market have a character of permanence. In the typical Arabian restaurants, there is unfailingly an irrigation channel with babbling, running water passing under the tables, providing coolness during the summer season. There was also an amusing event. For some reason, after a haircut in the barber shops of Damascus, it is considered good manners to sprinkle the head with alcohol and burn off the facial hair with a flame. The first time this operation is carried out without warning it produces a stunning impression that the whole head is set afire and the client jumps up in terror. However, the affair in general ends happily, to the amusement of the barber.

After collecting a large sample of different varieties and mailing them, I went to northern Syria, via Homs, Hama and Aleppo, from where I intended to go by car in the direction of Mesopotamia [now Iraq] to the Euphrates river. This large area is the granary of Syria. It is inhabited by typical, slender Arabs in burnooses and turbans. The fields of wheat reach as far as the eye can see. Enormous areas are sown. Already there are attempts here at a kind of mechanization, e.g. utilization of peculiar, primitive threshing machines. In general the ordinary Mediterranean kind of agriculture dominates, including the use of the Latin type of plow, which does not turn over the soil strata, and threshing by means of wooden boards with flint pieces driven into them, which thresh the grain spread out with spades. The sowing is done during autumn. This is a monoculture. Mainly hard wheat and distichous barley are cultivated.

And there was the beautiful valley of the Euphrates, where once upon a time the Assyro-Babylonian civilization flowered, where the fate of the Near East was settled and

where the Codex of Hammurabi determined the standards of economy, justice and responsibilities. Ordinarily, the agricultural crops are not irrigated. The waters of the Euphrates flow without restraint all the way to the Indian Ocean. Waterwheels are built for lifting the water and irrigation is practiced only where water is nearby or where small streams run. Basically the agriculture is of a nonirrigated type. In the past it was no doubt richer, fuller and more interesting than the present type. There is no question that it is possible to return to the earlier conditions by a rational use of the water and the excellent soil. There are plenty of opportunities for this. Owing to the exploitation of its many colonies this is not necessary for the French and the suppressed Arab population is forced to be satisfied with primitive utilization of an enormous natural wealth.

The time was the very best for collecting. There was still much wheat and barley, not yet cut. The harvest was at its peak. The specific composition here is definitely different from that of southwestern Asia and the Irano-Turkestan region. The wheat is exclusively of a hard type, the barley always distichous. There is no doubt at all about the distinctiveness of this territory, its independence and its sharp distinction from southwestern Asia. Also, the leguminous plants of this territory are special. As demonstrated by research later on, the strains from the steppes of dry, northern Syria are particularly interesting for the drought-stricken areas of Ukraine.

From Aleppo we returned to Beirut and went from there northwards to Latakia and the Lebanese mountains. The mountains are a remarkable area, directly adjoining the coastal belt. They face the Mediterranean and reach an altitude of 2000 metres. The automobile was only with great effort able to climb to the top of these mountains. The region is densely populated; it is a resort area, to which a number of rich people from Egypt come. Beautiful villas and summer houses enliven the villages and harmonize beautifully with the mountain scenery.

The slopes of all the foothill areas are occupied by grapevines as well as groves of fig and olive trees. Every inch of the soil is utilized. The rich mountain flora of the Mediterranean area is especially interesting because it includes a multitude of wild relatives of cultivated plants. Here we found interesting wild oats [*Avena fatua* L.], wild peas, wild olives [*Olea europea* L. subsp. *africana* [Mill.] P. Greene] and wild carob trees [*Ceratonia siliqua* L.].

The ascent became even steeper. We had to park the car and ride horses to reach the groves of the celebrated cedars of Lebanon [*Cedrus libani* Loud.]. Here Solomon in his time sent expeditions after material for the construction of the temple of the Jews. At present this is one of the most remarkable preserves, exceptional because of its beauty. It is not very large, at most 200 hectares, the groves situated along the mountains in the form of steplike terraces. The enormous trees form large groups with straight, almost horizontal branches. Serenely and majestically these giants tower, looking much their age. At the feet of the mighty ones there are shoots of variously aged young cedars. Among them we found stands of wild perennial rye [*Secale montanum* Guss.].

Seeing the cedars of Lebanon involuntarily carries one back into the depth of the ages. They represent one of the relics that indicate the flora of the past. No doubt the large extension of the mountain massif, which reaches from the vicinity of Beirut toward the north, was once covered by coniferous forests. At present only isolated groups are left, saved in the form of forest reserves. Near the cedar groves there is a small tourist station with a tiny museum, devoted to the cedars of Lebanon.

We continued farther north, to Latakia. Along the road there were ruins everywhere, which give witness to a remarkable past and the outstanding civilization that had been concentrated here. Representing the present, there are only some small Arabian villages and a few Arabian schools. Much seems accidental and alien and an effort is necessary to distinguish the new from the really old, which has persisted through the ages.

We returned from Latakia to Beirut and tried to sum up the complicated impressions of the diversity of this country. I hurried to visit the herbarium of the Jesuit, Bouloumou. Father B. was near death. The superior of the ecclesiastical educational institution was astonished by my inquiries about the existence of the large herbarium and let me have the key to it. The 'Flora of Syria' by Bouloumou, the manuscript of which was lent to me during the time I spent in the herbarium, was to be published in the near future. The collection of plants was undoubtedly the result of an enormous endeavour. Hundreds of files indicated the great diligence spent on assembling it. But the herbarium was in a deplorable condition; everything was eaten by beetles and moths. It was a terrible pity that, in spite of its exceptional importance and the paucity of available information about the rich and important flora of Syria, it was, in essence, lost. By means of the manuscript I tried to find the groups of greatest interest to me, but soon I was convinced of the futility of the search since everything in the herbarium had been moved around. It turned out that in this ecclesiastical institution the herbarium had been neglected and that my visit to it was the first one during the last 4 years. Thus, the best herbarium of the rich Syrian flora is lost and all has to be started again from the beginning.

Before leaving Syria I went to Baalbek and the ruins of the temple, dating to the period of the Roman Empire. The modest work of restoration, only for display, had already revealed an exceptional standard of living. This city, a military outpost of the Roman Empire, was solidly built, just like everything made at that time. There was a theatre, a temple with Corinthian pillars, rows of shops with specially constructed counters, good roads in all directions, baths and sewer pipes. Even at the periphery of their empire, bordering on the desert, the Romans achieved the minimum of comfort that was considered necessary at their time. All the city buildings were laid out in a definite order, according to a system that could be traced even to our day.

Nothing is left of the glorious past. To replace the settled Roman civilization that once flowered in Syria, there was only a semi-nomadic but quite advanced Arabian civilization. However, during the ensuing dominion of the Ottoman Empire, the past fell into decay. The conversion of Syria after World War I into a so-called French mandate in no way improved matters. In all of the large area of Syria, which exceeds even that of France itself, I found in 1926 only a single agronomist, Mr. Ashar, who at the same time was consultant to the Syrian government on economic problems.

This country, with an ancient, glorious culture that has existed through periods of powerful accomplishment, endures at present a period of profound decline. It is underpopulated and does not utilize its enormous natural resources, which could provide opportunities for millions of people. The only highways are strategic military ones, constructed during the last couple of years, which uniquely indicates the influence of the French.

As a mandated territory Syria is a typical example of the political-economic absurdity that still dominates our earth. Why does the French people need a Syrian mandate? Certainly, not a single sensible Frenchman can answer that question.

EXPEDITIONS IN PALESTINE AND TRANS-JORDANIA[1]

From Beirut I went by car along the coast of Syria to Palestine. This is a very interesting road through ancient Phoenicia, past Tyre and Sidonia. Very little is left, just some ruins of a few ports, silent witnesses of a glorious past. I reached the border of Palestine. At the checkpoint, the bulky luggage gave rise to comparatively more interest than my documents. Behind the border gates, the landscape was the same. The demarcation did not in any way coincide with any natural border: on both sides the same narrow belt of Mediterranean vegetation, the same kind of dry foothills with a shrub vegetation called 'maquis' together with which wild olive trees, wild figs, pea-shrubs [*Caragana* Lam.] and wild almond trees could be seen. After reaching Haifa, the main northern port, I drove at once into central Palestine, to Jerusalem. There I stopped in the old city near Arabian and Christian temples, to be close to the ancient East.

I had to wait for 2 months in Palestine for visas for Egypt and Abyssinia, a long time in such a small country; but it allowed me to travel in all directions over it and Trans-Jordania.

Until fairly recently, up to 1918, Palestine belonged to Turkey, after which it was occupied by the English military, becaming an English mandate in 1920. Together with the English administration there is in Jerusalem also the residence of the Zionist Executive, the actual central organ of a Zionist state. Relations are always complicated. For the most part the English administration, with its comparatively small staff, is supported by the Hebrew population. The population of Jerusalem represents a quite peculiar conglomerate of old resident Arabs and Jews, most of whom are fairly recent immigrants from various countries of the world.

Licenses for buying land for the settlement of Jewish immigrants are granted to the Zionists. However, the land bought by Zionists occupies so far only a minor portion of Palestine, which is mainly inhabited by Arabs. There are 20% Jewish settlers against 80%Arabs, who lately, as is well known, have started a campaign against concession of land to the Jews. The behaviour of the English authorities is highly peculiar. In Palestine they defend mainly the rights of the Jews, but at the same time they prevent them from penetrating into Trans-Jordania, which is also an English mandate. Thus, for instance, a visit of Palestinian botanists to Trans-Jordania together with me was almost impossible. Only thanks to the intervention of several people, including the director of the Department of Agriculture, Colonel Sawyer, who acted on my petition, were Dr. Eig, a Palestinian botanist and his assistants, allowed to accompany me into Trans-Jordania.

After Arabic the language most widespread here seems to be Russian since a rather large number of the Jews, seeking a new homeland here, appear to be emigrants from Russia. I recall an episode from my first days here. I had to deliver a letter of recommendation. When arriving at the house indicated and after knocking at the door, I asked them to open and started speaking, of course, in English. There was no answer. I turned to German, thinking that due to the similarity between it and Yiddish, I would be understood in that language. This did not happen. I tried French and still met with no luck. When I switched to Russian, I was finally understood, the door opened and I was advised always to speak Russian in Palestine.

[1] After World War I, the territory consituting present-day Israel was awarded to the UK as a mandate by the United Nations. In 1922 the British divided the mandate into two parts, designating all lands west of the Jordan River as Palestine, and those east of the river as Transjordan, or 'Trans-Jordania'. Editor's note, 1996.

At the end of my mission, at the invitation of Palestinian agronomists, I had to give a lecture about my work and the origin of cultivated flora of Palestine. A large audience had assembled, 200-300 people, in part arrived from other cities. Colonel Sawyer, the director of the Department of Agriculture as mentioned above, was expected and therefore it was natural that the lecture should be delivered in English. However, for some reason Sawyer was unable to come, prompting a discussion about which language would make the lecture most accessible to the audience, since English did not appear to be understood by everybody. I was able to give it either in French or in German. However, a vote showed that Russian was the most acceptable language and the lecture was, thus, delivered in that language, along with simultaneous translation into Hebrew, knowledge of which is obligatory for the Zionists.

While travelling around in the country I here and there visited Arabian schools, where the teachers understood Russian fairly well. It turned out that a considerable number of Arabian schools here had in their time been built and paid for by Russians, who had gone on a pilgrimage to Palestine on the condition that Russian be taught in the schools side by side with the Arabian language.

The small country of Palestine is exceptionally convenient for studies of Mediterranean crops. On acquaintance the Agricultural Research Station in Tel Aviv turned out to be a first-class scientific establishment with major scientific forces collected from all over the world. In one laboratory they spoke English, in another Russian, in a third one German and in a fourth, French. This internationalism is typical of Palestine. It makes it unique, raising the country to the highest intellectual level. The first-class University of Jerusalem, created at the initiative of the great botanist Warburg and the physicist Einstein, is no doubt one of the most remarkable establishments in respect of both the professorships and the exceptional value of the books assembled in its library.

The excellent roads, recently constructed, make it easy and fast to study the entire country in all its diversity. Although small as a territory, Palestine presents a great variety of natural conditions owing to its mountainous terrain and the presence of such a deep depression as the Dead Sea, situated 400 metres below sea level. Altogether, the irrigated and nonirrigated agriculture and the proximity of the Arabian desert provide opportunities for observing a multitude of contrasting landscapes in a short time.

With respect to scientific studies Palestine stands at an immeasurably higher level than Syria. The phytogeography of Palestine has been excellently described during the last couple of years by Dr. Eig, the author of beautiful geobotanical and taxonomic papers. The herbarium of the University of Jerusalem furnishes an exhaustive representation of the flora of Palestine, Trans-Jordania and adjacent dominions. The soil conditions have been elucidated in papers from the Tel-Aviv research station. The remarkable work of Velikanskiy, *From the Primitive to the Present Type of Agriculture*, furnishes an opportunity for understanding the particulars of the agriculture of this country. The agricultural museum, created by the agronomist Eittingen, is exceptionally complete and is a fine introduction to the agricultural life of this country.

Old Jerusalem is now surrounded by a large new city, where the university and most of the hotels are situated. All building activities are concentrated mainly within the new Jerusalem. Old Jerusalem still preserves the traits of an ancient city. Behind its wall Moslem mosques are completely preserved, relics from the time of Mohammed. Close to the ruins faithful Jews mourn the loss of their temple from early morning to late at night. A new Christian church is represented by great numbers of altars, carelessly constructed by differ-

ent powers. Orthodox, Protestants, Catholics and Copts all have their own altars and their own services. All of old Jerusalem is a complex museum, where each street and every house represents a page from the biblical history. In the garden of Gethsemane centuries old olive trees are still preserved. The city is surrounded by hospitals, almshouses and other charitable establishments.

Jerusalem is situated in a montane area at an altitude of 500 metres and has a typical semi-desert climate. The summers are completely dry. No rain falls until late autumn. The precipitation occurs during late autumn, winter and early spring. The inhabitants of Jerusalem suffer from a shortage of water. The city is supplied with water from the surrounding mountains. It is collected in special reservoirs in the foothills and conducted into Jerusalem via aqueducts and subterranean conduits. But it is not enough., especially in the autumn. In September and October it is often easier to find a glass of wine than water in Jerusalem. When sleeping one morning in November, I heard a noise in the street. The first rain of the autumn was falling. The inhabitants and especially the children were delighted. All the city was literally rejoicing. The water was collected from the roofs and greedily drunk.

After working out a plan for an expedition in Jerusalem and Tel Aviv, I went together with the agronomist Eittingen to the valley of Esdralon where at present the Jewish colonization is concentrated and where Aaronsohn had made the main finds of wild wheat. The vegetation was mainly arboreal. Only during early spring is it possible to see the herbaceous ephemerals to which the wild wheat belongs.

In the foothills of the mountains from which a subterranean stream flows into the Esdralon valley, I actually found a large stand of wild wheat together with an admixture of distichous barley. This was on vacant land with soft, fertile soil surrounding the crops themselves. The wheat here looked distinctly different from what we had collected in Khoran in Syria. The spikes and the spikelets were large, reminiscent of those of cultivated wheat but with rough awns and large grains. This was far from a xerophyte like the Syrian wheat and in essence the plants were close to cultivated wheat.

When studying the crops in the valley of Esdralon itself, I found wild wheat in large amounts around the edges and along the boundaries of the fields. There is no doubt at all that it represents a wild relative, very close to cultivated wheat, in particular hard wheat. In contrast to the Syrian wild wheat, the Palestinian one is represented by a great variety of forms, of which K.A. Flaksberger has described a large number of varieties. The fact that it is found together with wild barley suggests that Palestine just like Syria actually belongs to the basic native lands of the most important of the cereals, that is, wheat and the barley. Here, where archeological documents also indicate the presence of ancient civilizations, the main evolutionary links of the crops in question are also found.

The land in the valley of Esdralon has to a major extent been bought up by the Zionist Executive and during the last couple of decades large waves of Jewish colonizers have been arriving there. The conditions are rather peculiar. For every family 1000 pounds sterling are given as long-term credit and can be used at will. It is possible to join a commune, to work individually, or to form a cooperative. In a commune all is common property. The children of the members sleep together in one place, separated from their parents. In the commune there is still a complete bond to agriculture but the families regularly go to work in the towns and then return in accordance with the seasons to do field work. The valley of Esdralon is like a research field, where various forms of societies are tried out. There is a gratifying tendency toward mechanization of all agricultural work.

The wide valley of Esdralon, with a kind of black soil, is exceptionally favourable for agriculture. The level character of the area makes it possible to do completely mechanized work here. The most productive of the local wheats have been selected and are sown by Jewish farmers.

Work at the Tel-Aviv research station soon led to a plan for the most rational control of agriculture. Naturally, a conversion to the European turnover type of Sack plows was the first thing desired. However, research at the station demonstrated that in this respect the Arabian or Latin type of furrow plow was indispensable. For greater efficiency it was provided with wheels. Here the turning over of the sod is practiced only on lots where the soil is extremely weedy. Where the soil is adequately cultivated, turning over by plow is unnecessary; the ordinary Latin-type furrow plow is entirely satisfactory of working the soil.

At the station, part of the research conducted concerns application of irrigation to subtropical crops, i.e. different kinds of bananas and sugarcane.

I also went to the lake of Genesareth. There fishing is conducted just as it was in the distant past. No doubt the population of ancient Palestine was much larger than the present one: hundreds of structures, long ago fallen into ruins, and thinly populated areas provide a picture of the present. Everything in this area is abandoned, neglected and deserted. The blue lake carries one back to Biblical times. Nazareth is also here. It is surrounded by a thicket of cacti, mainly without spines [*Opuntia ficus-indica* [L.] Mill.], that was planted 160 years ago. This indicates that the spineless cactus was known long before Burbank, to whom usually the 'invention' of cacti without spines is attributed. The cactus is a typical Mexican plant and the presence of spineless cacti in Palestine indicates a distant provenance of this form.

The composition of the kinds of cultivated plants in Palestine largely reflects what is local and endemic; but at the same time, thanks to the large turnover of the populations, one also encounters undoubtedly alien and casual introductions.

I went to the northern border of Palestine, back towards Syria, where the Syrian Khoran imperceptibly crosses over into the Palestinian one. The flora is the same and so are the dry foothills and the hard wheat, the 'Khoranka.' Turning eastward I went to the Jordan river, which flows out into the Dead Sea and separates Trans-Jordania from Palestine. The bright, dark-blue and narrow band of the river is flanked by a marsh on the Palestinian side. Around the river itself and on a part of the bank, there is a stand of beautiful papyrus [*Cyperus papyrus* L.], reaching 2 metres in height. Behind them there is a thicket of oleanders [*Nerium oleander* L.] with pink flowers. The oleanders flower in September. From far away it looks as though the entire valley is an endless stretch of pink. The papyrus and oleander bordering the Jordan give it an exceptionally picturesque aspect. The water is clear and potable. A marshy area lines the Palestinian side. Across the river from Palestine, on the Trans-Jordanian highland, a rural extension of Palestine begins where enormous crops of wheat are concentrated.

The Dead Sea, situated almost 400 metres below sea level, is a deep depression filled with briny salt water, unsuitable for life. On its steep eastern shore thickets of wild date palms [*Phoenix sylvestris* [L.] Roxb.] can be seen. They give it a distinctive look. I took a steamer to the south end of the Dead Sea. A piece of heavy wood thrown into the sea floats on top of it. To swim in the sea is peculiar: the water lifts one to the surface. It has a very unpleasant taste. When getting out of this lake one has the feeling that the body is covered by some kind of a crust.

Ancient Jericho is situated on the western shore of the Dead Sea, surrounded by irrigated gardens and palm trees. To the south the beautiful Gilboa mountains with slopes of different colours, mainly dark brown and gloomy, can be seen. All around is a lifeless desert. Only occasionally are there a few plants, e.g. the peculiar small crown flower [*Calotropis procera* [Ait.] Dry.] with inflated fruits and the original 'cucumbers of the prophets', also called 'gooseberry gourds' [*Cucumis prophetarum* L.]. These are the size of small plums and covered with thorns and, although edible, they are not tasty but somewhat salty. This is all the vegetation on these yellow clayey or sandy expanses.

Near ancient Jaffa on the Mediterranean coast the a new city of Tel Aviv[1] has been built up during the last couple of decades. In contrast to ancient Jaffa, which was a typically Asiatic city with flat roofs, Tel Aviv is a very modern city with beautiful and comfortable homes, European hotels, theatres, schools, factories and plants; in other words, it is a city built in a very short time according to American methods of high-speed construction.

Plantations of the famous Jaffa oranges [*Citrus sinensis* [L.] Osb. cultivar.] are concentrated on the red soils around Jaffa. This is one of the most important products of the Palestinian agriculture, outstanding with respect to the technology of irrigation, care, application of fertilizers and the fight against diseases and pests. Here a rigid selection of the best plants is made. The well-known brand 'Shamudi' arose apparently as a vegetative mutation as was demonstrated by a Dutch research worker, Oppenheimer. Jaffa oranges are distinguished by their smooth and thick skin and the large size of the juicy fruits and have therefore, in essence, no competitors. The market for them is absolutely secure and practically unlimited.

From Jaffa a road runs southward to Egypt via Gaza. The climate becomes increasingly drier, the soils sandier and more easily wind-driven. Gaza, bordering on an Egyptian area, is situated in a large oasis with thousands of date palms. Artificial pollination is practiced. The dates are of high quality, not less than that of dates from the oases of Sahara.

The agricultural opportunities for Palestine are limited. Most of its area is occupied by highlands, suitable only for cultivation of olives. The area for fields is limited and to a great extent already used up. A number of major irrigation projects have been worked out, offering rich possibilities for spending considerable amounts of money. Opportunities for developing agricultural crops are far better on the other side of the Jordan, in Trans-Jordania. This country, which seems like a natural extension of Palestine and is immediately adjacent to Mesopotamia, is represented by an enormous level territory favourable for cultivation of cereals. Crops stretch over wide areas almost to the horizon. They consist mainly of hard wheat and the distichous, drought-tolerant Palestinian barley.

Whichever way you turn in Palestine, there are ruins of large buildings and traces of Roman roads. The authority of the Roman Empire reached as far as here. In the centre of Trans-Jordania, remains of a large outpost city with ruins of temples with Corinthian colmuns are preserved. The agricultural character of Trans-Jordania is imprinted on the ruins of this Roman city. Conical stone mills, used for grinding grain on stones, are preserved here in large numbers. They are by far more perfect than the primitive and simple stone mills. In other words, here things were better in the past. Indeed, in ancient times the initial acculturation of bread grasses, wheat and barley, occurred exactly within this territory. There can be no doubt that in the past considerable amounts of wheat and barley were grown here, which was possible thanks to the development of an agriculture which

[1] 'Hill of Spring', but originally written in Russian mistakenly by Vavilov as 'the spring flower'

made use of the plow. According to documented data, not only was Trans-Jordania the granary of Palestine but its grains were exported far beyond its borders.

The future prospects for agriculture in Palestine are not very clear. It is absolutely obvious only that the system of government and the building up of Palestine is not radical but often counterproductive. The surplus of intelligentsia, including agronomists, cannot really be assured of a rational application of their efforts. It is impossible to escape the detrimental effects of the national disunity and the discord that seem to be what is primarily being cultivated in this country.

ALGERIA

From Marseilles it is just about an 8-hour voyage aboard a fast steamer to the port of Algiers. So this is Africa. However, the first impression is that there is very little of the real Africa left here. All around and wherever you look in Algeria there is an exclusively international flora: beautiful Peruvian philodendron [*Monstera* sp.] with split leaves; enormous thickets of Australian eucalyptus, acacias and casuarinas; citrus trees introduced from southeastern Asia; Mexican cacti and agaves planted as fences along the shores; and endless vineyards, stretching for miles in all directions. This is what characterizes the present agriculture of Algeria.

I went to see the main 'culprit' for this, the famous French introducer of plants Louis Trabut. This was during the summer of 1926. On the day of my arrival the Algerian community was celebrating the occasion of Trabut's 75th birthday and a bronze medal was issued in his honour. Trabut had studied the flora of Algeria untiringly for more than 40 years and together with Batande he compiled the first catalogue of it; he also studied the evolution of the cultivated flora of Algeria. Trabut was the first one to understand the connection between the cultivated Mediterranean oats, *Avena byzantina* C. Koch, and wild oat-grass, *A. sterilis* L.; and he found the wild ancestor of horse beans in the mountain areas of Algeria, the so-called *Vicia pliniana* [Trabut] Muratowa. However, the most important matter in the life of Trabut, his greatest feat, was his wide-ranging scientific plan for introduction of everything of value within the plant kingdom from all countries with tropical or subtropical climates.

In contrast to American introducers, Trabut, a very well-educated taxonomist, phytogeographer and evolutionist, delved deeply into the selection of species and genera. His most beautiful monographs are studies of the evolution of the eucalyptus, acacias and agaves. He applied the wide horizon of a phytogeographer to the selection of citrus species. He created an important botanical garden, where a worldwide tropical and subtropical flora is concentrated. There he gathered what was most valuable. Most of all this was subject to evolutionary and ecological ideas. The fame of Trabut is immortal. His methods are used not only in different countries along the shores of the Mediterranean; they are also employed in the subtropical areas of the Soviet Union.

The visitor from the Soviet Union was apparently a very welcome sight for the eyes of the stern old man. He eagerly showed me his herbarium and provided me with seeds and literature. Together with him I worked out a travel route through Algeria including stops in the Sahara. The conversations with Trabut were a great pleasure because of his wide views, concrete knowledge and soaring thoughts, as well as his evolutionary ideas.

The modest condition of his home indicated that even in the rich capitalistic countries science sets toilers to work, that to a great extent their work is unselfish and that it is in no way remunerated according to the value of the results achieved. This is especially characteris-