

ATLIXCO

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Mr. President, Ladies and Gentlemen:

"It was cold this morning when I arose in Puebla"—thus runs the entry in my Field Journal under date of December 18, 1918—"and as I came down the street toward the railway station I noticed frost upon the roofs of the houses. An overcoat and gloves, which had for months lain untouched in my trunk in Veracruz, while I was in the hot lowlands, now felt very grateful. It was just such a morning as we often experience in California at this season of the year.

"The train started just as the sun was rising over the distant hills, and we were soon rolling across the broad, level floor of the valley of Puebla. The village of Cholula, with its immense pyramid built by the ancients, was reached after half an hour. At the time of the Conquest this was an important city, with commerce which extended as far south as Guatemala. Because of the religious institutions which existed here, Cholula has been called the Mecca of the ancient Mexicans. Nearby Atlixco, it seems to me, may well be termed the Mecca of California avocado growers. Because of the important part which it has played in the early development of our avocado industry it must always remain to us an historic spot, and it will, I believe, be visited in future years by many Californians.

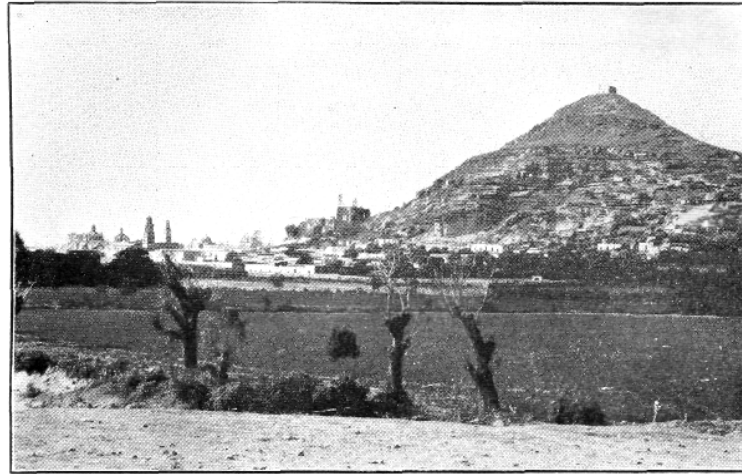
"We left Cholula, and traveled across a fertile plain directly toward the volcano Popocatepetl, whose snow-covered summit, towering ten thousand feet above us, glistened in the morning sun. On our right, stretching away to the hills, were patches of scrub and other patches of unbroken grass land. On our left were endless cornfields, in which the crop had been harvested and the fodder cut and shocked.

"Here and there we passed a house or two, with fruit trees scattered about—apricots now dropping their leaves and peaches coming into bloom. Then we came alongside the *malpais* or 'bad lands,' the extreme limit, it is said, of the last lava flow from Popocatepetl. The dull gray rock is heaped up thirty feet or more above the surface of the land, and its jagged surface furnishes innumerable hiding places to Zapatistas, who are wont to fire from this stronghold upon passing trains.

"Up to this point we had traveled at the level of Puebla, 7,100 feet. Once past the *malpais* we began to descend. It was not a rapid drop, but rather an easy descent across the sloping plain and alongside a barranca leading through the Tentzo hills

which separate the valleys of Atlixco and Puebla.

"And as we began to descend I had my first glimpse of the valley of Atlixco, and could fix the situation of the town itself by the cerro *de San Miguel*, a conical hill, beautifully symmetrical and of considerable height, which rises abruptly from the plain.



THE APPROACH TO ATLIXCO

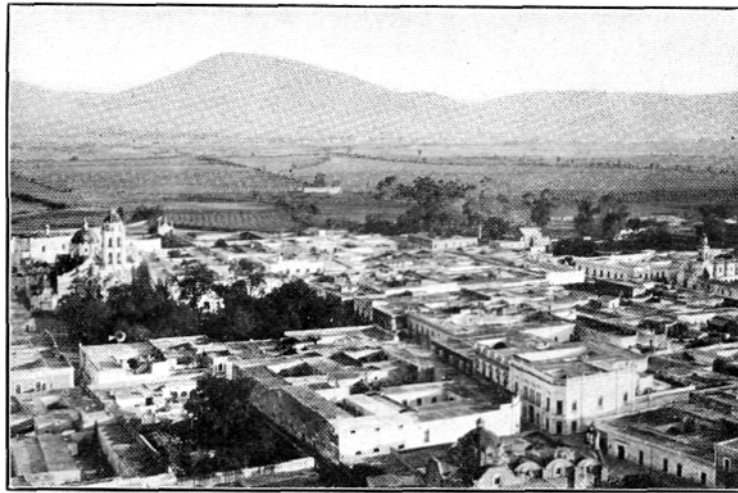
The Cerro de San Miguel, a hill about 500 feet high, and the ancient church towers at its foot combine to make a picturesque scene. The traveler arriving from Puebla first views it across the alfalfa fields visible in the foreground.

"I never go into a new region which holds something of interest without carrying with me certain preconceived ideas of its appearance. And almost invariably these ideas turn out to be erroneous. If I might have seen a few photographs of the valley of Atlixco before I came here I would have had no occasion to be disillusioned—*desengañado*, as the Spaniards say—in the rude manner which befell me. I had pictured a small mountain valley, whose slopes were covered with the pines and oaks characteristic of this elevation, and a town of picturesque houses nestling among roses and fruit trees. Imagine my surprise, therefore, as we passed around the western end of the Tentzo and I saw spread out before me, stretching away into the dim and hazy distance, a broad, level plain, intensively cultivated, almost devoid of trees, and broken here and there by a series of low, rolling hills, as brown and barren as those of Southern California in September.

"As we came alongside the station and climbed off the train, I noticed that the town was not hidden from view by roses and fruit trees. At first I was disappointed, and then I began to wonder where I would find the orchards which I knew must exist close by. Here and there I could see a single tree rising above the stone walls of a patio, but nowhere did I see anything which looked like a grove. Back of the town the cerro de San Miguel rose in all its cactus-dotted barrenness. 'Is it possible,' I asked myself, 'that there can exist, in such a region as this, the gardens of which we have heard?'

"But I was told to wait; and after crossing the town and approaching the foot of San Miguel, I began to catch glimpses of clumps of trees, and walled gardens, and little

streams of water running here and there. And then we climbed the hill, and the whole glorious scene was spread out before me; the town in front, with a clump of green foliage marking the site of the plaza, and to the rear, extending around the base of the hill from one side of the town to the other, the groves and gardens—*solares*, they are called—where abundant water makes possible the cultivation of fruits and flowers which otherwise could not grow in this dry region.



THE TOWN AND VALLEY OF ATLIXCO

This old Spanish city, lying at the edge of a fertile plain given over to wheat culture, is the Mecca of all California avocado growers. The trees upon which the avocado industry in California was founded have mainly come from the orchards which lie to the right and left of this picture.

"Here they were, the gardens of Atlixco! Here at last were the avocados— I could easily distinguish them from the other foliage. Somewhere among all those trees below me, I thought to myself, must be the parent Fuerte, and the parent Puebla, and many other trees I had come so far to see!"



A STREET THROUGH THE AVOCADO GROVES

Along this picturesque roadway are several of the walled orchards from which were obtained the fine Atlixcan avocados now cultivated in California and Florida.

It is probable that any other California horticulturist possessing a deep interest in avocados would have been subject to much the same impressions upon arriving in Atlixco as those which I experienced on the day I wrote the above paragraphs. I am certain that he would have been surprised to find a region so strikingly suggestive of his own State, and I am equally certain that he would have been thrilled as he viewed the avocado trees from the summit of San Miguel.

So far as I am aware, the attention of Californians was first publicly called to the avocados of Atlixco by William D. Stephens, in an article which he wrote for the California Cultivator in 1911. Mr. Stephens was formerly a mining man. He became familiar with the avocado in 1900, while in La Paz, Lower California. Later he was in the Mexican State of Oaxaca, and there saw avocados growing at elevations of 5,000 to 8,000 feet above the sea. The similarity between the climatic conditions of Oaxaca and southern California suggested to him the possibility of growing avocados in the latter

State. He returned to California and found that a few trees were already fruiting at Monrovia, Santa Ana, Hollywood and elsewhere, and he decided to start an avocado nursery. He formed a partnership with D. E. Glower of Monrovia, and imported several-thousand avocado seeds from Mexico. In the early summer of 1910 he returned to the latter country to search for the best varieties to cultivate in California. The story of his explorations in the Atlixco region I quote from an account which Mr. Stephens has kindly furnished me:

"Through friends in Mexico City I learned that Querétaro was undoubtedly the Mecca I was seeking. To Querétaro I hastened, and there I remained about two weeks examining the fruits and shipping home seeds and budwood. I was not, however, entirely satisfied with the fruits I found there. I returned to Mexico City and went through Orizaba and Córdoba to the Isthmus of Tehuantepec and the State of Chiapas. I found avocados of ordinary quality everywhere but not the superior ones I was seeking.

"I went back to Mexico City and fell in with Dr. Martin Espinoza, a dentist who had lived in San Francisco. He told me of the Atlixco district and its magnificent avocados. They were thick-skinned, he said, and ripened in winter and spring instead of summer. In two days I was in Atlixco.

"My Spanish was poor, so I made an effort to find someone who knew English and who could serve as interpreter for me. The second day after my arrival I met Gabriel Fuentes, a man who had been raised in the United States. He proved to be intelligent and courteous, and best of all was thoroughly familiar with avocados, owing to the fact that he made a business of shipping them to Mexico City and occasionally to the United States. He took me through the groves and showed me the trees which produced the choicest fruits. At that time of the year, August, the latter were only half-grown and I could not sample them; but I arranged with Mr. Fuentes to ship me specimens as soon as they were matured, numbering each one and sending a description of the tree from which it came. I believe it was in January, 1911, that the first basket of Atlixcan avocados reached me in California. I had these fruits photographed, and then we selected five of them for propagation. These bore the numbers two, six, seven, thirteen and fifteen. It was at this time that I wrote a short article for the California Cultivator descriptive of the fruit, methods of preparing and serving it, and ended with some optimistic predictions regarding its future in California. In the meantime, owing to damaging frosts at Monrovia, I become skeptical about the desirability of that region for an avocado nursery and dissolved partnership with Mr. Clower.

"I formed a new partnership with A. R. Rideout, of Whittier, and as soon as the buds at Atlixco were in proper condition Mr. Fuentes began shipping to us.

"What happened to the avocado pioneers, in the winter of 1912-13, is now history: Jack Frost played few favorites, and when the smoke of battle had cleared away and we had taken stock of our salvage, all that we had left to represent our effort and expense was four plants of Number Two and five or six of Number Fifteen. From these we have since propagated others, until we now have several hundred five and six-year-old trees chiefly of the Number Fifteen variety. These trees are divided between myself, A. R. Rideout of Whittier, and G. W. Beck of La Habra. The Number Two trees at Mr. Rideout's place and the Number Fifteen at Mr. Beck's fruited lightly this past season. The fruits of both

numbers were of exceptionally fine quality and desirable size (16 to 24 ounces), and we hope that further experience will show that they merit extensive cultivation in California."

Previous to Mr. Stephens' visit to Atlixco, Juan Murrieta of Los Angeles had been in touch with the region, and had secured seeds from which he raised numerous trees. Mr. Murrieta first learned of Atlixco in 1892. He entered into correspondence with Mr. Fuentes, and in January 1893, the latter forwarded a shipment of fruits. Other shipments were received at later dates. The seeds from some of these fruits were planted by Mr. Murrieta himself, while others he gave to friends in or near Los Angeles. From them came the parent trees of several well-known varieties which are now propagated in California.

I am told, also, that commercial shipments of avocados from Atlixco reached Los Angeles from 1890 until the time when communication was interrupted by the revolution,—about 1911. From some of these fruits, sold in the markets of Los Angeles, have come seedling trees which have in recent years attracted much attention.

Carl B. Schmidt, Explorer for the West India Gardens of Altadena, spent several months in southern Mexico during the latter part of 1911. He sent from Atlixco budwood of nearly thirty varieties, many of which were successfully propagated in California.

The year following Schmidt's work, Roberto Johnson, a horticulturist living in the state of Jalisco, Mexico, visited Atlixco, also in the interests of the West India Gardens, and forwarded more budwood of several of Schmidt's selections, as well as a few additional varieties. Had not political conditions in Mexico become so unsettled about this time other visits to the region would undoubtedly have been made by those interested in the development of the avocado industry in California, but for several years Atlixco has either been occupied by the Zapatistas or subject to their raids, so that no one has desired to venture into the vicinity on a mission of this nature.

So far as I have been able to learn, the following varieties are all which have been successfully introduced into California from Atlixco (I refer, of course, to budded varieties,—that is, those which originated in Atlixco as seedlings, and of which budwood was sent to California. Varieties which have originated as seedlings in California, from seeds sent from Atlixco, are not included) :

Introduction by William D. Stephens: Two varieties not yet named, grown provisionally under the numbers Two and Fifteen.

Introduction by the West India Gardens: Puebla (introduced under the number Thirteen) ; Fuerte (No. Fifteen) ; Redondo (No. Sixteen) ; Verde (No. Seventeen, at first called California Trapp, later changed to Verde) ; Merito (No. Eighteen) ; Perfecto (No. Nineteen) ; Number Twenty, a variety not named, and perhaps no longer growing in California; Number Twenty-two, a variety not named, and perhaps included with Perfecto (in case the latter at any time shows two distinct strains, it will be probable that one is the true Perfecto and the other No. Twenty-two) ; Colon (No. Twenty-four) ; Canto (No. Twenty-five); Alto (No. Twenty-eight) ; Atlixco (No. Twenty-nine) ; Oro (No. Thirty-two) ; Montezuma (No. Thirty-three) ; Miles (No. Thirty-five) ; Sinaloa (No. Thirty-seven) ; Grande (No. Thirty-nine) ; Schmidt (No. Forty) ; Obispo (No. Forty-one) ; Popocatepetl (introduced without a serial number) ; Volcan (introduced under the name

Ixtaccihuatl) ; and Modesto.

HISTORY

Undoubtedly the valley of Atlixco was an important agricultural region before the arrival of the Spaniards. The indigenous inhabitants probably cultivated maize, beans, peppers, squashes, and a few other crops.

It is evident that it did not take the Spaniards long to appreciate the attractiveness of the region, for they were already established here in 1540,—less than 20 years after the arrival of Cortéz in Mexico. Fray Toribio de Benavente, better known as Montolinia, gives us a lengthy account of the valley in these early days. Montolinia, who was the sixth Franciscan named as a missionary to Mexico, received his letters patent in Spain in the year 1523. He wrote his description of Atlixco, from which I translate* only those portions which are of most interest to us, in 1540, and died on the day of San Lorenzo in the year 1568:

**I take this description from "Puebla; Su Territorio y Sus Habitantes," by Enrique Juan Palacios, México, 1917.*

"Situated four leagues from this city (Puebla) is a region called the Val de Cristo, where the inhabitants of Los Angeles (Puebla) have their vineyards and their orchards of pomegranates and other fruits, and where these things grow luxuriantly. They also have here their wheat fields, which yield nearly all the year round, in contrast to those of the *tierra fria*, which only produce a single crop annually, like those of Spain; but in this valley of which I am speaking, since it is *tierra caliente* (or at least the crops are not injured by frost) and water is always abundant, they sow and harvest continuously. Fields can be seen in which the seed has just been planted; others in which the first green sprouts break through the surface of the ground; others in which the wheat is in full leaf and heading out; and still others with ripened grain ready for the harvest. This is a very common sight. Bread made from this wheat is extremely good, so much so that it can be said the people of this city eat nothing but *pan de boda* (wedding bread). The riches of this favored region are increased by the mulberry trees which have been planted and are continuing to be planted, for great preparation is being made to produce silk. So fertile is this plain on which is situated the district which I have called the Val de Cristo, that I doubt if there is another better, or even equal to it, in all New Spain; farmers versed in their calling and those who are competent to recognize good soil say that this plain is better than those of Granada and Orihuela.

"The Spaniards call this plain the Val de Atlixco; among the Indians it has several names, since it is a large region. Atlixco means *spring*, or *source of water*; in the spot properly known by this name, two leagues above the Spanish settlement of Val de Cristo, is a large and beautiful spring, whose waters give rise to a river which irrigates a large part of the broad and very fertile valley; there are also other streams and many springs and brooks. Close by this large spring is a town which bears the same name, Atlixco, or San Pedro de Atlixco.

"Aside from the crops grown by the Indians on this plain, among which are some of great value, especially fruits and *centli* or maize (which produces two or three crops a

year), peppers, garlic, beans, cotton and other crops succeed here. It is a valley in which many mulberry trees have been set out; an estate is being planted for the King with a hundred and ten thousand trees, more than half of which are already in place, and they make as much growth here in one year as they do in Spain in three. Some of the Spaniards who live in Puebla have five or six thousand trees, each one planting as many as he can care for. The silk which will be produced here will yield immense wealth.

"This valley produces melons, cucumbers, and all the vegetables which can be grown in *tierra fria*. It should not be called *tierra caliente*, inasmuch as it only resembles the latter zone in the absence of killing frosts; in other respects it is as temperate as other regions, including that in which the Spaniards have settled. There is a characteristic of the valley often noted by Europeans, which is that a pleasant breeze, known as the *marera*, always springs up at midday; I call this the *auram post meridiem*, after the grateful breeze which is said to have blown in the terrestrial paradise. Surely such a region as this, a delightful garden in which there is an abundance of running water, roses, and fruit trees, deserves to be called a paradise, and for this reason it is termed the Val de Cristo."

The mulberry, which Motolinio considers so promising, appears never to have added to the wealth of the valley in the manner which he prophesied, for silk-culture was suppressed by the Spanish government in New Spain in order to encourage the industry in the Orient. At the present time, there is scarcely a mulberry tree in the valley. The custom of planting and harvesting wheat at all seasons of the year also seems to have gone out of date, if it ever existed to the extent which Motolinia describes. Upon inquiry, I was told that only one crop was produced a year, but that the time of sowing may be varied two or three months.

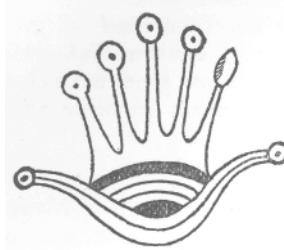
According to Betancourt, the Spaniards who first arrived in this valley were filled with admiration at the sight of the groves of fruit trees. It is not stated what kinds of fruits these groves contained. Many of the species at present grown in Atlixco, such as the cherimoya, the sweet lime, and the peach, have been introduced since the Conquest; it is probable, therefore, that they contained avocados, guavas, tejocotes, and a few other species known to be indigenous.

The modern city of Atlixco dates from 1579, when it was granted the royal charter and a coat of arms, the latter containing a figure of the archangel Saint Michael, holding in one hand a sheaf of wheat. The elevation of the city is 1880 meters, or approximately 6150 feet. The population in 1910 was said to be 9,219, but political disturbances have caused a considerable exodus during the last few years, and it is doubtful if more than 5,000 people reside in Atlixco at the present time.

The picturesque hill of San Miguel, which arises immediately behind the town and forms a conspicuous landmark throughout the valley, is considered to be of volcanic origin. It is formed of varicolored rocks, andesite, hornblend, and basalt being the principal ones. Its summit is about 500 feet above the plaza of the town.

Alexander von Humboldt, in his *Ensayo Politico Sobre Nueva España*, published in 1827, speaks of this valley, "Justly celebrated for its beautiful climate, the great fertility of its soil, and the abundance of delicious fruits, above all the cherimoya and many

passifloras." It is strange that the avocados of this region did not attract the attention of this great naturalist. We may, perhaps, infer from his failure to mention them that the large fruited varieties, for which Atlixco is at present famed throughout southern Mexico, have not been grown here until recent years.



The name Atlixco as represented in the picture-writing of the Aztecs. (See explanation in the text).

The Nahuatl name *Atlixco* is formed from the words *atl*, water, and *ixtli*, face, with the addition of the suffix *co*, meaning *among*, *in*, *upon*, or *above*. The word was expressed by means of a hieroglyph in the form of a rebus; the arms protruding from the bowl-like base form the conventional sign for *atl*, water; at the base of these there should be the small circular sign for *ixtli* or face, but Robelo (*Diccionario de Aztequismos*), from whom I have taken the hieroglyph, did not include it and I have thought it best to reproduce the figure exactly as given by him. In stating that the sign for *ixtli* is lacking, however, I am voicing the opinion of Mrs. Zelia Nuttall of Coyoacán, well-known for her work in Mexican archaeology, especially in the interpretation of the ancient picture writings or codices. The suffix *co* is expressed by the bowl from which the *atl* sign arises, the whole combining to read *atl-ixtli-co*, or *Atlixco*. This name, meaning "above the waters" or perhaps "among the waters" was doubtless given to the region because of the numerous springs which exist here.

SOIL AND CLIMATE

In the small area occupied by the avocado groves the soil appears to be uniform in character. It is similar to that found throughout a large part of the valley,—a friable, almost loose gray-black volcanic loam, unchanging in character to a considerable depth. I have seen cross sections ten feet in thickness in which the gray-black color and sandy texture remained the same throughout.

In my paper on the Guatemalan avocados* I have described the remarkable volcanic sands of the valley of Antigua, the greatest Guatemalan center of avocado culture. The soil of Atlixco differs in texture from that of Antigua; the latter is coarse, suggesting cinders, while the soil of Atlixco is a light loam or a sandy loam.

Water is readily available. In some places it comes to the surface, forming small springs, while in others the permanent water level appears to be as much as 25 feet below the surface. I noticed in the garden of Pedro Carrera a well in which the water

stood at a depth of about 20 feet.

**Exploring Guatemala for Desirable New Avocados, in Report Cal. Avocado Assn., 1917.*

In discussing the climatic conditions of a region such as Atlixco, one is handicapped by the lack of meteorological data. Naturally enough, such data are not obtained in the small towns of Latin American countries, hence one must resort to the observations he can make from the presence of topographical features which influence the climate, and from the character of the vegetation. In the case of Atlixco, we have a few data from Puebla which are of value, but must draw our conclusions regarding minimum temperatures from the presence and behavior of certain plants whose susceptibility to frost is fairly well known to us.

The valley of Atlixco is said to be somewhat drier than that of Puebla. The rain-clouds which drift up from the Gulf coast and impinge upon the great bulk of the volcano Malintzi, precipitating their moisture upon the valley of Puebla, do not always reach Atlixco, because of the barrier formed by the mountain range which separates the two valleys. I have been unable to obtain any records of the annual rainfall in the valley of Atlixco, hence an approximation must be reached by subtracting 5 to 10 inches, the probable difference, from the known annual rainfall of Puebla. This latter, according to the records of the observatory of the Colegio del Estado, averaged about 36 inches during a period of five years. Using this as a basis, it is reasonable to consider the rainfall of Atlixco 30 inches or a little less.

There are well-marked wet and dry seasons, the former extending from June to September or October, and the latter from October to May inclusive. During the dry season there is an occasional light shower, usually of no importance agriculturally. The abundance of surface water in the vicinity of the avocado orchards, however, makes it possible to irrigate the trees at any period of the year.

In regard to extremes of temperature, the maximum is not so high, nor the minimum so low, as in the avocado districts of California. The highest temperature registered in the city of Puebla during a long period of years is approximately 90° F. The minimum in the same city is 32° F. The difference in elevation between Puebla and Atlixco results in the minimum temperatures of the latter region being higher than those of the former. It is safe to assume, therefore, that the minimum experienced in Atlixco is not as low as 32° F. The mean annual temperature of Puebla is about 61° F.; in Atlixco it certainly is not much higher. The presence of coffee plants in abundance is a definite indication that the usual minimum temperatures are not so low as in most parts of southern California; even better evidence of this is furnished by the zapote (*Achradelpha mammosa*), the zapote negro (*Diospyros ebenaster*), and the zapote amarillo (*Lucuma salicifolia*). All of these plants succeed in Atlixco, but can not be grown in California. Judging by the presence and appearance of these and other cultivated plants, I do not believe it is common for this region to experience temperatures lower than 38° or 40° above zero.

It will readily be seen, therefore, that the climate of Atlixco is not so cold in winter as that of southern California, neither is it so warm in summer. It is more equable, the seasons being less well marked by changes of temperature than they are in California.

The records at Puebla show the relative humidity of that region to have averaged 63% during a period of 10 years, and 64 during another period of five years. Atlixco should differ very little from Puebla in this respect.

So far as I can judge, this region is practically free from winds of great velocity, such as those sometimes experienced in parts of southern California. During the dry season a light breeze usually commences to blow about ten o'clock in the morning and persists until sundown. It is not sufficiently strong to affect avocado trees injuriously in any way.

PRODUCTS OF ATLIXCO

The valley of Atlixco is best known throughout neighboring parts of Mexico for its wheat, its avocados, its sweet limes and its winter vegetables. In addition to these products, however, it yields a number of others which are consumed locally or shipped to nearby cities.

The field-crops of the valley are numerous. Most important is wheat, which can be considered the staple crop. Modern methods are employed in its production, gasoline tractors having recently been brought to the valley for use in preparing the land. Wheat is sown from October to December, and harvested from April to May. The quality of the grain produced here is considered excellent. Maize or Indian corn is another important crop, particularly in the lower end of the valley. Barley is grown to a very limited extent. Peanuts are produced in large quantities; about Christmas time, carloads of them are sent to Puebla and Mexico City. *Habas* or broad beans, and *garbanzos* or chick peas are produced commercially; the common *frijol* or black bean is also a standard crop. Squashes and tomatoes are grown extensively during the winter months to supply the markets of Puebla and Mexico City. Alfalfa was formerly an important crop in the vicinity of the town, but during the last few years its cultivation has declined. Sweet potatoes of several varieties are grown commercially. Chiles of several kinds, including the large sweet chiles and the small hot ones, are important crops, as also the *tomate* (*Physalis peruviana* L.), which enters into the preparation of many Mexican stews and sauces. The *jicama* (*Pachyrhizus tuberosas* Spreng) is cultivated for its edible roots, which are eaten like turnips.

Coffee forms an important culture in Atlixco. It is planted in nearly all the *solares* or *huertas*, usually occupying the ground beneath avocados, jinicuiles, and other fruit trees. The quality of the berry produced here is said to be excellent, but the production is not great enough to make Atlixco coffee an important factor in the market. In the lower end of the valley, around Matainoros Izucar, cane is grown extensively, and a considerable quantity of sugar is annually produced. The *guaje* (*Leucaena esculenta* Benth.), an indigenous tree belonging to the Leguminosae, is very abundant around the edge of the valley, and also in the town. It produces long, slender, flattened pods, containing numerous flattened seeds which form an important article of food among the lower classes.

It may be worth while to mention the common ornamental plants found in Atlixco gardens, since they help to indicate the nature of the climate. It will be noted that most of them are plants characteristic of southern California gardens. Probably the

commonest one is *Schinus molle* L., the so-called California pepper tree, here known as Peru. An ash (*Fraxinus berlandieriana* DC) and a willow (*Salix bonfilandiana* HBK) are also common. There is a single tree in the edge of town,—and it is a historic old giant, mentioned in the chronicles of the early travelers,—of the ahuehuete or Montezuma cypress (*Taxodium mucronatum* Ten.). One or more species of Eucalyptus have become fairly common. Casuarinas, *Ficus elastica* Roxbg. and *Araucaria excelsa* R. Br. have been planted in the central plaza of the town. Among ornamental shrubs the commonest are hibiscus, crepe myrtle, poinsettia, oleander, *Brugmansia arborea* Steud., privet (*Ligustrum japonicum* Thunb.), one or more species of frangipani (*Plumeria*), and the mock-orange, a species of Philadelphia. Roses, geraniums, violets and marguerites are abundant in nearly all the gardens. The bougainvillea is occasionally seen.



LOOKING TOWARD THE VOLCANOS FROM ATLIXCO

Everywhere in this region Popocatepetl and Ixtaccihuatl dominate the landscape. This view, taken from the summit of San Miguel (whose shadow can be seen in the foreground) shows a few avocado trees around the wheat fields in the edge of town, and the Metepec mill in the distance.

Fruit culture is important in and about the town, and the number of species cultivated is large. Sweet limes and avocados are the principal commercial fruits; but cherimoyas, guavas, and a few others are produced commercially in a small way. Following is a list of the species which I observed during my stay, with their local names (Spanish), the English names, and a note regarding the importance of each:

Achradelpha mammosa O. F. Cook. Mamey: sapote. Rare; not entirely successful.

Amygdalus persica L. Prisco: durazno: peach. Common.

Annona cherimola Mill. Chirimoya: cherimoya. Commercially important.

Carica papaya L. Papaya. Rare.

Casimiroa edulis LaLlave. Zapote blanco: white sapote. Abundant.

Citrus aurantifolia Swingle. Limon: lime. Rather abundant.

Citrus aurantium L. Naranja agria: sour, bitter, or Seville orange. Rare.

Citrus grandis Osbeck. Toronja: grapefruit. Rare.

Citrus limetta Risso. Lima: sweet lime. Commercially the most important fruit of Atlixco.

Citrus medica L. Cidra: citron. Rather common.

Citrus sinensis Osbeck. Naranja dulce—sweet orange. Rather abundant.

Citrus sp. Lima-naranja: lime-orange. Rare.

Crataegus mexicana Moc. & Sessé. Tejocote. Rather abundant.

Cydonia oblonga Mill. Membrillo: quince. Rather abundant.

Diospyros ebenaster Retz. Zapote negro: zapote prieto; black sapote. Rather common.

Eriobotrya japonica Lindl. Níspero del Japón: loquat. Rather rare.

Ficus carica L. Higo: fig. Rarer.

Hylocereus sp. Pitahaya. Rare.

Inga jinicuil Schlecht. Jinicuil. Very abundant.

Lucuma salicifolia HBK. Zapote amarillo: yellow sapote. Rather rare.

Malpighia mexicana Juss. Nanche. Rare.

Malus sylvestris L. Manzana: apple. Rare.

Mangifera indica L. Mango. Not entirely successful, but rather abundant.

Monstera deliciosa Liebm. Piñanona. Rather common.

Morus sp. Mora: mulberry. Rare.

Opuntia sp. Tuna: prickly pear. Abundant.

Passiflora ligularis Juss. Granadita: granadilla. Abundant.

Persea americana Mill. Aguacate de China: paha: avocado. Commercially important.

Persea drimifolia Cham. & Schlecht. Aguacate corriente: Mexican avocado. Commercially important.

Prunus armeniaca L. Chabacano: apricot. Rather rare.

Prunus capuli Cav. Capulin; wild cherry. Rare.

Psidium guajava L. Guayaba: guava. Abundant.

Punica grandatum L. Granada: pomegranate. Rather common.

Pyrus communis L. Pera: pear. Rather rare.

Spondias mombin L. Ciruela: red mombin. Very rare.

Vitis vinifera L. Uva: grape. Very rare.

From the above list of fruits it may be deduced that Atlixco lies at the meeting point of the *tierra caliente* or tropical zone and the *tierra fria* or temperate zone (so-called).

Fruits of the first-named region, such as the mango, the papaya, and the zapote negro, do not grow with such luxuriance as at lower elevations. On the other hand, the fruits of the temperate zone, such as the apple, the pear and the apricot, can be grown, although they are not so successful as at higher elevations. Fruits suited to a climate midway between the tropical and the temperate (using these terms as they are applied in Mexico), such as the avocado and the cherimoya, find in Atlixco optimum conditions.

AVOCADO CULTURE IN THE VALLEY OF ATLIXCO

Atlixco, while not the greatest avocado region of Mexico, from the standpoint of production, is probably entitled to the palm in so far as quality of fruit is concerned. Querétaro has more trees and produces much more fruit; but the Mexican race is the only one grown in that region, and the fruits are small. Atlixco, on the other hand, produces not only some large-fruited varieties of the Mexican race, but also the splendid examples of the Guatemalan for which it is renowned.

I can, perhaps, convey an idea of the extent of the orchards by describing them as seen from the summit of the cerro de San Miguel. Climbing this hill from the edge of town, you see spread out before you the broad valley of Atlixco, with Popocatepetl towering up on the northwest, only a few miles distant, and the lower stretches of the valley,—the Matamoros region,—far to the south. Below you, on one side of the hill, lies the town, covering an area one-half to three-quarters of a mile in diameter. Extending around the base of the hill, from one edge of the town to the other, and forming nearly three-quarters of a circle, are the *huertas* or *solares*,—the gardens of Atlixco. These form a belt nearly half a mile wide at the point where they join the southern end of town, narrowing to less than a quarter of a mile on the west and north, and broadening again to slightly more than a quarter of a mile where they unite with the northern end of town. The belt is perhaps three-quarters of a mile in length. These figures are all approximate,— the estimates which I made when standing on the hill.

These gardens, while devoted to the cultivation of numerous fruits, as well as other crops, contain so many avocado trees that in places the appearance is that of an orchard planted exclusively to this fruit. In other places there are many *jinicuiles* growing among the avocados, and always there are other trees which are not noticeable from the hill because they are low-growing and are over-topped by the avocados. Here and there is an open space where wheat, alfalfa, or some other crop is planted.



THE ORCHARDS OF ATLIXCO

Perhaps one-third of the orchards which surround the Cerro de San Miguel appear in this photograph. A large proportion of the trees are avocados; the remainder are mainly jinicuales (see text). While Atlixco does not produce so many avocados as Querétaro, it greatly excels the latter in the quality of its product.

In addition to the trees in this belt there are other plantings of avocados in the valley, but I did not see any of them. The nearby town of Tochimilco bears the reputation of producing fruits as good as those of Atlixco itself, and the quantity grown is said to be considerable. There are also many trees in the villages and haciendas between Atlixco and Matamoros, not to mention a large number in Matamoros itself. At some future time, when conditions are more favorable, this entire region should be thoroughly explored for desirable varieties. I believe such an exploration would bring to light several worthy of introduction into other countries.

Of the Guatemalan race I do not believe there are more than 500 trees in the huertas encircling the base of San Miguel. The Mexican race is more extensively grown than the Guatemalan. I have estimated the number of trees to be at least four times that of the latter, or 2,000. These figures are, of course, only rough estimates, since I did not have time to take an accurate census.

I have obtained no definite information regarding the history of avocado growing in this region. It is reasonable to assume that the Mexican race was known here before the Conquest. As to when the Guatemalan was introduced, it is idle to venture a guess without more data than I have at present. It is interesting to note that this race is not generally grown throughout this part of Mexico. I have seen avocados from other regions, e. g., Ozumba and the state of Guerrero, which appeared to be Guatemalans, but it seems that the race is not common north of Atlixco. I know it to be grown in Oaxaca, and further south in the State of Chiapas. One is, perhaps, justified in suggesting that it has reached Atlixco from some region to the south, and it appears that this is the northernmost point in Mexico where it is cultivated extensively. However, I have not been able to visit every part of the country and consequently do not feel safe in making generalizations of this nature.

The distinction between the two races is not clearly made by the people of Atlixco. They

classify avocados as *primera* and *segunda clase*, first and second class. The first class includes all of the larger fruits, which are Guatemalans with the exception of a few large-fruited varieties of the Mexican race. In the second class fall the smaller fruits, including most of the Mexicans and a few inferior Guatemalans. In the local market prices are quoted on avocados accordingly as they are first-class or second-class fruits.

In addition to this commercial classification there is another commonly, though loosely, used. This consists of the following groups: *ahuacate de China*; *pahua*; and *ahuacate chico* or *ahuacate corriente*.

The term *ahuacate de China* is of indefinite application. In general it implies fruits of good size and quality, especially those which are smooth and comparatively thin-skinned. Most of the fruits known under this name are Guatemalans, but the largest Mexicans also pass as ahuacates de China. The name is said to have reference to the character of the skin; "*papel de china*" is the term commonly used for tissue paper, hence its application (abbreviated to *China*) to an avocado indicates that the latter has a skin as thin as tissue paper,—figuratively speaking. This explanation of the name does not seem to be characterised by logic in a high degree, but it is the only plausible one I obtained, after making numerous inquiries.

Pahua, from the Aztec *pauatl* (meaning *fruit*) is the name applied to thick-skinned avocados of the Guatemalan race. According to some growers, only those fruits which are round or oval in form are pahuas, the rest being ahuacates de China; according to others, the *pahua* is characterized by a sweetish, watery flavor, and is lacking in richness. In any event, it is evident to me that the name *pahua* connotes to the Atlixcan mind a fruit of rather inferior quality, hence a grower will rarely describe any of his own fruits as pahuas, all of them being ahuacates de China; while those grown by his neighbor are (to his mind) all pahuas. When you visit the neighbor in question, however, he reverses the classification.

The term *ahuacate chico* or *ahuacate corriente* (small ahuacate or common ahuacate) is applied to small-fruited varieties of the Mexican race. This includes the great majority of the trees grown in Atlixco. The largest fruits of the Mexican race are called ahuacates de China. The probable hybrid, *Fuerte*, is also known by this name, though the owner of the tree refers to it as "ahuacate verde" or "green ahuacate," because of its color when ripe.

I will not here enter into a discussion of the botanical differences which distinguish the Guatemalan and the Mexican races, since they have elsewhere been treated as fully as the present state of our knowledge will permit. Suffice it to say that the Guatemalan, so far as we know at present, is a horticultural race of *Persea americana* Mill. (*Persea gratissima* Gartn.) developed in or suited to tropical highlands. It withstands more cold than the lowland or "West Indian" form of the same species. The Mexican race (so-called) appears to be a distinct species. *Persea drimifolia*, described by Chamisso and Schlechtendahl in 1831. Horticulturists in the United States are now familiar with the characteristics of the Guatemalan, West Indian, and Mexican races.

Most of the avocados observed in Atlixco can easily be classified as either Guatemalan or Mexican. I found a few trees however, whose fruits were rather puzzling. *Fuerte* is the most noteworthy of these, and after careful examination I believe this to be a hybrid

between the two species. Elsewhere in this paper I discuss its characteristics more fully. Several varieties were seen which in most respects resembled the Mexican race, but they were larger in size and had thicker skins than usual. At first I thought that some of these might be hybrids like Fuerte, but on further study I found no evidence which warranted the retention of such a belief. Puebla is one of these varieties, and the others were similar to it in character.

CULTURAL PRACTICES

Little can be said regarding the planting of avocados in Atlixco, for it seems rarely to be intentional. The situations in which the trees are found suggest that in most cases they are volunteers. I have seen a few plants growing in flower pots or tin cans, to be planted later in the orchard; but the groves now in existence do not appear to have been systematically planted.

No instances were observed in which avocados had been budded or grafted, or propagated in any way except by seed. While sweet limes are commonly propagated in Atlixco by stem-layering (marcottage) and the pear is occasionally cleft-grafted on the tejocote, no asexual method of propagation seems to be applied to the avocado.

Sometimes two trees will not be more than six feet apart, in other instances they may be fifty, or a single tree may stand alongside a small field or patch of cultivated ground. There is no uniformity whatever in this respect.

Avocados are found in Atlixco under three rather distinct sets of cultural conditions. These are: (1) trees growing in grain fields, where the ground receives tillage incidental to the planting and cultivation of wheat or maize; (2) trees growing in huertas containing a varied collection of fruit trees and perhaps coffee bushes, and where the ground is occasionally cleaned with a hoe and thus kept reasonably free from weeds and grass; and (3) huertas such as those under (2) except that the ground is not cleaned, weeds and grass being allowed to develop unhindered.

I cannot determine which of these produces the best results, as trees look very much alike under all three sets of conditions. It would require a long period of careful observation to settle this matter.

Practically the only cultural attention given intentionally to avocados in this region consists of irrigation during the dry season,—October to May. Throughout this period water is run thru the huertas every 15 to 30 days. The typical Atlixcan avocado grower turns the water into his huerta thru a small ditch from one of the numerous small canals; no system of furrows is used to carry the water to all the trees, but the grower rolls up his trousers and stands nonchalantly about with a hoe, occasionally excavating a short furrow to conduct the recalcitrant liquid to some portion of the huerta where the force of gravity would not otherwise take it. After the water has run over the ground for half a day, the supply is shut off and the work is considered finished. No tillage is given after irrigation to break up capillarity and conserve moisture, but as the ground is in many cases shaded by a dense growth of trees and shrubs, evaporation is retarded to a helpful degree.

I observed no evidence of pruning except where large dead limbs had been cut away

from old trees, and where the system of tree renewal observed in Orizaba and Querétaro* had been practiced. This system appears to be employed less frequently in Atlixco than in either of the two regions mentioned.

The trees differ in habit, some being broad and spreading, others tall and strict. There is less variation in this respect, however, than is usually noticeable in Guatemala. The lower limbs are nearly always cut away, forcing the crown to develop six to ten feet above the ground.

*See "*The Avocados of Mexico: A Preliminary Report,*" in *Report Cal. Avocado Assn., 1918-1919.*

THE CROP: SEASON OF RIPENING

It is said that avocados are marketed in Atlixco during every month of the year. This would not be remarkable, were it not that the entire supply is obtained locally. In Guatemala City avocados are always on sale, but they come from many different elevations, consequently they do not necessarily represent varieties distinct in ripening season, since the period required for the fruit to mature is lengthened or shortened by increase or decrease in elevation. Thus a single variety, if grown at elevations of 2,000, 4,000, 6,000, and 8,000 feet in Guatemala (or elsewhere in tropical America) would supply ripe fruit throughout most of the year.

Atlixco has, of course, a decided advantage over Guatemala in that two races are commonly grown, one ripening in winter and the other in summer. Another factor of great importance is the tendency of certain trees of the Mexican race to produce two crops annually.

If all avocados were left upon the tree until *fully* mature it might not be possible to have an extensive supply throughout the year, but here as elsewhere in tropical America many are picked one to three months before they have reached complete maturity. This pernicious habit extends the season, but results in obtaining for the fruits a reputation for inferior quality which they do not deserve.

The Mexican race ripens its main crop in Atlixco during July and August. A few fruits may hang on the trees until October or even November. In addition to this main crop, there is an early crop, called the *cuaresmeño*, produced by some of the trees but not by all. This early crop matures in March and April, thus filling a gap which would otherwise intervene between the Guatemalan and Mexican races, for the Guatemalan fruits are never allowed to remain on the trees until April, and the main crop of Mexicans does not begin to ripen earlier than June. The *cuaresmeño* crop of Mexicans is, therefore, of great importance. We have observed this same tendency to produce two crops annually in the case of the Northrop and a few other trees in California, but it has never been considered a factor in connection with the commercial production of avocados. I believe we should devote more attention to this matter. It may be possible to obtain from Mexico good varieties of the Mexican race which will give us two crops of fruit during the year.

The season for Guatemalans in Atlixco is October to March. That is to say, the fruits are picked during this period. I greatly doubt if many of those gathered in October are mature. There is a decided tendency to rush the fruits to market as soon as they are full

grown, because of the danger from fruit-thieves. Many of the growers complained bitterly to me of their inability to harvest their own crops. "*Todo el mundo es dueño ahora*" ("Anybody and everybody is the proprietor nowadays") one old orchardist kept repeating during the morning I spent with him in his huertas. Thieves were always troublesome in this region, but since the revolution their numbers have multiplied and their audacity is unlimited.

Comparing the ripening season with that in California, I believe it to be, on the whole, about two months earlier. This is more than can be accounted for by the elevation of Atlixco. As explained in my paper on the avocados of Guatemala, the ripening season in California corresponds to that at elevations of 6,000 to 7,000 feet in tropical America, while the season in Florida corresponds to 3,000 to 4,000 feet in tropical America. Atlixco lies at an elevation of 6,000 feet, and should, therefore, have practically the same season as California. The difference of two months is probably due to the sheltered position of Atlixco, and the consequent warmth of this climate. The town is protected on the north by high mountains, and lies at the upper end of a broad valley which falls away toward the south.

I would expect a variety whose season in Atlixco is January to March to ripen in California from March to May. In stating that its season in Atlixco is January to March, however, I imply that these are the months during which fully mature fruit can be picked, and not necessarily the ones in which the Atlixicans would harvest the crop.

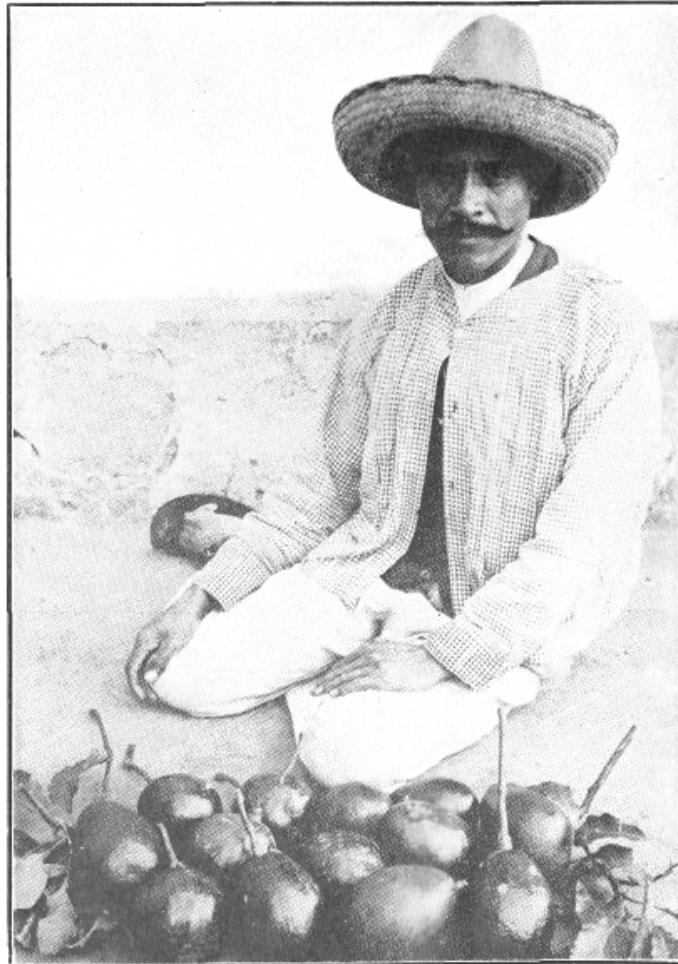
THE CROP: PICKING AND MARKETING

The difficult question of determining when an avocado is sufficiently mature for picking seems to have been given little attention in Atlixco. I do not find that the rule followed in Guatemala is observed here. This rule is to the effect that the fruit can be gathered when the tree comes into flower, and in any event would probably apply only to avocados of the Guatemalan race.

Purple-fruited varieties are commonly considered to be mature when the color begins to change from green to purple. In respect to green-fruited varieties, I have not found that the growers have any accurate means of determining when they are mature, in spite of the fact that several have asserted to me that they did. They probably know in what month they are accustomed to pick the fruit from their various trees; but if shown a new variety and asked to state whether or not the fruit was mature, I believe they would be unable to do so.

Vicente Suarez, an old Indian who owns several huertas, was assuring me that he not only could tell just when a fruit was mature, but he could also tell by looking at it just what its quality was, and how large a seed it contained. I happened to hold a small avocado in my hand. "For example," I asked him, "What will be the quality of this fruit, and how large its seed?" He gravely examined it, pointed out several small brown dots which he intimated were infallible indications of something or other, and then replied: "It is of excellent quality, and has a very small seed." I took it home and cut it, to find that the seed was so large there was scarcely any space left for flesh. What there was of the latter was rich and of fine flavor, but I later learned that my assistant had privately

passed the word to old Vicente that the fruit had been given me by a friend who recommended it as of unusually fine quality.

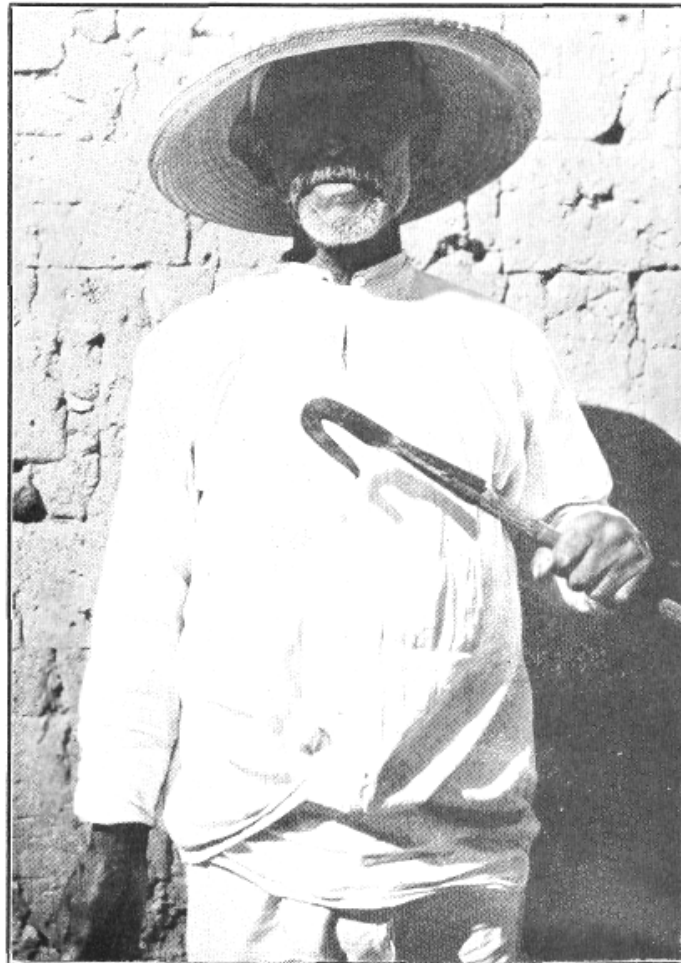


ATLIXCO'S BEST

These fruits represent the cream of the Guatemalan seedlings grown in Atlixco. The largest weigh nearly two pounds, and all have small seeds.

In picking avocados, some of the Atlixicans employ more intelligence than is generally used in this connection in tropical America. They do not knock them off the trees and allow them to fall to the ground, but pick them with an apparatus which removes them carefully and catches them in a small basket or sack. This is a fruit-picker similar to those used in the United States, consisting of a hook or knife attached to the end of a bamboo pole, with a small wire basket or cloth sack so arranged as to catch the fruit when it is cut or pulled from the tree. The use of this apparatus has probably been encouraged by the high prices obtained for large Guatemalan avocados. In Guatemala, where avocados rarely bring 50 cents a hundred, the grower can scarcely be blamed for picking them in the easiest manner possible, but here, where a good one is worth 10 or

15 cents, the orchardist realizes that every one lost means 10 or 15 cents less in his pocket. It seems to be understood by all that an avocado is badly bruised if allowed to fall to the ground from a high tree, and that a bruised fruit will not ripen perfectly, nor keep well in the market. Without this understanding, of course, there would be no incentive to careful handling. Not all of the growers use this method of picking, and I do not believe it is employed by any of them except in connection with the Guatemalan race.



AN AVOCADO GROWER AND HIS PICKING-HOOK

This hook is used in Atlixco to pick sweet-limes, avocados and other fruits. For the large Guatemalan avocados it is sometimes supplemented by a cloth sack suspended below it to catch the fruit as it is pulled from the tree.

For shipment to Puebla, Mexico City, Veracruz, and other points in the Republic the fruits are packed immediately after picking in boxes or *huacales*, the latter being crates made of small round sticks. Usually no packing material is employed, but when it is desired to pack with especial care the fruits are wrapped separately in paper. Sr.

Fuentes, who formerly exported avocados from this region to the United States, packed in large baskets, with abundant hay or straw to prevent bruising; but as no fruit is now being exported this method seems to have fallen into disuse. The huacal is the commonest package. It usually measures 2x2x2 feet, and the fruits are packed fairly tightly so they will not shake about while in transit.

After packing, the fruits require five to ten days to soften, and after softening can be kept on the market for several days before they spoil. When received in the market they are examined and the soft ones picked out and placed on the fruit stands for immediate sale. If not sold within five or six days they are lost. If it is desired to hasten softening, the fruits are placed in a tight box with hay, leaves, or a blanket over them; if, on the other hand, it is desired to retard ripening, they are kept in the open air, as cool as possible.

Small fruits ("ahuacates de segunda clase," mostly of the Mexican race) net the growers \$1.50 to \$3.00 per 100 at the orchard. The larger ones ("ahuacates de primera," mostly of the Guatemalan race) net them \$12.00 to \$15.00 per hundred, occasionally more. These prices are in Mexican currency, on a gold basis. Much of the fruit produced in Atlixco is sold in the local market at wholesale to buyers who come from Puebla, Mexico City, and other points.

THE CROP: CHARACTER OF THE FRUIT

Comparing the fruits of the Guatemalan race produced in Atlixco with those of Guatemala itself, I believe the Atlixcan varieties average somewhat larger in size; are smoother on the surface; and have smaller seeds. In quality, I believe the average is about the same in both countries.

Contrasting the *extremes* of each characteristic as they occur in these two regions, we find that the largest fruits observed in Atlixco weigh only two pounds, while the largest in Guatemala weigh three pounds. This in spite of the fact that the average fruit of Atlixco is larger than the average of Guatemala. In quality, I am satisfied that the best fruit I tested in Atlixco was not equal to the best ones I found in Guatemala, which latter are represented by several varieties in the collection introduced for trial in the United States. The smallest seeds observed in Atlixco (considering the size in relation to that of the entire fruit) are smaller than any observed in Guatemala, with possibly two or three exceptions. The thickest skin noted in Atlixco was not as thick as many seen in Guatemala.

I have not had an opportunity to examine critically many fruits of the Mexican race grown in Atlixco, as they were not in season at the time of my visit. I have seen some of them in the markets of Orizaba and Veracruz, however, and I found them to be much above the average of this race. Undoubtedly there are many small, ordinary seedlings, but there seem also to be some which excel those of Querétaro and most other regions.

THE FUERTE AVOCADO

Fuerte is at present the most extensively planted and is generally considered the most

promising of all the avocados which have been introduced into the United States from Atlixco. My desire to see the parent tree was the principal motive for undertaking the trip of which this paper is a report. I felt that North American avocado growers should know as much as possible about Fuerte; if it was representative of a race or group cultivated in Atlixco, and there were better varieties of the same general character to be obtained, then we should not plant it too extensively; if on the other hand it proved to be unique, and superior to the other avocados of its region, we could enlarge our plantings with greater confidence.

Perhaps I can most accurately present my observations on this variety by quoting from my Journal entry of December 19, 1918:

"This morning I went out with Carl Schmidt's notes and diagrams to hunt up some of the avocados which have been propagated in California.

"Fuerte was the variety I was most desirous of finding. After considerable search I succeeded in locating it. Schmidt gave the name of the owner as Matildi Dion. This is incorrect. The owner is Alejandro Le Blanc, a Frenchman by birth, now a Mexican citizen; Matildi Dion, now dead, was a relative of his and formerly lived on the property, which is situated at No. 2, Calle Manuel Buen Rastro.

"The son of Alejandro Le Blanc, a decidedly *simpático* young fellow, showed me over the place and told me everything he could about the Fuerte tree.

"On a small branch I found the copper label put on by Carl Schmidt in 1911. It bore simply the number 15, which is the serial number under which Schmidt sent budwood of the variety to California in 1911. Le Blanc told me he had been careful to preserve this label, having loosened the wire on several occasions when it was cutting into the limb.

"In this tree Le Blanc possesses something of unusual character, as well as merit, and he knows it. The family is so fond of the fruit that they always keep the entire crop for their own use. Not only do they consider the flavor unusually rich, but they say that the seed is exceptionally small, leaving an abundance of meat. In addition, the tree is peculiar in that it ripens its fruits over a much longer period than any other known to them. They call it "*ahuacate Verde*" because it remains green in color when ripe. They know when the fruit is ready to be picked by the yellowish tinge which it assumes on one side.

"Young Le Blanc says they picked about 200 fruits last month (November), and there are about 200 more on the tree which are maturing very slowly. Most of them will not be ready for picking until January or February. The tree is now putting forth a few flowers. Unquestionably its fruiting habits are peculiar. Le Blanc says that it bears every year but that some seasons it produces heavier crops than others. He thinks 600 fruits is a good crop, but says if the tree were given better care it would yield a thousand.

"The age of the tree is not known, but Le Blanc, after having investigated the matter as carefully as possible, believes it to be between 55 and 60 years. In 1911 Carl Schmidt, in his notes on the variety, estimated the age at 25 years, a figure which Le Blanc at that time thought to be correct.



THE PARENT TREE OF THE FUERTE AVOCADO

At the present time no tree in Atlixco is of greater interest to Californians than the parent Fuerte, which stands in the garden of Alejandro Le Blanc. It is believed to be about 60 years old, and its crown is approximately 25 feet high and 30 feet in spread.

"The form of the tree is rare. It is very broad and spreading, though not drooping. The main limbs extend almost horizontally from the trunk. The crown can not be considered large. I have taken the following measurements:

Circumference of trunk at ground	69 ins.
Distance from ground to first branches	5 ft.
Number of main branches	5
Greatest spread of crown	33 ft.
Height, approximately	27 ft.

"The tree is growing in the corner of Le Blanc's *huerta*, with a high wall near it on one side, and the house not far away on another side. The ground beneath its branches is clean and level, but not cultivated in any way. Le Blanc tells me the tree receives plenty of water; in addition to that which reaches it when the *huerta* is irrigated, there is a drain below the surface of the ground, a few feet from the trunk, and doubtless the seepage is considerable. In appearance the tree is healthy and vigorous."

Sr. Le Blanc generously gave me a dozen fruits, the best on the tree, and I carried them with me to Mexico City. I sampled them as they ripened, one by one, and prepared a description of the variety which I here publish in order to place on record the character of the fruit produced by the parent tree:

Form varying from pyriform (not necked) to oblong, the majority of fruits slender pyriform in outline. No round fruits such as those said to have been produced by one Fuerte tree in California were found on the parent tree. The weight is 8 to 12 ounces. The variation in weight is not as great as in many other varieties, most of the fruits weighing about 10 ounces. The surface is distinctly pebbled, often having a wrinkled appearance around the base of the fruit. The color is uniformly dull green, with numerous small yellowish dots. The skin has a maximum thickness of 1 millimeter; toward the stem end of the fruit

it is slightly thinner than near the apex. In texture it is very pliable, but it is sufficiently tough so that the flesh can easily be dipped out of the skin with a spoon. The skin peels readily from the flesh when the fruit is fully ripe; its inner surface is characterized by none of the hard granules which are typical of the Guatemalan race. In thickness and texture of skin Fuerte is similar to the thickest-skinned forms of the Mexican race, but it seems tougher than that of any Mexican which I have examined. The flesh is rich cream-yellow in color near the seed, changing to pale green near the skin, the greenish zone extending one-third of the distance from skin to seed. There are often traces of fiber in the flesh around the base of the seed. In texture the flesh is fine-grained, smooth, very buttery or oily, with none of the watery character often found in the Guatemalan race. The flavor is characterized by the peculiar richness or nuttiness typical of the Mexican race, as opposed to the distinct flavor of the Guatemalan. The seed is relatively small to medium in size, and fits snugly in the cavity. The cotyledons are often unequal in size. When the ripe fruit is opened, both seed-coats cling to the seed, but sometimes they are not closely united and may be separated with ease. The surface of the cotyledons is nearly smooth.

In the 1916 Report of the California Avocado Association, page 142, appears a photograph of two entire and two half fruits, one of each round, the other oblong-pyriform. Beneath this photograph is the following legend: "Bud variation in Fuerte avocado (one-half natural size). On right normal Fuerte fruit, on left round fruit of Redondo type produced on the same budded tree of the Fuerte on the ranch of Mr. J. T. Whedon, at Yorba Linda, Cal. The tendency of this variety to produce two types of fruit is said to be the cause for the naming of two varieties, Fuerte and Redondo, when they were imported from Mexico. The Redondo is now known to be the round fruited bud variation of the Fuerte."

I found no fruits on the parent Fuerte tree which varied strikingly from the type. Redondo is a distinct variety, not to be confused with Fuerte: the parent tree, which I have examined, is growing in the garden of Salvador Amor, as indicated by Schmidt in his notes. The fruit is very thick skinned, and in size and form resembles Challenge. Redondo is a true Guatemalan in every respect.

The probability of Fuerte being a cross between the Mexican and Guatemalan races has been discussed in print on several occasions. Scarcely had the variety commenced to fruit in California when this was suggested as a hypothesis to account for some of its extraordinary characteristics, and as time has passed, belief in its hybrid origin has grown stronger. Doubt always remained in my mind, however, until I had visited Atlixco. I had suspected that Fuerte might represent a distinct race found in that region. I found nothing to indicate, however, that Atlixco possesses any races or groups not already known to us. The Mexican and the Guatemalan, as grown in Atlixco, differ in no important characteristics from these races as we know them in California. No trees were found which closely resembled Fuerte in habit and fruit, though I looked particularly for such.

I feel, therefore, that it is now more reasonable than ever to believe that this variety is a hybrid. In certain of its characteristics we have indications of its hybrid nature, and additional evidence has recently been furnished by the behavior of its seedlings. A number of these have been grown at the U. S. Plant Introduction Garden, Miami,

Florida. Some of them closely resemble the parent in foliage, including the possession of the anise-like odor which has been taken, in Fuerte, to indicate Mexican blood, inasmuch as this odor is never present in true Guatemalans or West Indians. Others are typical Guatemalans in appearance, and have lost the anise-like odor. It will be interesting to watch these seedlings come into bearing. It is possible, of course, that some of them are the result of cross-pollination, flowers of the Fuerte having been visited by insects carrying pollen from trees of other varieties; but their behavior is decidedly different from that of ordinary avocado seedlings.

While it has not been possible for me to keep in close touch with the avocado industry in California during the past few years, I had formed a high opinion of Fuerte from what I had seen and heard of its behavior in that State. In Florida, also, it has shown much promise. My visit to Atlixco served to increase my confidence in this variety, and I believe any California avocado grower who could have shared my week there would have come to feel the same way. Let me, if I can, make my position clear.

We have recognized that Fuerte was an unusual variety, and its hardiness, its vigorous growth, its tendency to fruit while very young, its season of ripening, and the excellent quality of its fruits have combined to make us realize that it possessed exceptional value. But always we have felt that perhaps in the region from which it came there were even better varieties which we could and should obtain; that Fuerte, in other words, might be representative of a group or race occurring in southern Mexico, and that by a brief search we might obtain other and more valuable varieties of the same race. A visit to Atlixco has served to clear away these doubts, and make me realize that in Fuerte we have secured a unique avocado.

Imagine that you have gone to Atlixco in my place. You found good avocados,—many of them excellent avocados,—all about you. Guatemalan varieties of large size and good quality, and Mexican varieties better than those of almost any other region. You looked over these fruits and were delighted with them. Then you came upon a single tree of rather distinct character, and found that its fruit was reputed to be as good as the best Guatemalan, while it had a ripening season which exactly met your requirements,—a thing which most Guatemalans do not possess. Would it not attract your attention? And as you examined it more carefully, and found that the fruit was not only of excellent quality, but that it had a tough skin and a very small seed; that the tree bore regularly and abundantly; that the ripening season was unusually long; and that it was a vigorous grower and hardier than any known variety of the Guatemalan race; would you not become enthusiastic about its possibilities.



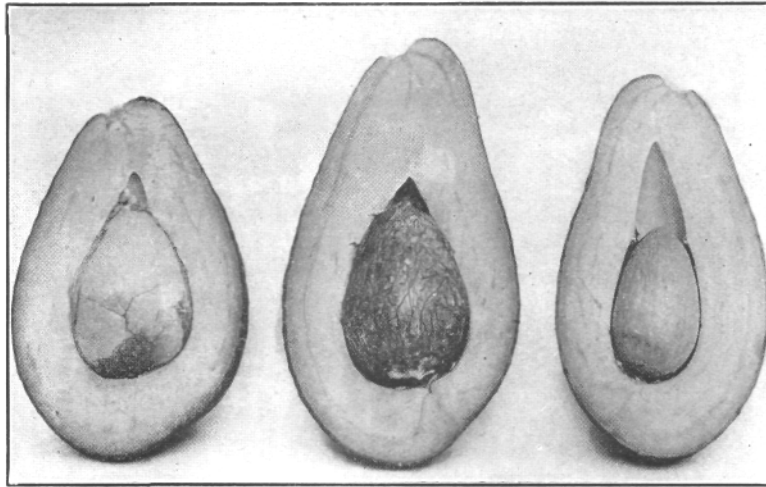
FRUITS FROM THE PARENT FUERTE AVOCADO TREE

Alejandro Le Blanc, Jr., is here shown holding several avocados of the 1918 crop from the parent Fuerte tree. When told of the present importance of Fuerte in California and its probable future value to the avocado industry Senor LeBlanc expressed himself as delighted that he had been able to give to horticulture something of merit.



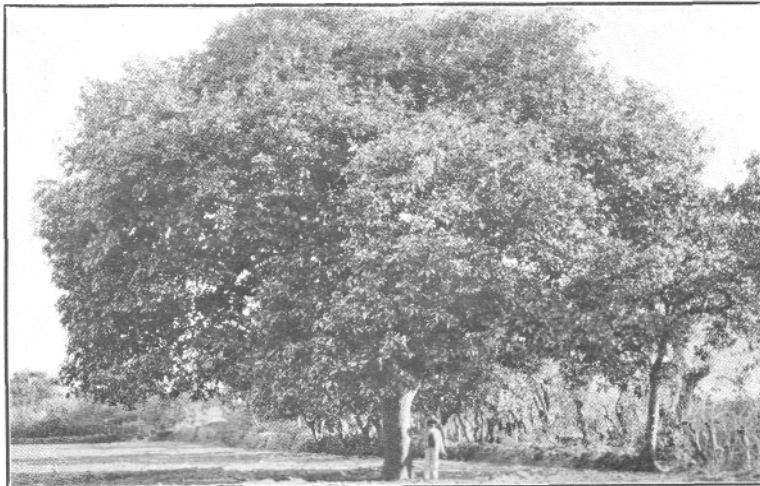
VARIATION IN FRUITS FROM THE PARENT FUERTE

These fruits, here shown reduced in size, represent the range of variation which occurs among the avocados borne by the parent Fuerte tree. Each of these specimens weighs about 10 ounces.



FRUITS FROM THE PARENT FUERTE

These are the same fruits which were shown, entire, in the last illustration. The seed is variable in size, and the yellow flesh is unusually rich and pleasant in flavor. This variety is considered by those familiar with it one of the best in Atlixco, if not better than all other varieties there produced.



THE MEXICAN AVOCADO

This large tree, almost ideal in form, is growing in the edge of a small wheat field. Its development has been unhindered, and the cultural conditions are unusually favorable. Such a tree should yield annually several thousand small fruits.

THE PUEBLA AVOCADO

Since it has been included in the list of eight varieties recommended for planting by the California Avocado Association, Puebla is worthy of more than passing notice.

In the circular issued by the Association (Circular No. 1) the statement is made: "Puebla is not strictly a Guatemalan type, but is supposed to be a hybrid." A careful examination of the parent tree, growing in the huerta of Vicente Pineda, in Atlixco, and of its fruit, has satisfied me that Puebla is a representative of the Mexican race, and not, like Fuerte, a

hybrid between the Mexican and the Guatemalan. I was unable to find a single character which indicated hybridity, while in Fuerte there are several. Puebla is later in season than most other varieties of its race, but this is the only way in which it seems to differ from them. The character of its fruit is purely Mexican, so far as I could see, and the tree is a typical Mexican, both in appearance and in the anise-like odor of its leaves.

It was impossible to obtain a satisfactory photograph of the parent tree, owing to its situation. It is crowded between several other avocados, with pomegranate bushes close beside it. It is not large, perhaps 25 feet high, and is slender in habit, with a trunk about 10 inches thick. It does not seem to be in vigorous condition. When I saw it, on December 19, there were only two fruits left on it. I was informed by the caretaker that the bulk of the crop had been picked in September. The season of this variety in Atlixco can be considered September to December.

The fruits which I obtained were small and probably not typical of the variety. They were obovoid in form, rather broad at the base, with the perianth-segments persisting around the stem,—one of the characteristics of the Mexican race. The surface was smooth, slightly glossy, dull maroon purple to purplish black in color, with minute reddish dots. The skin was 0.5 to 0.7 millimeters thick, leathery, rather firm, peeling readily from the flesh but not granular in texture. The flesh was cream-yellow near the seed, changing to pale green toward the skin, buttery and fine-grained, with the fiber markings not very conspicuous. The flavor was rich, nutty, and very pleasant. The seed was proportionately large, tight in the cavity with both seed coats closely surrounding the cotyledons.

Puebla can be considered an unusually good fruit of the Mexican race, particularly valuable because of its lateness in ripening.



Wilson Popenoe, explorer for the United States Department of Agriculture, returning from a trip into the Andean mountains of northern Ecuador. On the pack mule are boxes containing avocado budwood for shipment to Washington. The picture was taken exactly on the equator, which crosses Ecuador a few miles to the north of the capital city, Quito.