

THE PARENT FUERTE TREE AT ATLIXCO, MEXICO

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Mr. President, Ladies and Gentlemen:

"It was cold this morning when I arose in Puebla"—thus runs the entry 111 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 Vera Cruz, 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 Atlixico, 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.

"I never go into a new region which holds something of interest without carrying with me certain pre-conceived 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 fruit and flowers which otherwise could not grow in this dry region.

"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!"

It is probable that any other California horticulturist possessing a deep interest in avocados would have been subject to much the same impression 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.

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) :

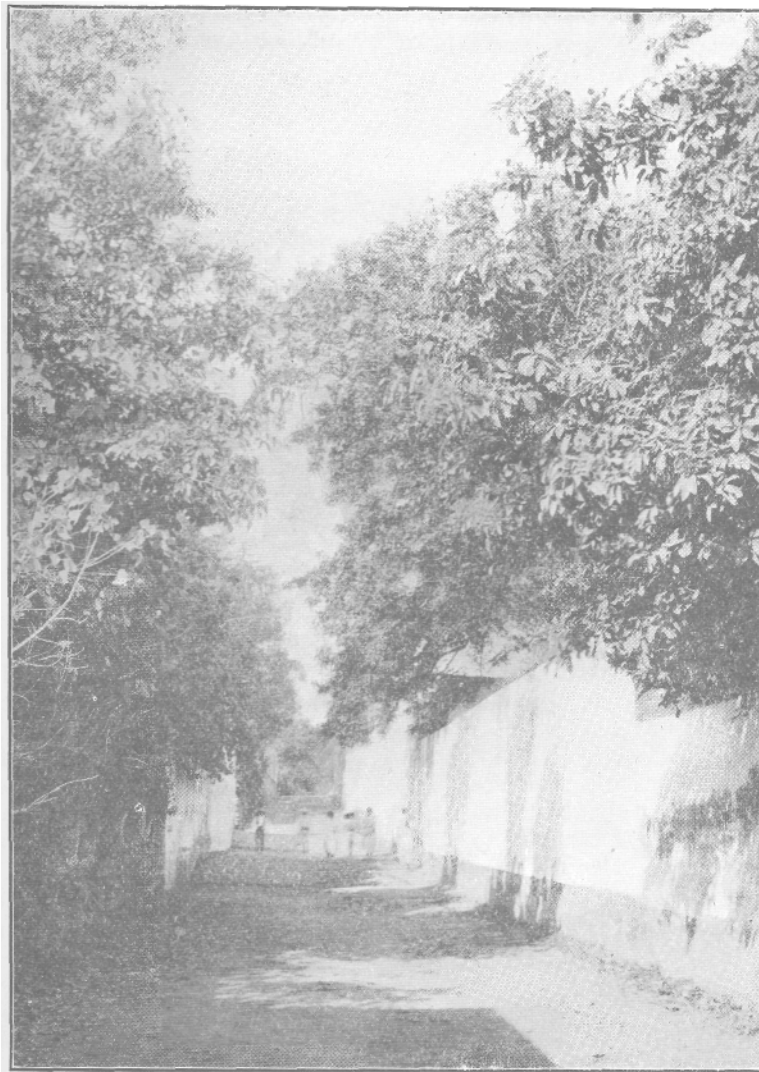
Introduction by William D. Stephens: Two varieties not yet named, grown provisionally under the numbers *Two and Fifteen.

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.

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. Queretaro 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.



A Street Through the Avocado Groves of Atlixco

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 Pococatepetl towering

upon 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.

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 (*mar-cottage*) and the pear is occasionally cleft-grafted on the *tejocote*, no asexual method of propagation seems to be applied to the avocado.

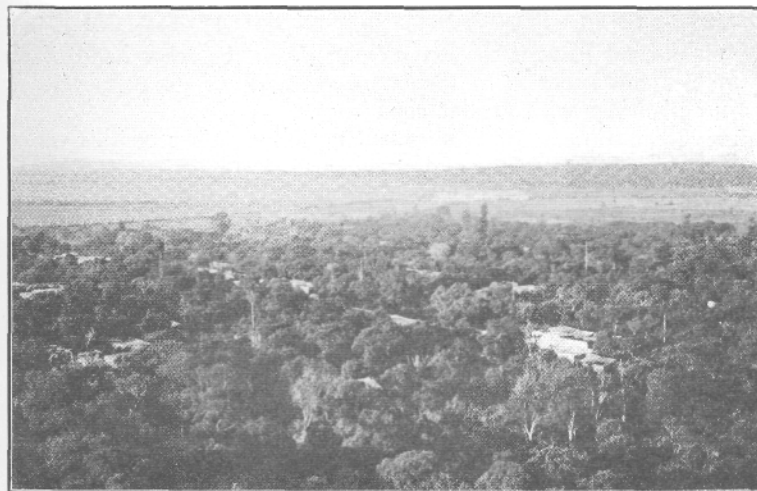
Sometimes two trees -will not be more than six feet apart, in other instances they may be fifty, or a single tree may stand alongside a small field or patch of cultivated ground. There is no uniformity whatever in this respect.

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.



The Parent Tree of the Fuerte Avocado stands in the garden of Alejandro Le Blanc in Atlixco. It is believed to be sixty years old, and is approximately twenty-five feet high and thirty feet spread



Avocado Orchards of Atlixco

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 through 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 tree 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 Queretaro 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 straight. 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.

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 *simpatico* 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 has been careful to preserve this label, having loosened the wire on several occasions when it was cutting into the limb.

"Ill 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 fifty-five and sixty years. In 1911 Carl Schmidt, in his notes on the variety, estimated the age at twenty-five years, a figure which Le Blanc at that time thought to be correct.

"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 cannot 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."

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: *f* "Bud variation in Fuerte avocado (one-half natural size). On right, normal Fuerte fruit; on the 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, California. 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 Salvator 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 suspicion 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 had 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?



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



Looking toward the Volcano from Atlixco. View taken from the Summit of San Miguel

The Puebla Avocado

Since it has been included in the list of 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 twenty-five feet high—and is slender in habit, with a trunk about ten 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.