

The Avocado Breeding and Selection Program at CICTAMEX

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Abstract - Mexico is both the largest producer and consumer of avocados in the world. Hence, the culture of avocados generates employment, economic resources and provides a highly nutritional fruit that in many cases is a meat substitute in the rural counties. In 1982, the Centro de Investigaciones Científicas y Tecnológicas del Aguacate del Estado de México (CICTAMEX) was created with the research goal of identifying dwarf varieties of avocados with high productivity and an out-of-season harvest. This facilitated the establishment of high-density plantations with low production costs. The origin, current situation and perspectives on the avocado selection breeding program at CICTAMEX is presented.

Mexico is a country whose diversity in climates and variety of natural resources is so striking that for some time our territory (taking its form in account) was considered a "Cornucopia". The Aztecs named the avocado tree "ahuacacahuitl" or "testicle tree" because of the peculiar form of the creole avocados of the Mexican race.

Avocado culture on a commercial level in Mexico, using improved varieties, began in 1950 with the re-introduction of the cv. Fuerte. In the 1960's the cv. 'Hass' was introduced. Currently, Mexico is the largest avocado producer in the world, with 700,000 tons grown on 93,000 ha, which generate 40,000 permanent jobs and economic resources above 480 billion pesos (currently >\$160 million) (Paz, 1990).

The avocado is habitually consumed as part of the nourishing diet of the Mexican people. Its importance led to the establishment of the Centro de Investigaciones Científicas y Tecnológicas del Aguacate en el Estado de México, CICTAMEX, to conduct research directed towards solving the problems facing Mexican fruit growers. Among which the most pressing are:

1. Reduction of the cultivable surface, caused by the rapid demographic growth.
2. A steady increase in the production costs, which are higher than the prices paid to the grower, thus generating low rentability of the avocado growing activity.
3. Low average yields due to inadequate cultural practices and to ineffective programs of phytosanitary control.
4. Minimum export volume compared with the overall production attributed to the slow development of postharvest technology and to the lack of infrastructure needed to compete in the international market.

The problems cited above are compounded by a socioeconomic environment in which the low income population is suffering from severe undernourishment. To contribute to the solution of these problems, CICTAMEX's mission is to perform research oriented towards obtaining dwarf avocado cultivars that could be grown in high-density plantations with low production costs. This will allow the peasants settled within the "Avocado Belt of the Mexican Republic" to establish roots by giving them a remunerative activity: the culture of avocado.

With the increasing production of avocados from the high-density plantations, there will be a greater total supply of the product. This will help to solve the difficult problem of malnutrition as, in a great many instances, avocado is one of the few sources of protein available to those people in the economically marginal levels.

The intent of this paper to present the evolution of avocado breeding and selection program at CICTAMEX, from its origin to its potential future.

Materials and Methods

The first step used at CICTAMEX in searching for dwarf avocado cultivars was the selection of strains from commercial cultivars, among them were 'Hass', 'Fuerte' and 'Rincon' which exhibited distinctive characteristics such as short intern-odes, abortion of the apical bud, and branches with pronounced horizontal growth.

From the continuous selective propagation of the strains, most of them obtained at Ixtapan de la Sal, México, were derived dwarf cultivars and selections such as 'Colín V-33' and 'Rincoatl' (Fig. 1).



Once dwarf avocado selections were obtained, we began the planting of seedlings to promote genetic recombination; these seedlings were evaluated to detect promising selections.

In order to enhance the desirable characteristics of selections, CICTAMEX is utilizing the multigrfts technique, in which several selections (dwarf, early or late maturing, small seed size, good fruit quality, etc.) are grafted on various shoots of a trunk, promoting recombination by open pollination. The fruits obtained from the multigrft have been planted and will be evaluated for desirable characteristics.

Results

The following is a summary of the evolution, current situation and perspectives of CICTAMEX (Sánchez Colín, 1989).

In 1953 Dr. Sánchez Colín became aware of the growing necessity to generate knowledge for the national development of fruit growing. In order to gain firsthand experience, he established the orchard "Las Animas" in El Salitre, Ixtapan de la Sal, Mexico, by planting seven hectares of avocado cv. Fuerte.

This orchard, planted in thin, clayish soil with excessive salts and calcium, was established close to a thermal water spring, with a flow of one liter per second.

Notwithstanding the poor soil, the trees produced fruit of excellent quality, and for the first time in Mexico, avocado was packed in cardboard boxes.

In 1957, twelve trees of the Fuerte variety were added to the orchard, they were from Ajijic, Jalisco. These trees developed some vegetative characteristics such as short internodes, horizontal growth of the branches and apical bud abortion that were different from the 'Fuerte' trees planted earlier. After selection and grafting of wood taken from select trees, Colín V-33 was developed.

In 1969, the avocado trees at "Las Animas" showed a marked effect from the excess calcium, clay and saltpeter in the soil. In order to continue the research, another site was sought and the orchard relocated to "Rancho La Cruz" in Coatepec Harinas, Mexico. The transfer of vegetative material from the best specimens at "Las Animas" took place, among them 'Colín V-33', 'Rincoatl', 'Colín-Mex' and 'Colín V-101'. At Coatepec Harinas a process of selection for the best Creole types of the region began which formed the basis of a valuable bank of germplasm. It is on this germplasm bank that CICTAMEX now conducts much of its research.

We must mention that in 1969 a factory which produced avocado oil was established, with a grinding capacity of a ton per day and producing 200 kg of pressed oil. This factory operated only four years due to problems in the commercialization of this product and also as a consequence of decreased production of creole avocados (the raw material) which were replaced by the commercially more lucrative 'Hass' and 'Fuerte'.

In 1970, a semi-commercial orchard of 'Colín V-33' was established. It was here that the most representative and productive trees were identified in order to stabilize the characteristics of this variant.

In 1978, the first plot of seedlings from 'Colín V-33' and 'Hass' was established in order to obtain segregants.

In 1982, the creation of CICTAMEX was accomplished. CICTAMEX was conceived and nurtured out of experimental orchards and infrastructure provided by individual fruit growers. The government paid for the wages and salaries of personnel.

Currently, CICTAMEX is organized in four research areas: edaphology, phytotechnology, parasitology and agroindustrial.

There also exists a program of training and publishing that every month publishes articles of practical interest to fruit growers, gives technical assistance and promotes courses and conventions.

The experimental area of CICTAMEX is comprised of several plots with a total of 36 hectares. There is an inventory of 6000 trees and 3675 segregants. Up to now 21 outstanding selections have been obtained.

Discussion

There are several institutions devoted to avocado research in Mexico among them we may cite Colegio de Postgraduados, Universidad Autonoma Chapingo and INIFAP. One big problem is the limited quantity of economic resources to develop research projects and sustain them long enough give them continuity.

CICTAMEX, which is supported by the government of Mexico State since 1982, has endured several changes in respect to budget and external structure. For that reason, Dr. Sánchez Colín is promoting the formation of a Foundation to confer financial security and programmatic continuity to CICTAMEX.

At the national and international level, CICTAMEX supports increased cooperation and better coordination of avocado research in order to reduce the expenses of this important activity and to further the development of the avocado industry. Therefore, CICTAMEX sustains the idea of creating a World Avocado Society to promote mutual collaboration among the different countries for the improvement of the world avocado industry.

Literature cited

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