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Chapter

The Production and Marketing Issues of Pineapple (*Ananas comosus*) under Humid Tropical Conditions in the State of Tabasco and Way-out

Maritza Alejo Jeronimo, Edward Manuel Arevalo de la Cruz, Hortensia Brito-Vega, Armando Gomez-Vazquez, Jose Manuel Salaya-Dominguez and Edmundo Gomez-Mendez

Abstract

Pineapple cultivation has had the greatest impact on the market and that has increased world production in the recent decades in all tropical and subtropical areas. It is one of the crops that best adapts to these environmental conditions. In Mexico, its production has decreased significantly. Tabasco pineapple producers have been facing various problems that have further worsened. The main causes of the crisis are increase in input costs, lack of provision of technical advice to small and medium producers, little support of field programs by the government, and the growth of imports of industrialized pineapple. At the same time, the problem is seen during the cultivation of pineapple in the field. The producer sows the plant with fertilization without having chemical tests of the soil and irrigation water due to the costs and no interpretation of the results of these soil analyses. This affects the harvest and quality of the pineapple in its sale price.

Keywords: fertility, phenological phases, price and soil

1. Introduction

Pineapple (*Anana comosus* (L.) Merr.) is a species of high commercial demand. MD-2 is among the most promising pineapple varieties, which has captured the consumer appeal in recent years [1]. Pineapple is very demanding in mineral elements such as nitrogen, phosphorus, potassium, boron, calcium, zinc, magnesium, magnesium, copper and humic-fulmic acids, which are applied in the region with chemical fertilization, with minimal use of compost or organic materials such as cattle or sheep manure existing in the region. The large number of inputs used includes the use of insecticides, nematicides, acaricides, and fungicides that contribute to contaminating the region's soils. The pineapple clones that are currently enjoying the greatest growth are MD2 and the smooth cayenne cultivars in the state of Tabasco [2].

The Mexican tropics present appropriate agroecological conditions for the development of tropical crops such as pineapple (*Ananas comosus*). Its fruit is highly demanded due to its pleasant flavor and aroma, as well as its content of vitamins A, B and C, is highly demanded in various markets of the world [3]. Maximum growth potential is expressed in subtropical, warm and humid climates. Therefore, its production is mainly distributed between latitudes 30° north latitude N and S [4]. The second place in the world production of tropical fruit trees, only surpassed by the mango [5], although it is native to Brazil and Paraguay, especially from the Paraná River basin [6]. Currently the main pineapple producing countries are Costa Rica, Brazil, the Philippines and Thailand [7].

Regarding the alternatives put in place by some farmers in the municipality of Huimanguillo, Tabasco, to improve their land, there is the use of compost that undergoes a biological process through which it is possible to convert organic waste into stable organic matter (mature compost), due to the action of various microorganisms. The most common applications of composting include the treatment of agricultural waste and garden waste, mainly and fertilizers from animal farms. As stated above, the objective of the present study is focused on the production of national and international commercial pineapple and some problems that arise during the production process in the field.

2. Pineapple

Pineapple (*A. comosus* L.) is a tropical fruit native to Brazil. The ancestors called it *Ananas*, which means “excellent fruit”. Pineapple is a fruit of the Bromeliaceae family, it is non-climacteric that produces small amounts of ethylene in terms of ripening [8]. It is a perennial plant with a base formed by the compact union of several leaves forming a rosette. The concavities of the leaves can give rise to shoots with small basal rosettes (**Figure 1**), which facilitate the vegetative reproduction of the plant. They have a stem after 1–2 years that grows longitudinally and forms an inflorescence at the end. Its leaves are thorny that measure 30–100 cm long, its flowers are pink and have three petals that grow in the axils of pointed bracts and hypogynous ovary. Its flowers are grouped in spike inflorescences of about 30 cm in length with a thickened stem. The flowers bear fruit without need for fertilization and from the hypogynous ovary berry-shaped fruits develop, which together with the axis of the inflorescence and the bracts, give rise to a fleshy infructescence [8].

The main varieties are classified into six groups according to their growth habits, fruit shape, flesh characteristics and leaf morphology and have spread throughout the world based on their ability to adapt to local pedoclimatic conditions: 1) Cayenne (**Figure 2**), 2) Española, 3) Queen, 4) Pernambuco, 5) Perolera and 6) Gold “Extra Sweet” MD-2 [9].

Pineapple (*A. comosus* (L.) Merr.) has been for years one of the economic resources for export in many countries, is the United States (over 95% of exports), Argentina, Arabia Saudita, Chile, Egipto, Emiratos Árabes Unidos, the European Union and now Canada especially the cultivar Gold “Extra Sweet” MD-2, which due to its content of soluble solids, aroma and color has been preferred and has remained number one in world markets. This plant is fast growing and has a shorter production cycle; in addition, the production yields very sweet and pineapple juice extraction, although it is recognized that it is susceptible to mechanical damage and Phytophthora [10].



Figure 1.
Plant with a base formed by the compact union of several leaves forming a rosette.



Figure 2.
The pineapple (Ananas comosus (L.) Merr.) that is produced in the soil of the sabana municipality of Huimanguillo, Tabasco.

Replacing the low-yielding cultivars with the better ones is a difficult task, considering that pineapple is one of the fruit trees with a high planting density, around 60,000 propagules per hectare for 'MD-2' and, at the same time, is the one that produces fewer propagules naturally [11].

3. National and international pineapple production

In Mexico, pineapple was produced in 14 states during year 2019. Although 80% of the production was concentrated in the Bajo Papaloapan region, which include seven municipalities in the state of Veracruz: Isla, Juan Rodríguez Clara, José Azuela, Chacaltianguis, Medellín, Alvarado, Tlaxicoyan and two municipalities in the state of Oaxaca: Loma Bonita and Tuxtepec. Both the area planted and pineapple production

have increased from 13.93 thousand ha to 376.15 thousand t in 1980 to 44.18 thousand ha and 1041.16 thousand t in 2019, which represents an average annual growth rate of 3% and 2.6%, respectively, Tuxtepec [12]. Therefore, pineapple is considered as the second most important tropical crop in the world after bananas, contributing more than 20% of the world volume of tropical fruits. Until 2002, Mexico occupied the seventh position in the world in pineapple production, contributing 4% of the total world volume Tuxtepec [13].

Worldwide, there are 14 countries that dominate pineapple cultivation, in which Mexico is the leader in yield with 42.8 t ha^{-1} , but its production is surpassed by Thailand, the Philippines, Brazil, and China, who report yields of 23.6 t ha^{-1} , 37.5 t ha^{-1} , 24.3 t ha^{-1} and 36.2 t ha^{-1} respectively Tuxtepec [14]. Although there are other countries that has greater production compared to Mexico, however, these are not considered important since their participation in the world market is less than 2%. The cultivated area of pineapple in Mexico in 2008 was 29.46 thousand hectares, which produced 718.29 thousand tons, with a value of \$94.92 million dollar USD [14].

The state of Tabasco in 2008 ranked fourth in planted area with 1287 hectares, and third in production with 42,400 tons, which reached a value of \$6.17 million dollar USD [14]. The largest importer of pineapple worldwide is the United States with 696.82 thousand tons. Although Canada, another trading partner of Mexico, in the same year imported 102.06 thousand tons [15], even though Mexico is one of the most important trading partners for the US and Canada, it does not export pineapple. Which is due, among other things, to the area dedicated to this crop [16].

4. Economic importance

Although pineapple is grown in the state of Tabasco, the government, through various institutions, carried out agroecological zoning studies to find out areas having the greatest production potential for pineapple cultivation. The world pineapple market is 2.49 million tons, which is imported by 123 countries. 74.31% of the world pineapple market is dominated by eight countries listed below in order of importance: United States (696,820 t), Belgium (292,499 t), Netherlands (200,026 t), Germany (167,416 t), Japan (165,794 t), United Kingdom (116,730 t), Spain (113,182 t) and Canada (102,064 t) [15].

The pineapple cultivation is profitable when more than 45.8 t ha^{-1} fruit is produced. 5.96 thousand ha area was identified with great potential to produce pineapple mainly located in Campeche, Chiapas, Oaxaca, Puebla, Quintana Roo, Tabasco, Veracruz and Yucatán. It is concluded that pineapple production is profitable in those regions that present ideal agroecological conditions for its production. The main marketing channels for fresh pineapple in Mexico are: 1.- Central de Abasto de la Ciudad de Mexico: In this center it is acquired between 30 and 35% of the total volume of national production that is channeled to the fresh pineapple market. However, all this volume is not consumed in Mexico City and the metropolitan area rather an important part is redistributed to other supply centers in the interior of the country. 2.- Central de Abasto de Monterrey: In this center, 20% of the produced crop volume is acquired. This plant supplies the market in the north of the country. 3.-Central de Abasto de Guadalajara: This center acquires an average of 10% of the national production destined for the fresh market. 4.- Second-order markets such as Puebla, Chihuahua, Tamaulipas, Yucatán and Michoacán, acquire 10% and 5.- Smaller places and self-service chains consume the remaining 30–35% [15, 16].

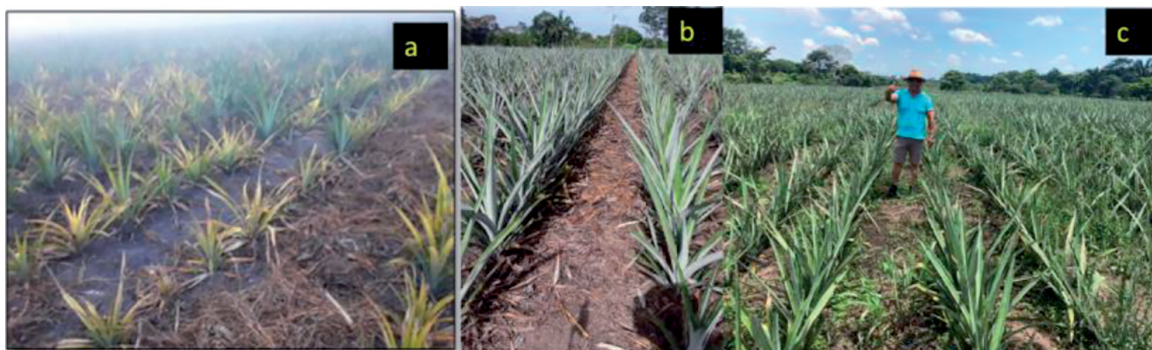


Figure 3. Pineapple cultivation: a) Crop with problems of nutritional deficiency and excess water; b) crop in full growth with the proper management of fertilization doses and c) Development and growth of pineapple maguery without deficiencies and adequate drainage.

5. Limiting factors in production

The factors that limit pineapple production are potential of the soils including soil fertility, acidity, excess or deficit of water, clay content, soil erosion, nutritional deficiencies, presence of Na, alkalinity and low CIC that, alone or in groups, influence the detriment of soil fertility [17].

The acid soils of the Sabana de Huimanguillo are characterized by high phosphorus fixation, deficiencies of zinc, boron, calcium, magnesium and potassium, low rate of formation of ammonium and nitrates, in addition to a high percentage of aluminum saturation [18]. These restrictive soil fertility conditions are manifested in foliar deficiencies that affect the yield and quality of citrus and pineapple fruits. For this reason, acid soils are classified with the methodology of the Integrated System for There are programs with advice and recommendations for pineapple production such as cultural work, prevention and management of diseases and pests, fertilization doses to avoid macro and micronutrient deficiencies, depending on the pineapple variety, but these programs do not reach the small producers, they empirically produce even the fruit, and a third party buys at the foot of the field at a lower price than in the market [19].

Pineapple cultivation affects the natural environment (**Figure 3**). In many producing countries, there is a fruit sector of small producers whose plots are modest in size and have very little impact on the environment. However, industrial production, which produces most of the fruit destined both for fresh export and for processing, has important consequences for the environment.

6. Conclusions

The pineapple cultivation in Tabasco has been affected by the little support and technological interest which consequently increased the total costs of production. Furthermore, due to disproportionate increase in the application of chemical inputs, the cultivation surface and little or no technical advice, has made it difficult to place surplus production in the internal market. The situation is further aggravated by entry of the processed pineapple into the national territory through unfair trade practices. The small producers that produce the pineapple fruit without programs, recommendations to obtain better management and quality of the fruit, there is a

national and international market with a good acceptability in flavor, consistency and special in the juice and syrup of the fruit of the same.

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Conflict of interest

The authors declare no conflict of interest.

Notes/thanks/other declarations

No declarations just to thank the pineapple producers of Chontalpa de Huimanguillo, Tabasco, Mexico. Place.

Author details

Maritza Alejo Jeronimo, Edward Manuel Arevalo de la Cruz, Hortensia Brito-Vega*, Armando Gomez-Vazquez, Jose Manuel Salaya-Dominguez and Edmundo Gomez-Mendez
Division Academica de Ciencias Agropecuarias, Universidad Juarez Autonoma de Tabasco, Teapa, Tabasco, México

*Address all correspondence to: hortensia.brito@ujat.mx

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