

Use of micro tunnels to produce cantaloupe melon out of season in the comarca lagunera region, northern Mexico

Abstract

The Comarca Lagunera region is the most important area for cantaloupe production in Mexico with about 6,000 hectares. However, under traditional production systems there are problems that limit production. An important problem is that early planting (January) without protection systems crops are damaged by low temperatures, which causes great economic losses. The objective of this work is to present information, obtained during the 2010-2018 period, of research and technology transfer projects of the use of polypropylene microtunnels to produce cantaloupe at an early planting date in the Comarca Lagunera region, Mexico. The results showed that with the use of microtunnels, in early planting dates, a better agronomic behavior of the crop, higher productivity and better profitability have been achieved.

Keywords: cantaloupe, microtunnels, early planting, market window

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Introduction

The Comarca Lagunera region, located in the North Central Mexico, is the largest cantaloupe-producing area in the country with about 6,000 hectares. The Lagunera region is located between the parallels 26° 51' 00" and 24° 22' 48" north latitude and the meridians 101° 51' 36" and 104° 48' 36" west of Greenwich and an altitude of 1200 masl. This region registers high temperatures during spring and summer seasons with levels $\geq 35/20^{\circ}\text{C}$ day/night and low temperatures during the months of November-February, typical conditions of arid and semi-arid environments in northern Mexico.¹ In this region, traditional melon planting date takes place from March 1 to March 15 and is harvested from May 20 onwards.² In this period there is a lot of production, the market saturates and the price falls.³ To improve this situation, producers have been looking for alternatives to increase productivity and profitability, among which one is the early planting dates. Early plantations are at risk of damage from low temperatures, but cantaloupe farmers take the risk because of the possibility of selling at better prices. In 2011, La Laguna Experimental Station of the National Institute of Agricultural, Livestock and Forestry Research of Mexico (INIFAP) started a research line with the aim of producing melon out of season.^{4,5} Agribon (polypropylene) micro tunnels (MT) have been tested to improve yields and induce precocity in cantaloupe.^{6,7} This technology allows harvesting outside the traditional season at an early date, protects plants from low temperatures, from the effect of wind, from attack by rodents, from diseases caused by soil fungi such as *Damping off* and *Fusarium* and induces precocity. The trials in the experimental station were carried out during the years 2011-2013 while in farmers' fields from 2014 to 2018. The factors

under study were the protection systems with and without the use of microtunnels with three treatments: two early planting dates (January 1-12; January 18-23) and as a control the traditional planting date (March 1-15). Simple and factorial experimental designs were used, with 3 to 4 repetitions. In 2014, after having worked experimentally for three years, technology transfer began with producers in the region. Gaytán-Mascorro et al.⁸ indicates that the use of agribon MT can be a profitable technology in the Comarca Lagunera. Some authors consider that with the use of micro-tunnels a 15% yield increase would be sufficient to be profitable.⁹

Currently 33% of the melon area in the Comarca Lagunera region, in early planting dates, uses microtunnels. The results obtained with the use of this technology are as follows:

Economic results

Sales prices: With the use of MT (17g/m² polypropylene) the harvest was advanced on average from 18 to 20 days; as a result, it was possible to sell at better prices. It is possible to reuse microtunnels for at least four production seasons. Table 1 compares the sale prices using MT (January) vs traditional planting season (March) during the 2014-2018 period; the difference in favor of the former are clear:

Percentage of harvest due to the use of MT: Because of precocity during use of microtunnels the first 18 days from the start of harvest, the MT system produces between 65% and 80% of the total yield, managing to sell at the best prices of the season. Micro-tunnels modify the environment in the plant, resulting in benefits of accelerated growth, early maturity, and a possible increase in yield.¹⁰

Table 1 Farm level cantaloupe prices (USD/kg) using microtunnels vs traditional planting season during the 2014-2018 period

Season	Price range under use of micro tunnel (\$/kg)	Price range under traditional planting season (\$/kg)
2014	\$ 0.22- \$ 0.27	\$ 0.09- \$ 0.13
2015	\$ 0.27- \$ 0.36	\$ 0.09- \$ 0.13
2016	\$ 0.27- \$ 0.36	\$ 0.08- \$ 0.18
2017	\$ 0.20 - \$ 0.29	\$ 0.07 - \$ 0.18
2018	\$ 0.29 - \$ 0.36	\$ 0.07 - \$ 0.24

Protection against rodents that damage seed: It is possible to save from \$ 66.67 to \$ 222.22 / ha for seed and wages for replanting activities;

Savings by elimination in the application of fungicides and insecticides: \$7.29 per hectare;

Benefit/cost ratio: According to production costs and revenues, the following benefit-cost relationships have been estimated: with microtunnels: 4.1; traditional planting season: 2.62.

Technological results

Melon production out of season at an early date:—Under treatment 1 (MT and planting date 1-12 January) the harvest was obtained between April 8 and 16; under treatment 2 (MT and planting date 18-23 January) the harvest was obtained between April 22 and 28; while under the control treatment (planting date March 1-15) the harvest was obtained on average from May 12 to 23; this is two or three-week advance with the harvest in the best time of cantaloupe prices;

Use of Technology: During the period 2014-2018 the use of MT technology in cantaloupe has had variations in planting area. The approximate planting area with MT has increased from 180 ha in 2014 to 300 ha in 2018;

Increase in temperature in soil and with in microtunnel: Root diseases such as *Fusarium* do not prosper, which may cause losses of up to 30%. Other research results indicate that MT of polyethylene, have shown advantages in yield and quality of fruit in melon with respect to a system with out protection at planting dates of December 15.¹¹ In the Lagunera region, the use of a polyethylene protection system has caused damage to the plant canopy due to high temperatures, causing leaf edgeburns. With polypropylene MT the damage has been of little significance.

Environmental results

Low temperature protection: During the 2013-2019 period, temperatures up to -5 °C have been presented for short periods of time, with the use of MT this condition has been tolerated. It is important to consider the effect of the width of the polypropylene.

Conclusion

With the use of MT of polypropylene, cantaloupe could be produced from the first week of April in the Comarca Lagunera, Mexico, with an advance between two or three weeks compared to the traditional system, achieving better profitability. The benefits obtained from this technology in commercial plantings were evaluated through technological, economic and environmental indicators.

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None.

Conflicts of interest

Authors declare no conflict of interest exists.

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