Topics in Subtropics Newsletter

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News from the Subtropical Tree Crop Farm Advisors in California

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TOPICS IN THIS ISSUE

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Proactive Management of the Avocado Seed Weevil, *Heilipus lauri* (Coleoptera: Curculionidae)

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Avocados are an iconic specialty crop in California that are grown by approximately 4,000 growers who farm around 50,000 bearing acres. The crop is worth ~$350 million per year. The `Hass' variety accounts for >90% of the fruit production in California.

The native range of avocados includes parts of Mexico, Central, and South America and in this area insect biodiversity is high as insects have co-evolved with this plant. In contrast, the biodiversity of the pest arthropod fauna associated with avocados in California is low, consisting primarily of about 4 invasive pest species of insects and mites that feed primarily on leaves, of which one, avocado thrips, *Scirtothrips perseae*, can cause damage to the skin of immature fruit (Hoddle 2006).

An Identifiable Invasion Threat – *Heilipus* spp. Weevils: Currently, California-grown avocados are free from specialist fruit feeding pests such as seed feeding weevils (e.g., *Heilipus lauri*.) and moths (e.g., *Stenoma catenifer*). Larvae of these pests bore into fruit to reach the seed. Establishment of these fruit feeding pests in California would cause significant disruption and threaten the long-term economic viability of this industry (Hoddle 2006).

***Heilipus lauri*, the avocado seed weevil**

Approximately eight species of *Heilipus* (there are ~85 species of weevils in this genus) are associated with avocados in the native range. The *Heilipus* complex attacking avocados fall into two groups:

(1) Fruit boring seed feeders (e.g., *H. lauri* [Mexico {native}, Colombia {invasive and introduced from Mexico in seeds used for root stocks [Castañeda-Vildózola, et al. 2017]}] *H. pittieri* [Costa Rica & Nicaragua] and *H. trifasciatus* [very limited range in Mexico]), and (2) Species that bore into stems and branches (e.g., *H. albopictus* [Mexico], *H. apiatus* [native to SE USA], *H. cartagraphus* [Brazil], *H. elegans* [Guatemala, Costa Rica, Panama, Colombia, Brazil], and *H. rufipes* [Brazil]).

Heilipus spp. are considered the most damaging pest complex associated with cultivated avocados (e.g., Hass and Fuerte) in the native range of this crop (Castañeda-Vildózola, et al. 2017; Luna et al. 2017).

Damage caused by Large Avocado Seed Weevil, *Heilipus lauri*: Adult *H. lauri* feed on small immature fruit and leaves, and young stems but don't reproduce on these structures (Caicedo et al. 2010). Female seed weevils lay eggs inside holes they drill into fruit using their long beak like snout or rostrum. Hass fruit ~4-5 cm in diameter are preferred for oviposition. Larvae that hatch from eggs deposited into oviposition chambers bore through the fruit pulp to the seed. Upon reaching the seed, larvae burrow

A hole in an avocado seed from which an adult *H. lauri* emerged

into the seed to feed causing significant internal damage. Mature avocado seed weevil larvae pupate in the seed. Following pupation adults use their mandibles, located on the end of the rostrum, to chew a large circular exit hole to escape from the pupation chamber. Internal feeding by larvae damages fruit, making it unmarketable, and in some instances heavy damage causes fruit to drop prematurely. In parts of Mexico, *H. lauri* is a significant pest of Hass avocados. Around 60% of Hass fruit have been reported as being damaged by *H. lauri* in unmanaged orchards in Morelos, Mexico (Medina 2005). In Colombia, damage levels in heavily managed Hass orchards range ~4-8% (Caicedo et al. 2010).

Control Options: Chemical control is difficult because larvae are protected within fruit (Caicedo et al. 2010). Cultural control (e.g., removal of infested fruit and branches) and trapping using black pyramidal interception traps (i.e., Tedders traps) that serendipitously catch motile weevils are ineffective for suppressing pest populations to non-damaging levels (Vallejo et al. 2014). The natural enemy fauna, especially the identity of parasitoids, attacking weevil eggs, larvae, and pupae is not well documented and natural enemy impacts need quantification (e.g., life table studies) (Caicedo et al. 2010; Castañeda-Vildózola, et al. 2017).

Hass fruit with oviposition holes made by *H. lauri*

Hass fruit with *H. lauri* larva feeding inside seed

The Threat to California's Avocado Industry: Consequently, *Heilipus* spp. are listed by USDA-APHIS as avocado pests of high concern for countries that export avocado fruit (i.e., Hass) to the USA from areas where avocados and *H. lauri* are native (e.g., Mexico) or invasive (e.g., Colombia).

Initiation of a Proactive Mitigation Program for *H. lauri*: In response to the invasion threat posed by *H. lauri* to the California avocado industry a proactive mitigation project was initiated in February 2020. This program is supported financially by the California Department of Food and Agriculture's Office of Environmental Farming and Innovation Proactive Integrated Pest Management Solutions grant program.

A major focus of this research program is to identify the aggregation pheromone released by male weevils. If the pheromone can be identified and synthesized it will provide a powerful tool for incursion monitoring in California. Perhaps more importantly, the pheromone can be used in areas with *H. lauri* activity from which avocados are exported (e.g., parts of Mexico and Colombia) to the USA (especially California) to determine if these areas are free of *H. lauri*. In addition to detection and monitoring, the pheromone, if highly attractive, may have potency as a mass trapping tool that could be used to control weevils in export areas. This forward-leaning approach would deal with *H. lauri* at the source and would

be an additional step in the pest management chain to further reduce accidental introductions of a serious avocado fruit pest into California.

With respect to the pheromone, this proactive management project has three main objectives: (1) to identify the aggregation pheromone released by male weevils. Progress has been made in Dr. Jocelyn Millar's lab in this respect. Two compounds (one major and one minor) have been identified. (2) Field tests in Mexico in 2021 will be conducted with cooperators with these two putative pheromone compounds to determine their attractiveness. (3) Once the pheromone component(s) is/(are) optimized for weevil attraction they will be deployed in one of seven different commercially available trap types used for catching weevils in agricultural settings. The goal of these field experiments is to identify the most efficacious trap design for use with the weevil pheromone.

So, please stay tuned, there will be a lot new and exciting findings to report on over the next two years!

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False Chinch Bug in New Avocado Plantings

By Monique J. Rivera, Ben Faber

The false chinch bug (FCB), *Nysius raphanus* (Hemiptera: Lygaeidae), is a pest of many plants. FCB is a generalist and has been found to be a problem in many cropping systems such as soybeans, quinoa, tobacco, cotton, broccoli and other Brassicaceae plants. FCB adults (above) is mostly light to dark gray, elongate, and about 0.12 inch (3 mm) long. Females lay eggs on host plants or in cracks in soil. The mostly pale gray nymphs have inconspicuous reddish to brown abdominal markings. FCB has 4-7 generations per year with all stages being potentially present throughout the year. All stages can be present throughout the year. They also can be found invading homes in the southwest. Their populations generally start in unmanaged fields with lots of weeds and are an issue for crops when they build up large numbers and move into the crops from the unmanaged, weedy fields.

Photos by Surrendra Dara.

This year it's host of choice is young avocado plantings in Ventura County. False chinch bug occasionally causes severe injury on young trees by sucking sap from shoots and young stems. Infested shoots wither and die suddenly after attack, which typically occurs in May and June. Economic damage normally

occurs in groves away from the coast only on young trees in border rows adjacent to uncultivated areas or grasslands. Otherwise healthy mature trees tolerate bug feeding.

Here are photos of damage to young avocado provided by Tom Roberts, Integrated Consulting Entomology.

To best manage FCB, a grower will need to catch it before it establishes and the populations explode. This is difficult because the pest will not reoccur every year on regular basis. From what has been seen in the field this year, FCB appears to prefer young avocado plantings and thus, a targeted approach is to monitor only in new plantings right as summer temperatures are rising. In paper in the journal, Phytoparasitica from 2006, the authors investigated what color sticky trap was best for monitoring and found that yellow worked best. Thus, passive monitoring with yellow sticky cards that are placed throughout the field and monitored weekly is a potential option. However, this approach can be expensive with the labor hours needed to properly process the sticky cards. A more practical approach is to sweep net weedy areas on the outside of avocado groves and adjacent unmanaged areas nearby weekly in search for the first signs of FCB.

In conventional avocado production, there is only one insecticide recommended for use against FCB. Malathion 8 at 16 oz/acre.

Subtropics Snapshot: The Mexican Date Industry

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The date palm in Mexico has two different historic routes, the first one being the introduction of the date palm to Mexico by the Spanish during the colonial period. The native palm oases of Baja California were the sites where the date palms grew best, but yields and fruit quality were poor, and the crop culture in these areas is fading. The other route came about in the 20th century, when high quality cultivars were introduced to the San Luis Rio Colorado and Mexicali Valleys, where the appropriate climate, rich soils, and modern agricultural practices allow good yields of high-quality fruit.

Traditional Oases Date Production

The cultivation of the date palm was introduced to the central part of Mexico in the mid-sixteenth century by the Spanish colonizers. However, due to climatic factors, that area of Mexico was not suitable for the production of dates. The Jesuit missionaries established settlements known as missions in 15 places on the Baja California Peninsula, chiefly in areas belonging to the present State of Baja California Sur, where dates can reach maturity, producing a viable crop in these areas. During the colonization process, which lasted from the late sixteenth to the mid-seventeenth centuries, various date palm plantations were established in oases areas, and some of them have survived to this day (Figure 1). The oases, which supported the native *Washingtonia* fan palms, were suitable for date production not only due to the climate, but also to the presence of high levels of soil water. Both *Washingtonia* palms and date palms require high amounts of soil moisture for vigorous growth and, in the case of the date palm, acceptable fruit development.

Figure 1. The oasis of San José de Comondú, Baja California Sur. Date palms and *Washingtonia* fan palms intermingle in the oasis.

After the Spanish colonial period, the oases continued to have a large agricultural heritage, including the date plantations, due to the availability of water in the arid Baja California peninsula. There are records detailing date production in the largest oases of up to 200 tons in 1957, as well as the export of dates from the Baja California peninsula to mainland Mexico and to China. However, date production was losing relevance due to the fact that the dates were considered criollo types. In this context, criollo refers to unimproved dates descended from the original importations of the Spanish; they are of low quality and value, propagated mostly from open pollinated seeds rather than from offshoots of superior selections. Today, commercial production is vanishing due to various factors, such as the low productivity and quality of the old plants that dominate the plantations, as well the lack of active management, such as artificial pollination, fertilization, and bunch management. In addition, a loss of interest was observed in the new generations of farmers, who prefer to develop more profitable economic activities, such as fishing or migrate to find employment in large cities. Likewise, the older generations cannot afford the risk of climbing the tall old palms to obtain a harvest of quality and value (Figure 2). Another factor affecting the reduction of date production is the current economic and cultural development of the region, where an increase in diversity of food and occupational options is taking place as the communication systems increase their impacts on the people and oases landscapes. In addition to the traditional oases culture in Baja California Sur, there is one industrial plantation (Ejido Alfredo V. Bonfil) slightly south of the traditional oasis of San Ignacio. Bonfil grows standard commercial varieties of dates and uses industrial technology in its production. There is also an industrial plantation in the Santo Domingo Valley established with the support of FAO using tissue cultured plants from the Middle East.

Figure 2. Old date palms at the oasis of La Purísima, Baja California Sur, Mexico. These trees are climbed with only a climbing belt once a year to harvest fruit.

Figure 3. Modern industrial date palm plantation in Mexicali Valley, Baja California, Mexico.

Modern date cultivation in Mexico arose independently from the traditional oases date culture. By the end of the 1960's, date cultivation had been established in the San Luis Rio Colorado Valley in the State of Sonora using offshoots imported from Yuma, Arizona. Commercial date plantations were subsequently established in the nearby Mexicali Valley in the State of Baja California (Figure 3) and in other areas of Sonora such as Caborca and Altar. There is also a small production area in the State of Coahuila comprising Ejido Bilbao and Viesca (Figure 4).

Figure 4. Date production areas in Mexico. Areas in red grow high value commercial cultivars; areas in blue cultivate criollo dates.

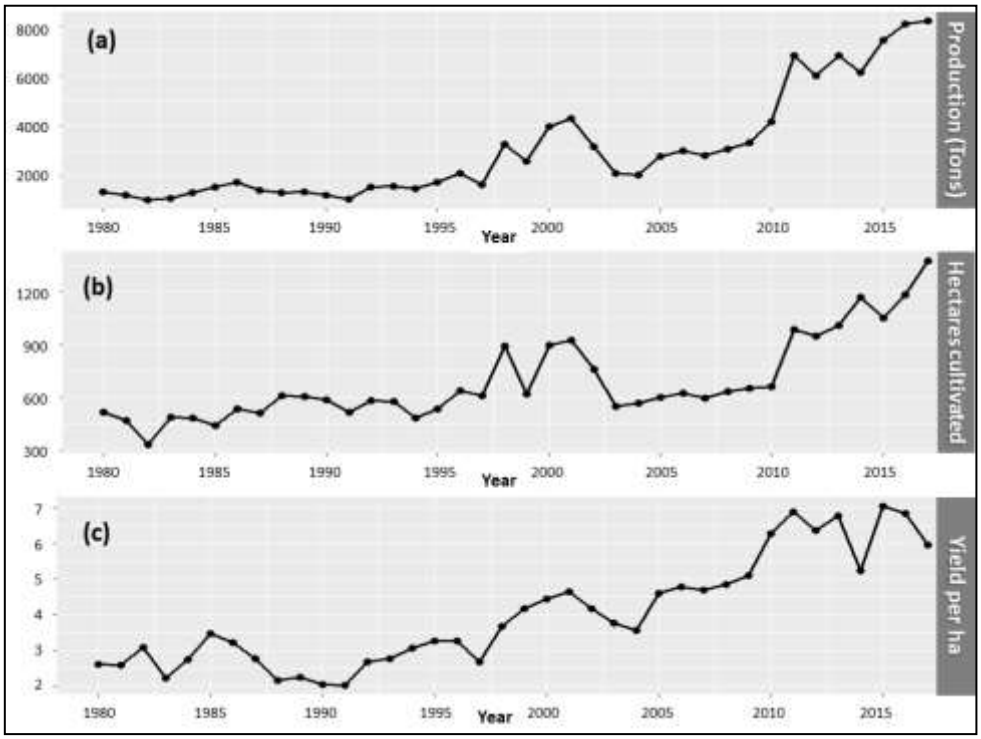


Figure 5. Representation of date production in Mexico from 1980 to 2017. (a) Production in tons. (b) Area cultivated in hectares. (c) Corresponding yield per hectare.

Mexico recognizes date production as a high priority crop and planted area, yield per area, and total yields have increased in recent years. Planted area increased by approximately 100 % between 2005 and 2015, while yield per area also more or less doubled, resulting in a total yield increase of over 250 % in this time period (Figure 5). In 2018, the production was 8,945.69 tons, obtained from a harvested area of 1,572.50 ha, whereas in 2019, the production was 12,364.94 tons from a harvested area of 1,768.69 ha, with a value of USD 34,049,689. The total planted area (bearing and non-bearing) increased from 2,366 ha in 2017 to 2,922 ha in 2018, an increase of 556 ha entering production (Table 1). However, for 2019 a planted area of 2,811 ha was reported, which represents a decrease of 111 ha compared to the previous year. This was due to poor crop management by new farmers in the cultivation of dates. For 2020, a total of approximately 400 new ha are reported to be entering production. The San Luis Rio Colorado and Mexicali Valleys account for 97 % of Mexican date production. Average annual production in these Valleys is 7.6 ton/ha.

Producer States	Year	Surface Planted (ha)	Harvested Surface (ha)	Production (ton)	Yield (ton)	Production Value (Millions USD)
Baja California	2014	444.50	271.50	1,822.26	6.71	3.87
	2015	668.25	303.00	2,411.84	7.96	7.33
	2016	841.22	346.00	3,394.07	9.81	10.56
	2017	805.25	346.00	3,388.92	9.79	11.12
	2018	1,388.70	408.50	3,04529	7.45	10.06
	2019	1,205.69	441.69	2,984.93	6.76	9.47
Baja California Sur	2014	345.00	285.00	50.70	0.18	0.12
	2015	348.00	135.50	157.26	1.16	0.32
	2016	332.50	235.00	154.00	0.66	0.25
	2017	335.00	278.00	302.65	1.08	0.72
	2018	318.00	278.00	476.20	1.71	0.98
	2019	352.50	278.00	597.07	2.15	0.99
Coahuila	2014	15.00	5.00	11.50	2.30	0.02
	2015	15.00	5.00	12.60	2.52	0.03
	2016	15.00	0.00	0.00	0.00	0.00
	2017	15.00	5.00	7.75	1.55	0.02
	2018	15.00	5.00	8.50	1.70	0.02
	2019	15.00	5.00	7.00	1.40	0.01
Sonora	2014	907.00	607.00	4,240.60	6.99	6.68
	2015	909.00	609.00	4,845.40	7.96	9.47
	2016	922.00	602.00	4,537.50	7.54	10.12
	2017	1211.00	748.00	4,516.00	6.04	9.57
	2018	1,201.00	881.00	5,415.70	6.15	12.55
	2019	1,238.00	1,044.00	8,776.00	8.41	23.56

Table 1. Production of dates in different states in Mexico. Baja California and Sonora account for 97 % of total production.

The ‘Medjool’ cultivar is the main commercial date grown in Mexico (94%), followed by small plantations of the cultivars ‘Deglet Noor’ (5%), and others such as ‘Khadrawy’, ‘Zahidi’, ‘Barhee, ‘Honey’, ‘Hallawy’, and criollo dates (1%). Mexico is currently the third largest producer of ‘Medjool’ in the world, after the United States and Israel. The quality of ‘Medjool’ grown in Mexico is comparable to that in most other countries.

Production Practices

The crop practices used in commercial date production in Mexico are mostly the same as those used in the United States, since the main growing areas in the U.S. are close to the San Luis and Mexicali Valleys and have similar climates and soils. Some companies have plantations in both countries.

Propagation is mainly by offshoots. The main cultivar, ‘Medjool’, produces many offshoots. Propagation from tissue culture is uncommon at this time, although recently there have been some plantings of tissue culture-derived palms from the U.S. and Qatar. These have not yet been field tested for performance compared to offshoot plantings.

Fertilization is provided mainly for N-P-K. In sandy soils, fertilizer is delivered via irrigation systems, and amendments for improving soil water retention are widely used. Organic production areas are small, but slowly increasing. Various farms are being certified since the market of this category of products gives better prices for the organically grown dates. Plantation practices differ based on the irrigation technique. Limited water supply is forcing irrigation to turn to pressurized systems; however, flood irrigation is the main method of water delivery. Flood-irrigated fields are leveled with laser equipment. In sandy desert areas, where flood irrigation is impractical, no leveling is required, and the use of drip irrigation with pressure-compensated drippers allows small slopes and dunes in the production field. In Baja California Sur, irrigation in modern commercial plantations is delivered by dripping systems, whereas in Coahuila, only the flooding technique is used.

The process of pollination in commercial plantations is carried out artificially, while in the oases it is performed naturally by the wind. Pollination takes place once the inflorescence is open by late February or early March. For ‘Medjool’, thinning of the bunch follows pollination. Some 15 to 20 flowering strands are cut from the center of the inflorescence in April and in May fruits are removed so that there is a separation of 1 inch between remaining ones, leaving 12 – 18 fruits per strand. This practice improves fruit quality and reduces alternate bearing. A concurrent activity to the thinning process consists of the tying of the bunch to the closest leaf in a position for easy access during the following activities. This supports the bunch and reduces the number of broken fruit stalks. Sacs of mesh fabric are placed covering the fruit raceme to avoid damage from birds and insects. This activity is carried out when the fruits turn to a yellow color at the khalal stage in July to August.

Pest presence on date palms in Mexico is not significant, but there are various potential threats. Insect pests, such as various species of nitidulid beetles, have been detected infesting ‘Medjool’ dates in the Mexicali valley, and red mites can cause production losses. No research has yet been done to characterize the incidence of these pests in the region. The South American palm weevil, *Rhynchophorus palmarum*, has been detected in cities close to the production areas; therefore, a program for monitoring its potential presence is needed.

Date palm diseases in commercial production areas are not reported yet, but some plantations in both the San Luis Rio Colorado and Mexicali regions show a few palms with symptoms similar to those of Fusarium. Since this disease can be devastating to date palms, these palms need to be closely monitored.

Additional information regarding potential disease problems needs to be developed for the Mexican date-producing areas.

Vertebrate pests of date palms include squirrels and gophers. A potential vertebrate pest not found in the U.S. is the monk parakeet (*Myiopsitta monachus*), which makes its nest on the palms and feeds on the dates. The monk parakeet has been observed in garden palms and other plants in areas near date production in both Sonora and Baja California.

Harvest of 'Medjool' starts in August and finishes by October. Dates are harvested from the ground or by climbing into the crown with young, short trees. Harvest of taller trees uses forklifts fitted with circular platforms that are used to elevate the crews to crown. Date fruit are harvested into circular trays consisting of fishing net over a metal form, and then lowered to the ground and placed into 2-inch deep plastic trays.

Post-Harvest Handling and Processing

In the commercial production areas, once harvested, dates are transported to packing houses, where they are selected, fumigated, and frozen. Big farms have their own cold storage rooms and packing installations. Most of the small and medium growers sell the raw production to a packing house, where the fruit is selected at standard sizes and exported. Other growers sell the product to local markets. In the most recent seasons, packing house capacity has been insufficient to manage the increased production.

Commercial date production in Mexico is aimed at the export market. The regional 'Medjool' price is set in the Los Angeles, California, wholesale produce market, and is expected to grow at an annual rate of 3.5% between 2016 to 2020. An average of 57 % of the dates produced in Mexico are of exportable quality. Mexican date exports were valued at 3.8 million USD in 2013 and 8.4 in 2017, an increase of 122%. The product has been sold to USA, Australia, UK, France, China, and Germany. The same quality product is starting to be sold in high-end stores in the main cities of Mexico. The Mexican government is strongly promoting the commercialization of the dates in the country.

Date production in Mexico is aimed at the export market of fresh fruits, and no commercial products derived from its processing are in the wide market yet. However, there is active development of new products that can be found in limited quantities. Artisanal production of alcoholic beverages is very common. Confectionery products of dates filled and/or covered with chocolate, pecans, coconut, or pistachios are available. Date breads, pies, cakes, and cookies are often found in bakery shops. A great contribution to the Mexican gastronomy is the date tamale, consisting of a mixture of corn dough with date paste, in an envelope of corn husks, that is cooked by steaming. Interesting proposals of date-chile pepper dressings begin to be mentioned. The date milkshake may be the most common way of consuming dates, after eating them fresh. A coffee substitute from toasted date seeds is starting to appear, as well as facial beauty treatments based on the antioxidants and nutrient content of the seed. Candy pieces of date paste in a mixture with chile pepper are appreciated by young people.

Production Constraints

The Colorado River provides the water which is used in the date-growing areas in the Mexicali and San Luis Colorado valleys. Its provision is highly controlled and nowadays it is more common that the water rights are retired from agricultural use and transferred to industrial use. For example, there is a conflict in the Mexicali valley between farmers and a beer company which requires 20 million cubic meters of water per year for its operation. The Colorado River also supplies water to seven states in the United States. Water allocation to the U.S. and Mexico is regulated by various compacts and agreements between the

U.S. states and between the U.S. and Mexico. Reduced amounts of Colorado River flow, drought conditions, and environmental issues may well result in less Colorado River water being available both in the U.S. and in Mexico.

Wildfires are a common problem among the date palms growing in oases. The hot summers increase the risk of fires in the mostly unattended plantations of the oases. Unattended date palms and *Washingtonia* palms usually have large amounts of dry leaves, making them susceptible to fire hazards. Often the palms are not completely killed by the fires but crops are lost and it takes several years to recover. Baja California Sur is highly susceptible to hurricanes and continuous rains in the seasons of date maturation and harvest, causing the falling of the adult palms, and the remaining high humidity favors the fungi attack and fermentation of the fruits. In addition, hurricanes sometimes cause saltwater intrusion into freshwater estuaries near the coast. Although date palms and *Washingtonia* palms are relatively salt tolerant, these saltwater intrusions may result in soil salt levels high enough to weaken or kill palms growing near the coast. This is mostly a problem in the oases. In the valleys of Mexicali and San Luis Rio Colorado, rains are very scarce in the ripening and harvest seasons of the fruit and so do not present problems.

Research

Because commercial date palm cultivation is of recent introduction in Mexico, cropping practices developed in the United States have been successfully adapted to Mexican environmental and economic conditions. The main research efforts are carried out by the "Campo Agrícola Experimental de Mexicali", belonging to the "Instituto Nacional de Investigaciones Agrícolas, Pecuarias y Forestales" (INIFAP) in Baja California, and by Sonora State University at the San Luis Rio Colorado Campus. The Institute of Agricultural Sciences (ICA) from Autonomous University of Baja California (UABC) is also starting research efforts, and recently has established a small date palm experimental field located in the ejido "El Peligro", in the Mexicali Valley, B.C.

Conclusions

The date growing industry has the potential to contribute to the economic development of the northwest of Mexico, since there are not many other regions in Mexico that can grow high quality dates. Date growers are improving date cultural practices, and it is very possible that yields increase from the current average of 7.9 ton/ha to 10 ton/ha in the next 5 years. The main obstacle for this industry is commercialization and export. Currently, there is only one integrated company that exports the packaged fruit to other countries. Training and financing are required so that small and medium producers are better organized and form co-ops for packing and marketing of their products. In order to stimulate internal consumption, it is necessary to widely disseminate the health benefits generated by the consumption of dates. It is necessary to carry out more research on date palms in order to improve the current methods of cultivation, to be prepared for possible future pests, work with practices to optimize the use of water, and develop new products derived from the date. Likewise, research to take advantage of date palm agricultural residues, such as the extraction of oil from the seed, or use as biofuel or livestock feed is needed.

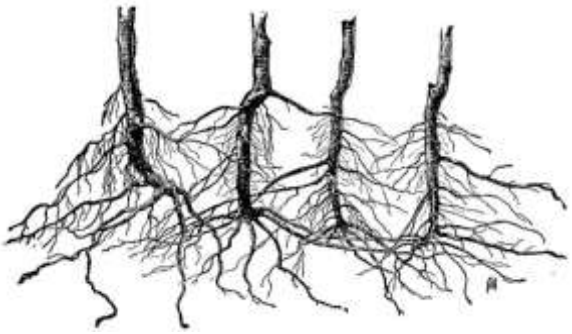
Note: This article was adapted from a longer, refereed paper. Ortiz-Uribe N, Salomón-Torres R, Krueger R (2019) Date palm status and perspective in Mexico. Agriculture 9, 46. doi:10.3390/agriculture9030046

Removing Avocado Suckers with Glyphosate

Ben Faber and Brad Hanson

This is not good. You find an avocado tree with sun blotch or it is time to thin the orchard and you remove the offending tree. You know that if you don't remove the sucker, you'll end up with some rootstock growth that just gets in the way of the other trees. Avocado suckers can look like a valued tree until it's time for harvest several years later, and then you are likely to find that it's not the variety that you thought it was. Homeowners often find this problem several years after a freeze and the lemon tree that regrew from the freeze damage turns out to be the rootstock variety and produces some gnarly, seedy, juiceless fruit. Even without a frost, sometimes rootstocks which are selected for their vigor, can be more vigorous than the scion variety and will overgrow it. You then end up with whatever the rootstock fruit turns out to be.

In some situations, it is legal and common to use a "cut stump" treatment to kill stumps and prevent resprouting. In these cases, glyphosate or triclopyr is sprayed, drizzled, or painted onto a freshly cut stump. Relatively high concentrations of the herbicide are applied to the cambium, which is the living tissue just under the bark. Cut stump treatments work well in many situations, including citrus orchards. This type of cut and spray treatment is commonly done to remove undesirable plants, like arundo and weedy tree species. However, in some trees, like avocado and many forest species, there can be root grafting, which are tree-to-tree root connections.



Due to root grafting in a mature avocado orchard, it really can be one giant root system, one tree connected to all the other trees. And if a systemic herbicide is injected in one tree, the surrounding trees can be affected – they might get enough herbicide through the root graft to be injured or even killed along with the target tree. This technique has been used in Florida to remove Laurel Wilt Disease infected avocado trees which can rapidly infect surrounding trees with the killer fungus. This is a helpful technique, because it removes any doubt that all infected trees have been killed to prevent the spread to healthy trees in the orchard.

In a healthy orchard in California, this is not a really good way to remove avocado stump sprouts. Every year reports come in of glyphosate killing good trees that surround a removed tree. The photo below is a recent case where the stump (circled in blue) was scored and painted with glyphosate. Within two weeks the surrounding tree were also killed. The systemic material was translocated from the cut surface by way of root grafts to the neighboring trees. And those trees are now dead, too.

So what to do? One thing done by those with a front-end loader or a backhoe, is to pull the stump and have an end to the sucker problem. It also reduces the possibility of chronic armillaria fungus persisting to infect trees. The problem is that it leaves a big hole to deal with which can open up a slope to erosion. If on a slope, it requires a decent sized tractor that can safely be operated on the slope without tearing up everything, including the irrigation system. And in the end, it's expensive.

The other approach is to just cut the tree down as low as possible without damaging the chain saw. Then as the irrigator makes inspections, just physically knock off the suckers as they come up. If walking the irrigation lines, it's not a problem. Covering the stump and immediate area with a physical barrier such as thick, black plastic sheet (greater than 5 ml), can reduce the number of suckers. To speed degradation of the stump, the top of the cut can be scored and a salt such as urea or magnesium sulfate (both at 10 pounds per stump) can be applied. At this rate, rather than fertilize the stump, under moist

conditions, this treatment facilitates the activity of wood-decaying microorganisms; it can also damage or reduce the regrowth of the suckers.
There are also a range of registered contact herbicides that can be used to burn out the suckers. Materials, such as Scythe ®, Axxe ® and Suppress ® are all registered for avocado sucker control. There are others. These contact herbicide work best on small tender suckers so don't let the suckers grow more than a foot or so. For best control of suckers, apply them at the highest allowable rate with an approved adjuvant at a spray-to-wet rate. Because these products are not systemic, you'll likely need repeat applications, as new fresh buds break and new suckers erupt.

Using a contact spray means the grower would still need to be out in the orchard controlling the suckers. The grower still needs to be out in the orchard checking the irrigation lines. Why spray the suckers when they can just be broken off?

Although systemic herbicide can be used effectively to control suckers or stump sprouts in some tree crops or situations where root grafting does not occur, this is not a recommended practice for avocado because of the risk of damage to nearby trees.

UC Ag Experts Talk

"Everybody is busy," said Beth Grafton-Cardwell, UCCE citrus entomology specialist. "It's hard for people to get to meetings. Now, they can get some of the hours they need for updating their professional licenses from home or work, or even on their smartphones."

A series of 1- hour webinars, designed for growers and Pest Control Advisors, highlight various pest management and horticultural topics for citrus and avocados. During each session, a UC Expert on the subject will make a presentation and entertain write-in questions via chat during and/or after the presentation. As we develop this program, we may expand to other crops.

Who is involved?
This webinar series is brought to you by Ben Faber (UC ANR Ventura Advisor) and Dr. Beth Grafton-Cardwell (Depart of Entomology UC Riverside Extension Specialist) with the technical support of Petr Kosina (UC IPM Contact Development Supervisor) and Cheryl Reynolds (UC IPM Interactive Learning Developer).

Are there Continuing Education units?
When the subject discusses pest or disease management, continuing education units will be requested from DPR (1 unit per session) and from CDFA (1 CCA unit per session). Participants will pre-register, participate in the webinar and be awarded the unit. The sessions will be recorded and hosted on this web site for future study. However, continuing education units will be awarded only to the participants who attend the live version of the webinar.

Professional pest control advisers must complete 40 hours of continuing education every two years; qualified applicator certification and qualified applicators license renewal requires 20 hours every two years, according to the California Department of Pesticide Regulation.

Register in advance for upcoming webinars at: https://ucanr.edu/sites/ucexpertstalk/

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