

## PRICKLY PEAR CACTI PESTS AND THEIR CONTROL IN MEXICO

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## ABSTRACT

*Opuntia* spp., known by Mexicans as nopal, represents historically one of the most important biotic elements of Mexico. This natural resource has been and is being used for multiple purposes. Some of the current uses include: food for humans as both vegetable and fruit, forage for animals, source for alcoholic beverages, sweetener, live fences, industrial products such as cosmetics and dye, and as a medical source against diabetes and other diseases. Its cultural and natural values have been reflected in paintings, ancestral Indian codes, and old writings; thus its historic relevance is quite apparent. Furthermore, it is depicted both in the Mexican national seal and flag where it represents the very characteristic feature of Mexican culture and society. *Opuntia* spp. are distributed throughout the American continent and Mexico is considered a center of diversity as these species are well adapted to the arid and semiarid conditions of Mexico. Here we summarize and discuss briefly the most important insect pest species and one snail species which currently are considered as serious pests of cultivated *Opuntia* spp. in Mexico, and, thus require control measures. The control of these pest species is mainly through chemical pesticides and currently at least a dozen types of insecticides are being applied.

Key Words: *Opuntia* spp., insect pests, control, arid zones

## RESUMEN

Las especies de *Opuntia* o nopal mexicano representan uno de los recursos bióticos más importante históricamente. Este ha sido y está siendo usado con muchos propósitos. Algunos de sus usos son: alimento para el hombre, tanto como vegetal como su fruto (tuna), forraje para animales, como materia prima para la preparación de bebidas alcohólicas, como edulcorante, para la construcción de cercas, medicinal contra diabetes, etc. Su valor cultural y natural se ha reflejado en pinturas, códigos indígenas ancestrales y escrituras antiguas. Más aún, forma parte del símbolo nacional de México. Las especies de *Opuntia* están distribuidas a través del continente Americano y México es considerado el centro de origen y diversidad de estas especies. Además de que están bien adaptadas a condiciones áridas y semiáridas de México. Este trabajo resume y discute de manera breve las especies de insecto plaga más importantes y una especie de caracol, el cual es considerado en la actualidad como la plaga más seria de *Opuntia* spp en México. El control de estas plagas está basado principalmente en Control Químico y al menos una docena de insecticidas se aplican actualmente para controlar estas plagas.

Sixty percent of the total area ( $2 \times 10^6$  km<sup>2</sup>) of Mexico is arid. There are over 200 species of *Opuntia* or nopal worldwide, of which more than 50% of the species are found in Mexico. Nopal grows naturally in an area of over 3 million ha in the country. Furthermore, there are about 250,000 ha in which nopal is grown commercially. In Mexico, nopal is used for various purposes, such as a source of energy, for production of cosmetics, dyes, and pharmaceuticals, for human consumption as both fruit and vegetable, and as livestock forage (Flores & Aranda 1997). There are over 240 food recipes of nopal in the country (Flores 1992, Flores et al. 1996).

Nopal grows best under the following conditions; a temperature range of 11.2-27.1°C, an annual rainfall of 116.7-1,805 mm, and a range of altitude of 0-2,675 m. In Mexico, there are at least 11 insect pest species and one species of snail which attack and cause damage to nopal. To con-

trol these pests in Mexico, traditionally over a dozen types of chemical insecticides have been applied (Sanchez & Alaniz 1997).

One of the main activities of commercial growers of prickly pear cacti (*Opuntia* spp.) in Mexico is the identification and control of insect pests. This paper provides a brief discussion of the main insect pests, and at the end of each section, where available, is a list of insecticides used against the pest. The insect common names given are those used in Mexico.

*Opuntia* Borer, *Cactophagus* (= *Metamasius*) *spinolae* Gyllenhal (Coleoptera: Curculionidae)

This is one the most serious pests of "nopal manso" or *Opuntia megacantha* Salm-Dyck in the states of Hidalgo, San Luis Potosi, Tlaxcala, Mexico, and Jalisco. Adults, which appear in May, are 2.3-2.6 cm in length, black with red markings on

the anterior section of the prothorax and have two orange bands on the elytra. They feed on the margins of the young pads and lay their eggs inside these pads, where larvae feed. The 2.5-3.1 cm long white larvae form galleries inside the pads. A brownish-yellow (eventually turning black) sticky secretion is produced by infested stems and accumulates at the base of the damaged pads. The larvae hibernate inside the pads. This pest reduces plant production and in some cases destroys the plant (Granados & Castañeda 1991).

Cultural control measures include the extraction of the larvae from the damaged areas by means of horticultural knives. Also the slow-moving adults are hand removed from the surface of the pads from May through September. Chemical insecticides used to control this pest include azinphosmethyl, endosulfan, malathion, and folidol.

Spine Borer, *Cylindrocopturus biradiatus* Champion  
(Coleoptera: Curculionidae)

The adult stage appears in April and May. It is 4-4.5 mm long and has a dark dorsal mark in the form of a cross. It oviposits at the bases of the spines; larvae occur in June and July. Larval feeding produces dry sections of the plant. This is not considered a serious pest of the plant. A cultural method of control consists of the removal of the damaged plants. Folidol is applied to control this pest in April and May.

Gray Chinch Bug, *Chelinidea tabulatus* Burmeister  
(Hemiptera: Coreidae)

This pest appears most abundantly during warm months. Eggs are laid in clusters of 5-15 on both the pads and spines. There are five nymphal instars. Both nymphs and adults suck the plant sap forming clear circular markings in damaged areas. Adults reproduce all year, achieving the highest densities during July and August; the reproduction rate decreases during the winter months. Both immature and adult stages are gregarious, however the tendency to aggregate in clumps is more noticeable in nymphs. The gray chinch bug is basically a pest of *Opuntia megacantha*. This pest prefers mainly young plants. This insect is controlled by chemical insecticides including malathion, ethyl parathion, methyl parathion, and endrin.

Red Chinch Bug, *Hesperolabops gelastops* Kirkaldy  
(Hemiptera: Miridae)

These insects hibernate as eggs inside the pads, leaving the damaged parts as nymphs in the spring. Young nymphs are red colored throughout including head and legs, however, as they grow the color of the legs turn black. Both adults (6.5-7 mm long) and nymphs suck plant

juice. Damaged areas are characterized by dried sections which eventually turn into invaginated superficial furrows (Garcia, 1965). During the winter, mated females lay their eggs inside the pads and then die. Insecticides used to control this pest include malathion, ethyl parathion, methyl parathion, and endrin.

Zebra Worm, *Olycella nephelepasa* (Dyar)  
(Lepidoptera: Pyralidae)

This is a more polyphagous pest species attacking the following opuntias: *O. megacantha*, *O. tomentosa* Salm-Dyck, *O. ficus-indica* (L.) Miller, *O. robusta* Wendland, *O. streptacantha* Lemaire, and *O. stenopetala* Engelmann. During January, young plants and pads are attacked by many colonies of white first instar larvae which in the next instar turn black with 12 well defined orange bands (hence the name zebra worm). Larvae are 4.5-6.9 mm long. They live entirely inside the plant and produce a bulged section that appears on the exterior part of the affected area of the stem. Larvae finally leave the plant and pupate in the soil. Opaque moths (0.5-5.2 cm long) eventually emerge. There are two generations per year, the first being the more damaging because of the absence of natural enemies.

Because this species causes damage in localized areas, a cultural control method consists of the destruction of the damaged plants. There are two species of parasitoids that attack the zebra worm in the Valley of Mexico. One is a tachinid fly (*Phorocera texana* Aldrich and Webber) (Diptera) that attacks the mature larvae and kills them after they transform to pupae. The other parasitoid is a braconid wasp (*Apanteles mimoristae* Muesebeck) (Hymenoptera) that attacks the younger larvae. Chemical insecticides, which are applied against this species during January, include carbaryl and endrin.

White Grub, *Laniifera cyclades* Druce  
(Lepidoptera: Pyralidae)

*Opuntia megacantha* is the most susceptible host for this pest. However, *Laniifera* is also known to attack other species such as *O. streptacantha* and *O. tomentosa*. This pest is usually found in the high plains states of Mexico. Eggs are deposited in groups of 30-50 in a regular or uniform pattern on the pads. Hatchling larvae live under the cover of a profuse web. These larvae gradually penetrate the internal tissue of the pads reaching the central axis and thus causing the collapse of the plant or inhibiting the production of new growth. Well developed larvae are 4.5-5.5 cm long. Larvae form cocoons inside the plant where they molt to the pupal stage of 2 cm length. The yellow moth emerges during July-October. Larvae throw their feces out of the openings that

they make in the pads and indeed, the opuntia growers use these signs of the feces or "rice mounds" to find and mechanically destroy the larvae. The same chemical materials which are applied against the opuntia borer are also used for white grub (Vazquez & Medina 1981).

Wireworms, *Diabrotica* sp. (Coleoptera: Chrysomelidae)

Females lay hundreds of eggs in the soil and near the roots of the plant from which 1.5-2 cm long bright yellow larvae hatch. The larval stage lasts three years, the larvae changing to pupae during the summer of the third year in the soil. The damage is to the roots and other subterranean parts of the plant and is manifested as the yellowing of the stems and reduction in vigor of the entire plant. The following insecticides are applied against this pest: carbofuran, chlordane, diazinon, fonofos, heptachlor, and trichlorfon.

Blind June Beetle, *Phyllophaga* sp. (Coleoptera: Scarabaeidae)

This is one of the most serious insect pests of opuntias in Mexico. The insects hibernate inside the soil as either larvae or adult females. During the spring, the females leave the soil at night and fly to nearby trees where they feed on the foliage. Mating occurs also during the night. The adults return to the soil with the onset of the dawn where they lay their white colored eggs. Eggs hatch in two to three weeks. The larva is white with a brown head and possesses two rows of short setae underside of the last abdominal segment which differentiate this species from closely related species. The larvae feed on the roots and other subterranean sections of the plant until autumn when they enter into hibernation. Chemical control of this pest is achieved by means of the same compounds applied for wireworm (see above).

Cochineal Insect, *Dactylopius indicus* Green (Homoptera: Dactylopiidae)

Each female lays an average of 150-160 eggs. The eggs almost immediately hatch into nymphs. The damage of this insect is basically localized in the basal portion of the plant where it produces cotton-like masses. Inside each mass is the insect body that, when ruptured, exudes a red or purple colored liquid. The severe attack of this insect can result in fruit fall, general loss of plant vigor and finally the death of the plant. An important natural enemy is *Chilocorus cacti* L. (Coleoptera: Coccinellidae) whose larvae attack the females. This insect is also very renowned for the production of dye and thus has a very high socio-economic and cultural value to the opuntia growers in Mexico. Traditionally the following insecticides are ap-

plied when cochineal is deemed a pest: malathion, methyl parathion, and trichlorfon.

Opuntia Thrips, *Sericothrips* (= *Neohydatothrips*) *opuntiae* Hood (Thysanoptera: Thripidae)

Adults are 1 mm long and yellow or pale colored. Development time from egg to adult takes about 20-30 days. Warm and dry conditions favor development and reproduction. This insect sucks the plant sap. The attacked portions of the plant are covered by yellowish or gray-whitish spots which in turn are covered by dark colored droplets of insect feces which later turn dry. Feeding can cause great losses of fruit and vegetative parts of the plant. This insect is also the vector of a viral pathogen of the plant. The following insecticides are used for thrips control: malathion, methyl parathion, heptachlor.

*Moneilema variolaris* Thompson (Coleoptera: Cerambycidae)

The larvae bore through the plant stems which results in loss of vigor and occasionally can cause the death of the plant.

Brown Garden Snail, *Cryptomphalus* (= *Helix*) *aspersus* Müller (Stylommatophora: Helicidae)

This organism feeds on the surface of the pads and thus inhibits the chlorophyll synthesis which in turn causes the reduction of new growth.

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