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## Red Gold - Raising Cochineal in Oaxaca

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**RED GOLD – RAISING COCHINEAL IN OAXACA**

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Cochineal is probably the first dye that comes to mind whenever we think of Mexican natural dyes. (Fig. 1) Although Oaxaca exported this dye in large amounts during most of the Colonial period, its production has significantly decreased. Fortunately, there still are some people that want to preserve the tradition of the “cultivation” of cochineal. This paper will focus on the similarities and differences that exist between the cultivation process of cochineal in Colonial and contemporary Oaxaca. Coming from the *Museo Textil de Oaxaca* (the Textile Museum of Oaxaca), we feel like we are paying tribute by means of this paper to all the relentless souls that have been preserving this tradition.



*Figure 1. Wool samples dyed with cochineal with different mordents and pH. Image by Eric Chávez.*

It was a task in itself finding contemporary “cochineal farmers”. We already knew of an important center: *Tlapanochestli* (meaning “colours of the cochineal”), located in Santa María Coyotepec, 10 km away from the city of Oaxaca. This place opened fairly recently, in 1991, under the direction of Ignacio del Río. Prior to the establishment of this center, there was only one hint as to where to obtain cochineal in Oaxaca, in the area of Ejutla, southern Oaxaca. (Unfortunately, so far we have not been able to contact this person). Since *Tlapanochestli* has been up and running, its team has been offering several workshops and training courses for the cultivation process. The other three places that now grow cochineal in Oaxaca, and that we were able to find, learned the process from Manuel Loera, current manager of *Tlapanochestli*. These other producers are located in San Sebastián Etla and in Teotitlán del Valle. We found a fifth producer in the city of Oaxaca, but unfortunately, we were not able to obtain any information from them.

## Methodology

A series of questions were prepared to obtain information from the producers and to compare the cultivation processes from each center in a more direct way. The questionnaire was divided in four different areas:

1. Historical aspects of each center and contact information - opening date, location, organizational chart, activities developed by the center, and financial sustainability.
2. Information on the *nopal* (cactus) used at each centre - provenance, species, and life cycle.
3. Information on the cochineal located at each centre - original provenance, type of cultivated cochineal, and typical size of the cochineal insect produced in each center.
4. Cultivation process.- Infestation and harvesting processes at each cultivation center, cochineal's reproduction method, cochineal's care and protection from the environment and predators, drying process(es), and storage method(s).

The obtained information will be presented in the next pages. More detailed information is available upon request.

## Colonial vs. Contemporary Oaxaca

Oaxaca's textile tradition is known for maintaining many of its original techniques. The cultivation of cochineal is part of these efforts of preservation. We will present the different stages and factors that are involved in the cultivation process that we found in 2010 and compare this in a parallel way to the information we have obtained from records from the Colonial period.<sup>1</sup>

### 1. Choosing the right nopal

The cochineal needs the pads of the nopal to grow. There are two main nopales that are used for this task. The first one is native to Oaxaca and is called "Nopal de San Gabriel" (*Opuntia tomentosa* var. *hernandezii*), which was illustrated and described in the 16<sup>th</sup> c. by Francisco Hernández and by Thierry de Menonville in the 18<sup>th</sup> c. The second type is the "Nopal de Castilla" (*Opuntia ficus-indica*), which is mentioned since the earliest records and all through the 19<sup>th</sup> century, for example, by José Murguía in 1821, in Oaxaca. This nopal is only known by cultivation which could imply that it was domesticated in Pre-Columbian times. It does not have any thorns and has a thin cuticle, which represents an advantage for the cochineal insects, since they find it easier to attach themselves to the pads. Also, the absence of thorns makes the "harvesting" process easier.

Even though it has been noticed that cochineal grows better on the *nopal de San Gabriel*, its structure makes it difficult to maintain. An image provided by Gonzalo Gómez de Cervantes, in 1599, shows that this nopal is being supported by wooden sticks, since its branches, in addition to the vertical growth of the plant, spread in an almost horizontal way. This characteristic, plus the fact that the *nopal de Castilla* needs less water to survive, might be the reason why the four cochineal producers that we found in Oaxaca prefer to use this species.

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<sup>1</sup> We compared the information we obtained through the interviews with the following references (see the complete reference at the end of this article): Alzate (1831), Dahlgren (1963), Gómez de Cervantes (1944), Menonville (2005), Río y Dueñas (2006), Sarabia (1994), and Trábulse (1985).

## 2. Infestation

Documents from the 18<sup>th</sup> and 19<sup>th</sup> centuries tell us that the nopales require from one to three years of growth before they were able to receive the cochineal on their pads, i.e. accept an infestation. This time period is mandatory so that the nopal has enough nutrients for the cochineal. This process began by putting the cochineals that were about to lay eggs into nests made of *paxtle* (Spanish moss – *Tillandsia usneoides*). A kind of pouch made of the coconut palm tree is also mentioned to be used as nest material in 1777. All these nests were put in between the cactus pads and/or held in place with a thorn to prevent them from falling down to the ground. Once the new cochineals were born, they slid out of the nests through tiny openings and found a spot to attach themselves onto the pads.

The infestation process that exists today in Oaxaca is quite similar. *Tlapanochestli* and *Don Benito Hernández* from Teotitlán del Valle both use nests made of palm. *Don Benito* attaches this nest to the pads with a thorn, while *Tlapanochestli* uses a hook of wire to hang the nest over the pads. However, both of them use a third element for their nests: nylon net, and sometimes, newspaper. (Fig. 2) They use these materials to fill in the nests in order to prevent the cochineal from falling out. The other two centers that collaborated with us, *Biidaiüü* in Teotitlán del Valle and Mrs. Teresa Carrasco in Santiago Etla, prefer to only use small bags made from nylon net. Both of them stick the nests with a wire to the nopales. A member of the *Biidaiüü* organisation, Fausto Contreras, prefers not to pierce the pads; instead, he places the pads flat on the floor and leaves the net bags lying on top. The only advantage that he has found to this method is that no cochineal is lost in the process, since none of them fall down to the ground.



**Figure 2.** Nests made of palm with newspaper filling and hanging on a cactus pad with a metallic wire at *Tlapanochestli*. Image by Eric Chávez.

In 1759, Francisco Ibáñez de Corvera wrote that people who raised cochineal kept the infested pads within their own houses for 20 or 30 days, before taking them outside and hanging them up from the straw-made ceiling. This partially corresponds to what *Biidaiüü*, *Don Benito*, and Mrs. Carrasco do.

(Fig. 3) One of the differences is that all three of them hang the pads up before the infestation. It is interesting to stress the process followed by *Biidaiüü* for hanging up the pads. They first cut the cactus pads and let them heal for one or two days before washing them with water and a soft brush. Once they are dry, they pierce the pads at the bottom with a wooden stick. This stick is previously covered in lime to cauterize the wound inflicted on the pads. They told us that they avoid using iron tools to pierce the pads, for this could promote a rotting process.



**Figure 3, left.** Cactus pads hanging at Benito Hernández's house in Teotitlán del Valle. Image by Eric Chávez.  
**Figure 4, right.** "Pad beds" for infestation at Tlapanochestli. Image by Eric Chávez.

It was also interesting to note that none of these three contemporary cochineal producers follow the method used in *Tlapanochestli*, given the fact that they learned the cultivation process there. Manuel Loera implemented a different system in 1999, which consisted of "pad beds". (Fig. 4) These beds are made of a wooden base of 10 cm high, filled with 5 cm of sand (to retain moisture) and 5 cm of fertilizer. The pads are then put into these beds before the infestation process begins. This system was proposed by Manuel to save both space and labour force. Even though Manuel created this in 1999, we found a note by Joaquín Basco that says that people kept the infested pads inside their houses, supported in between wooden sticks. This note was written in 1776 and although we do not know how the pads were maintained, it suggests that a system similar to the one used in *Tlapanochestli* might have been used a few hundred years ago.

Is cochineal raised directly on the planted nopales? It is true that there are no explicit descriptions of this situation, probably because the narrators assumed that the *nopalera* (that is, the *nopal* plantation) was obviously needed. However, we do find images from the 16<sup>th</sup>, 17<sup>th</sup>, and 18<sup>th</sup> centuries that depict this type of cultivation process. Out of the four contemporary producers in Oaxaca, only one uses this method: *Tlapanochestli*.

### 3. Taking care of the growing cochineal

Cochineal is quite vulnerable to climate conditions. Too much rain or fierce winds can knock the cochineal off the pads. On the other hand, vapour emanating from the ground after a very light rain might suffocate the cochineals that are attached to the cactus pads. Documents report that people used *acaguales*, which are dry and light branches, to cover the *nopaleras*. Thierry de Menonville mentioned that during the rainy season, people who were growing cochineal at the moment would cut the pads from the *nopal* and take them inside their houses. He also mentions that some others used *petates* (mats made of palm) to cover the *nopales*. He even experimented with a structure made of wood and metal sheets covered with tarred cloth to protect the plantation during the rainy season. As far as his records show, he succeeded in this enterprise, but he died before he was able to see if his idea worked on a larger scale.

Since *Tlapanochestli* is the only producer that grows cochineal directly on the *nopaleras*, we only have one comparison to this information regarding contemporary Oaxaca. Manuel Loera covers the *nopaleras* with mesh and plastic during the growing stages of the cochineal (which usually takes about three months). After the cochineal is “harvested”, he removes the plastic covers and leaves the *nopaleras* uncovered for at least three months so that the *nopales* can recover from the lack of sunlight that they undergo during the cultivation process. One more note on the *nopales*: Manuel washes them with water and soft brooms, so they are clean before the next infestation. Thierry de Menonville wrote that the pads were cleaned after the harvest stage, using a wet cloth for this process.

Cochineal is also vulnerable to numerous predators. Colonial documents reveal many of them and we find the following to be among the most important ones - different kind of worms; the *telero* (*Laetillia coccidivora*), the *tambor* (*Bacca* spp.), the *aguja* (*Symphorobius* spp.); the ladybug (called *xicarita*) (*Hyperaspis* spp. and *Chilocorus* spp.); different kind of birds, including the woodpecker, and mice. Wild cochineal is also considered a plague, for it threatens the growing process of the *grana fina* (fine cochineal). All these predators feed on the cochineal and some control measures from the past included the use of eagles and hawks to keep other birds at a distance, as well as people to supervise that there were no worms growing close to the *nopaleras*. Whenever these worms were found, people would hand-pick them to get rid of them, one by one.

Things have not changed much throughout the centuries. All the producers that we interviewed still face the same predators and they cannot do much more about it, except continue to hand-pick worms and ladybugs to get rid of them. No chemical products can be used, for this would also affect the cochineal. Mrs. Carrasco is quite strict in maintaining a clean, closed-yet-ventilated area where she keeps the infested pads, in order to prevent any plagues from attacking the cochineal. Thierry de Menonville, who visited Oaxaca in 1777, would have most greatly agreed with her, since he emphasised the cleanliness of the area where the cochineal was grown in order to avoid plagues. It is also interesting to notice the stress that the colonial documents show regarding mice as a difficult plague to eradicate. *Tlapanochestli* has faced the exact same problem, with mice being a tireless and unbeatable enemy.

#### 4. Harvest time

Once the cochineals are ready to lay eggs, we come full circle. Colonial and early 19<sup>th</sup> c. documents mention that once the cochineals were “mature”, people detached them from the cactus pads with brushes made out of deer’s tail-hair, *maguey* fibres, knife-blades, or wooden sticks. Narrators stressed the caution that was needed in this step to avoid any damage to the cochineal. De Menonville mentioned that only the larger cochineals were used for the next infestation, while the rest of them were dried to be sold. These larger cochineals were put into several nests which were attached onto new pads so the new cochineal could develop on top of fresh and succulent nopales. After laying the eggs, the cochineals would die inside the nests and be ready for the drying process.

There are several new ways to detach the cochineals from the nopales in contemporary Oaxaca. Mrs. Carrasco and *don Benito* both use soft brushes to detach the cochineals, while one member of the *Biidaüü* organisation uses a wooden stick. The other members employ the same method used in *Tlapanochestli*: a piece of a plastic bottle, flexible enough to be compressed against the pad so that it can gently detach the cochineals.

We found that Mrs. Carrasco and *don Benito* categorise the cochineals at this point. Both of them sift the harvested cochineals. Mrs. Carrasco repeats this process three times, and, just as *don Benito*, she uses the biggest cochineals for the next infestation. The cochineals that have not laid eggs are dried before being stored in a freezer and then sold as *grana plateada* (“silver cochineal”). Manuel Loera explained that he does not produce this *grana plateada* because he prefers to use all of the “harvested” cochineal for the next infestation. He also explained that the quality of the dyestuff is not compromised by the size or the

dried insect's colour. The only difference is that the *grana negra* ("black cochineal" – the one that is collected after it has laid eggs) contains less colour, which means that a dyer would need to use more of this type of cochineal to obtain the same shade of red as the one obtained with the "silver cochineal". Therefore, "silver cochineal" is sold at a higher price. The other producers that we interviewed did not mention the existence of the silver cochineal.

## 5. Boiling vs. Drying

Colonial documents describe different drying methods for the cochineal. José Manuel de Alzate mentioned in 1776 that cochineal was poured into "almost boiling water" and left there for three or four minutes; afterwards, it was drained and spread over a *petate* under direct sunlight and left to dry. Once dry, people would remove the soft white coat that covers the cochineal, as well as residues of worms, if there were any. He also described that cochineals might be put into an oven or a *temazcal* (a steam room) so they are suffocated by heat. However, he mentioned that this was an uncommon practice. Fray Joaquín Vasco described the same methods, but went a little bit further when explaining the suffocation methods. The first of these was to put the cochineal inside an enclosed *tanate* (a palm basket) over a pot with hot water, so that the steam would suffocate the insects. The second method consisted of damping the cochineal slightly before putting them in a *tanate* and then into a warm oven until suffocated. The same procedure was done using a *temazcal*. These methods continued to be used even in the early 19<sup>th</sup> century.

These texts mention another method: spreading the cochineal under direct sunlight until they were completely dry. Alzate stressed that this method was used by merchants and not by producers, since it was a time consuming task and the cochineal would significantly decrease in size. However, we did find that our contemporary cochineal producers prefer this method. Except for *don Benito*, who follows the boiling-in-water process for five minutes, the other three producers put the cochineal on trays and then leave them in the sunlight for three or four days until they are completely dry. *Biidaiüü* follows a previous step before exposing the cochineal to sunlight, which is to put the cochineal into plastic bags and close them tightly to remove as much oxygen as possible. They keep these bags in a refrigerator for a day and finally spread the cochineals onto trays for the drying process. They once tried to speed up the drying process by heating the cochineal on a *comal* (a plate made of clay used to heat food), but they did not get a good result since the cochineal started to burn and the smell, as they describe it, was not very pleasant. Both Alzate and de Menonville, in the 18<sup>th</sup> c., mentioned that the option of using the *comal* was quite risky, for it could burn the insects.

## 6. Dyeing tests

Cochineal was gathered from each producing centre to dye wool samples. These were mordanted with 15% alum in purified water (weight/volume) and then dyed with powdered cochineal at 20% weight of dyestuff to the weight of fibre. For the dyeing tests all variables in the process were controlled by using the same quality of wool, water pH, and dyeing kettles. The temperature of the dyebath was of 90°C and it lasted for 60 minutes. Afterwards, the samples were subjected to 90 days of constant light exposure at 5000 lux. Samples do show differences in both hue and saturation, as well as in light fastness. However, we think that further studies are required before making any final statement in this regard and before we suggest ways to improve production processes. For example, we will need to gather and test "silver cochineal" from each producing center to compare them on equal terms and relate the results, if applicable, to the size and age of the cactus and the land where it grows. We also need to test some cochineal boiled from each producing center to know if this has a repercussion in the colour's light fastness and/or saturation. This would be an interesting follow-up to this research project in order to suggest techniques that could improve the quality of the dye.

## Conclusions

Raising cochineal in the 21<sup>st</sup> c. is quite an achievement and contemporary producers deserve to be acknowledged. They are interested in keeping the tradition alive and *Tlapanochestli* has supported several projects both in Oaxaca and in other states in Mexico. Even after centuries have passed, the general guidelines for the “cultivation” of cochineal are still the same. Although there are new materials involved in the process, such as the nylon net, plastic covers, metallic mesh, plastic bottles, refrigerators, and so on, this is to be expected, since we all use what is available to us in our own time. All of the producers we interviewed have mastered the cultivation process in their own way. Although they are still facing some of the same problems that people in the 16<sup>th</sup> c. faced, such as fighting the abundance of predators that consume the native insect in southern Mexico, contemporary producers are facing new challenges. Some examples include the lack of space to grow the *nopaleras*, the scarcity of water, and the need of a constant and consistent local market to sell the cochineal. However, some of these challenges, like the price increase of cochineal, have prompted some groups to grow it. This was *Biidaiüü*'s experience. He only began cultivation after a significant price increase in 1996/97. Some will expand their production in 2011 due to the most recent increase.

This research has also allowed us to develop an updated database of local producers, which will be disseminated among the weavers and artists we work with in Oaxaca, as a way to encourage these few producers to continue harvesting cochineal in the future. This database will also be available on the Textile Museum of Oaxaca's website next year ([www.museotextildeoaxaca.org.mx](http://www.museotextildeoaxaca.org.mx)).

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