

### Nocheztli 25.04.08

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#### Introducción

Estimados amigos, con gusto estructuramos esta edición del informativo electrónico Nocheztli, en especial porque ya se tiene en puerta este año el próximo congreso internacional de grana cochinilla y colorantes naturales, como lo pueden revisar en la sección de congresos.

Ya entrados en el tema de la grana cochinilla, les comento que la producción de este insecto del carmín sigue en constante aumento, nuevos países se enmarcan como productores, entre ellos se destacan Etiopia y China, que este 2008 deben de estar produciendo de manera conjunta alrededor de 25 ton. Actualmente se estima que la producción mundial del insecto carmín ya rebasa las 2000 ton anuales, todo un record, Perú sigue siendo el puntero internacional. Otros países como Bolivia y Ecuador siguen en la producción del insecto, aunque no se conocen cifras concretas. En México la producción es inconstante, y en Chile tiende a la baja, sobre todo por los precios internacionales tan deprimidos. Justamente sobre precios y cotizaciones, Antonio Bustamante, en un comentario en <u>www.facebook.com</u>, indica que los precios se perfilan con base en el contenido de ácido carmínico, de esta manera el kg de grana seca está en \$0.53 dólares por cada punto porcentual del pigmento; de la misma manera los carmines se cotizan en \$0.98 dólares por grado porcentual de ácido carmínico.

Para contactar a Bustamante visiten su sitio en la red: <u>www.foodsafe.cl</u>, el cual tiene mucha información de interés sobre el tema de la grana cochinilla en Etiopia y el mundo.



Por otro lado, es mi deber comunicar que los apoyos de la FAO hacia las actividades del Grupo de Trabajo en Cochinilla se ven más lejanos que nunca, recientemente Sohn Keewook de la AGST-FAO (quien quedó en lugar de Lea HoZoo), me comentó lo que a continuación pongo de manera textual: "When Dr. Lea was working in FAO, there was a small fund he could manage, and the same kind of fund I am requesting has not been approved and when to be approved. That's why I cannot give you the confirmation on supporting cochineal activities." Por tal motivo debemos de esperar que KeeWook nos de buenas noticias, así como buscar otras alternativas para las diversas propuestas que deseamos realizar en torno a la grana cochinilla. Quien desee contactar a KeeWook, sus datos son los siguientes:

KeeWook Sohn

Technical Officer (Sericulture & Beneficial Insects) Agricultural and Food Engineering Technologies Service Rural Infrastructure and Agro-Industries Division (AGST) FAO-Rome. Viale delle Terme de Caracalla - 00100 Rome Tel: (39) 06-5705-2007, E-mail: <u>keewook.sohn@fao.org</u>

Es conveniente recordarles que debemos comunicar lo que estamos haciendo dentro del GTC, ya que a veces nos aislamos y algunos asuntos que nos tienen detenidos, pueden salir más fácilmente si los compartimos. Ya saben, cualquier comentario que deseen participar al GTC, debe enviarse al correo <u>cochinilla@cucba.udg.mx</u> o de forma directa a <u>portillo@cencar.udg.mx</u>. Recuerden que sus contribuciones son los elementos base de la integración del informativo electrónico Nocheztli.

linoto Pontelle

Coordinador Internacional del Grupo de Trabajo en Cochinilla



### Contribuciones

Como ya es conocido por ustedes, en esta sección se pueden incluir avances de investigaciones, anteproyectos, notas breves, resúmenes de trabajos y conferencias, comentarios, anuncios y cualquier otro material informativo que sea de interés para los graneros del mundo. Envíen sus contribuciones (de preferencia con figuras) en adjunto en correo electrónico a portillo@cencar.udg.mx.

La aportación que presenta el presente Nocheztli está a cargo de Antonio Bustamante, quien nos envía un manual de entrenamiento sobre la producción de grana cochinilla para la región de Etiopia. El material viene en inglés y con una buena cantidad de imágenes que facilitan su lectura:

## **Training Manual**

Prepared for farmers that are dedicated to cochineal rearing in Mehoni – Raya – Maychew lower slopes

**Authors:** José Antonio Bustamante; E-Foodsafe PLC and sponsored by GTZ (German Development Agency)

November 2007



# **Training Manual**

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Questions and Answers



### Chapter 1

#### **Nursery preparation**



The nursery is a special plantation of Beles, where a breeding of a large number of female insects takes place, with cochineal of all ages. At least some of them are giving birth at any given time, and where a rotation of pruned cladodes is programmed to have contact with the infested plants so that crawlers (small cochineal or "chicks") from rooted plants will affix themselves to any nearest cladode, put on purpose in the vicinity, to become infested. Cladodes have to be available all the time, those rooted to the ground cannot be overloaded, so a good provision of cut cladodes has to circulate to places where most births are likely. A fast rotation of cladodes is mandatory, to have them infested once this happens they must be removed and placed in the field. A nursery is essential in any large or small exploitation of cochineal.

**Specifications:** 

Size of nursery ridges, distancing among them.



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Ridges should bring Beles to comfortable height for operators; to have a guarantee that the terrain where the nursery plants are planted is soft, aireated and well drained, and finally, to protect plants against floods.



Ridges should be distanced, from centre to centre, by 3.50 m (see graphic below) they should be 30 cm to 40 cm high; the base should be 1.20 m wide, and the crown 90 cm wide.



Graphic 1 3.50 Mt 3.50 Mt 0.75-0.80 Mt 0.75-0.80 Mt Av. Igualdad No. 92, Guadalajara, Jalisco 44300, México

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Origin, selection and placement of suitable cladodes



Cladodes, as depicted in figure 4, should be placed transverse to the direction of the ridge. When placed, every four cladodes (two depth, four wide) an infested cladode must be put at center, to be sharing space with four cladodes in the vicinity (see graphic 1 and figure 4).



The cladodes should be cut when they are mature, with the nursery as destination; Maturing means that they are able to produce buds of fruit or of other cladodes. Their side surface should be mostly flat, without marked elevations where thorns are placed. The cutting should include a small piece from the cladode below.





When the nursery ridge is planted and ready, the top part of it should be "roofed" with more cladodes, resting on their flat sides, roughly on top of every colony of cochineal. That way, if it rains, it will not fall directly over cochineal that is hatching and reproducing, with the danger of washing it down.

The best environment for cochineal is a shaded young cladode that is not too cool; rather more to the warm side. It has been demonstrated that cochineal will cease its movements once that temperature falls below 18°C. This means that during the night and in early morning, the insects will be awaiting for the day to get warmer. It is important that they move, to choose a location, to shed skin, to reproduce, etc.

However, above 34°C they will dehydrate much too fast for good mobility and widespread population in all areas. They will concentrate and populate the small cooler areas of the plant. This has to be avoided, to populate the host plant evenly and increase yields.

Desired appearance and seasonal considerations; weed control.

The ridges formation is shown in figure 5; selecting four cladodes on the ridge, an infested one is inserted between them. This operation is repeated throughout the nursery.

Cochineal will pass from the infested cladode to all four corners surrounding it and therefore all empty cladodes in the nursery will have a chance of receiving the migration of crawlers from the direct vicinity of an infested cladode.

Once cochineal fully occupies the nursery, then the rotation of cladodes placed to roof the infested nursery, should be substituted with fresh ones as often as possible, so that the production of insects is more widespread and does not linger in the nursery, overpopulating it.





A reasonable period for cladodes used for infestation, to remain in the nursery, is from 7 to 10 d. In the beginning, the infestation can take place during all year, until the field has full coverage of infested cladodes strategically placed. Once the field has full cover, then we must introduce some seasonal division of labor, to best use manpower resources and closer to ideal conditions for insect growth and harvest.

(See chapter about "Timing of insect harvests and the logic behind it")

Rotation of top infested cladodes as vectors for insect propagation.

Let's not forget that cladodes recently infested will need some time before they themselves are ready to produce infesting new crawlers. As a rough basis of estimation, this should happen every 90 d. Therefore, this anticipation should be factored in, when calculating reproduction rates and harvest estimations. But since we are writing about the role of the Nursery, which is already overloaded with insects, reaching to a point in the verge of plant damage and saturation, it cannot be permitted to continue without cladodes rotation. Once the cladodes in the "roof" become somewhat shriveled and dry, they will lose desirability for cochineal, so the insect will go down and to the sides, instead of up, damaging the prospects of good propagation. It is in the interest of the farmer not to overload the Nursery. This is achieved with a plentiful rotation of fresh healthy recently matured cladodes.





Placement of vectors in the field. Density and location.

The cladodes that have been infested in the nursery should be quickly transferred to the field, where they should be placed, facing down, to avoid direct sunlight or exposure to rain. When placing them on each side of the passage, the operator should select the vicinity of green fresh cladodes, where cochineal chicks will like to settle. (See figure 10).

When the operator is going through a passage, he should place four such infested leaves on each of his sides, for every one meter thet he advances or works. In a particularly fresh plant, with many options of cladodes placement, he can increase such number to eight or twelve infested cladodes. This is only in the case of a very good host plant.







### Chapter 2.

#### **Field site preparation**

The basic criteria of field preparation is one that will permit maximum vegetation (maximum biomass/cladodes above every square meter) while at the same time permitting circulation of operators, for the operations of infesting, harvesting and pruning of plants. When a place has had no preparation, to meet this criteria a lot of work is needed, to plant on the empty spaces, to remove vegetation that is not beles and to replace the resulting space with newly planted beles. In the figure below, one can see the filling of empty spaces with new plants.



Further down in the next figure, what can be observed is the passage cut in the middle of a thick beles vegetation.



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The criteria seen is that the designated surface should be covered with Beles, in an orderly fashion, to allow people to work in between the rows of Beles, with only the minimum necessary space left for that work.

Main crossroads criteria and areas to cover, for a small extension, for instance 1 ha. The only thing required is a road 3 m wide, that surrounds completely the 100 x 100 m of the area. In a big extension, we prefer to have passages no longer than 200 m before they meet a bigger road, to circulate in a small truck or a mule cart that can collect pruned cladodes. Also, 200 m is the preferred length of the crossroads, so 200 x 200 m is the maximum area to be circumvented by wider roads that are capable of taking a mule cart or a small truck.

#### Smaller passages criteria

For 1 ha plot of land, the passages should be at intervals of no more than 3 m, including the width of one passage. See the graphic below, where there is a vegetation block of 2 m and a passage of 1 m.



For a bigger extension, as we said, it should be limited to 200 x 200 m before meeting a cross road. The smaller passages should be straight and no more than one Mt wide and a maximum (as mentioned above) of 200 m long. If we have one passage every 3 m, in 200 m we should count 67 passages.



Handling of old leaves, pruned material and debris.

Clearing passages produces a lot of discarded branches and cladodes. When possible, if they are of the correct size and age, they should be used in the Nursery; but whenever they are too old or too young to be classified as correct for nursery use, they can be piled up in the borders of each plot of land, to defend it from unwanted transit of roaming animals. Eventually, such vegetation can be used for biogas production and energy generation (Figures 13 and 14, Biogas installation in Chile).



Maintenance pruning and continuous replacement of leaves.

Once cochineal establishes itself in the field, a maximum of 3 generations of insect is all that a given cladode can take, before its production of cochineal decreases to almost nothing.



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The plants in the figure above have been allowed to infest excessively, in relation to their age and size and their production will be stopped for 2-3 years, before they manage to recover. Therefore, such very used cladodes have to be pruned in the act of harvesting cochineal, and disposed of, in the same manner described above.

### Chapter 3.

### Field site exploitation

We have covered so far, the Nursery preparation and the field layout and infestation. Those labors lead to the main subject of this book, which is: how and when to program the activities of infestation, maintenance, pruning, harvesting, post harvest handling of insects and disposal of waste.

#### Timing of insect harvests and the logic behind its planning:

Below we can see a table of the meteorological conditions of the Mehoni area, and how are we going to interpret them for the best harmonization with our own procedures:

Table (1)	Minimum	Maximum	Rainfall in mm	Remarks
Month	Temperature	Temperature	Average	
January	13,1	<mark>26,7</mark>	28	Harvest
February	13,8	27,1	26	To accomodate
March	13,1	27,6	86	To accomodate
April	13,3	<mark>28,3</mark>	56	Infest
May	14,5	<mark>28,6</mark>	41	Infest
June	15,7	<mark>29,8</mark>	6	Infest
July	16,2	28,1	64	Infest
August	15,3	<mark>26,4</mark>	110	To accomodate
September	14,7	<mark>26,7</mark>	15	To accomodate
October	14,3	27,0	40	Harvest
November	13,8	27,3	6	Harvest
December	13,0	27,0	7	Harvest
Annual	14,2	27,6	485	



Considerations from the above table:

- Infestation is favored by high temperatures. Apr-May-June-July
- Harvest is favored by good weather (dry or little rain) October-Nov-Dec-Jan
- Infestation can take place year-around, because the Mehoni weather is so mild. But this can be optimized depending on crawler's availability, more abundant in hotter months.
- There is not such flexibility with harvest times, which will depend on maturity of insects, usually coinciding with hottest months
- There is some overlapping of seasons between harvesting and infesting that needs flexibility. Doing them simultaneously in theory, will be the ideal, but it will put an enormous constraint in labor, so in practice this is not possible.
- But if we allow some delay before harvest (typically 30-45 days after appearance of crawlers, no more than 60 days) we will improve quality and have more harvest flexibility.
- This is the reason to insert some months with the description of "to accommodate" so that either infestation or harvest can overspill to adjacent months for technical seasonal reasons that call for accommodation (advances or delays).
- But those 4 months will be used –if harvests and infestations run well- for maintenance work of nurseries and field.

#### Size and appearance of harvested insects.

The following figures 16-20 (starting with the picture of day 5-7, then spaced by age approx 20-23 days from one to the next; the last figure of 90 days of age) depicts the growth of the insect for approximately three months. The proper harvest size is the one of figure 20, when the next generation already born is abundant and very visible, and the adult cochineal is not so white, because it has ceased to shed wax.





Methods of harvest and their seasonality.

Ideally, the most productive harvest is when the operator has a big population of cochineal in every cladode, so that his day of work produces many kilos harvested. When this happens, it also becomes necessary to cut some cladodes, thinning the foliage of beles, to reach further inside. When cutting the cladodes, it is also easier to brush the cochineal from them, instead of scraping it.



But this is not possible in the first generation, so one has to wait for two or sometimes three generations of insects, but –to maintain order, it will be necessary to superficially scrape with a spoon, the adult cochineal closest to the passage way. It will not be possible to go very deep, because of difficulty with thorns and the impossibility to clear accesses with pruning, because this will diminish the area for future cochineal to establish itself. These harvests must be made fast and the operator should scrape only what is fast and easy, otherwise the labor cost becomes too high.

#### Harvesting with spoon

This method is used for plants that have not completed the potential population of cochineal. When this happens, cochineal which is too old or dead should be removed, before it falls from the plant. On no account alive young cochineal is to be harvested during spoon harvest activities. The only cochineal to be collected is the one which is no longer white and has begun hatching, is of full size, or has begun to shrivel. Figure 20 shows the perfect harvesting age and appearance.



Harvesting of pruned cladodes with brush.

Beles, when growing, will gradually invade the passages with cladodes that sometimes will also be too loaded with cochineal. This is something that has to be avoided.



Then, using the clamps and a big, sharp knife, the operator should cut the protruding leaves and brush ALL the cochineal in them (here the method is different to the spoon method, where only selected older cochineal is harvested) (clamps).



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The brushing is done on top of a box, so that the cochineal dislodged from the plant falls into the box with no losses. The operator should exercise judgment when cutting inner leaves. He should of course cut all the protruding ones, regardless of age or cochineal population, but he should also cut particularly loaded with cochineal cladodes, in such a way as to provide access to spoon harvesters (coming behind him) to as much and as far as possible inside the beles vegetation.

#### **Disposal of leaves**

The passage of an operator cutting cladodes to brush them of cochineal generates a lot of biomass. If left to rot in the passages, eventually it is going to block them and prevent access to the beles plantation; therefore, the cladodes cut, should be systematically removed to a fixed location, that during the first years of activity of a farmer, could be to place them around his property, to prevent the passage of roaming animals. Bigger farms, as mentioned will remove them with trucks and mechanized lifting of cargo bays, scattered around the field (see figure below) (removal of spent cladodes)



Handling of harvested cochineal; cleaning and quality checks Cochineal quality is adversely affected when harvested with the wrong timing or bad methods.



Some indicators to be considered:

- Cochineal should be beginning to become grey or black and there should be a next generation of crawlers "chicks" visible in the cladodes harvested.
- When scraping with the spoon, the edge should be very close to the cladode surface, in order to avoid squashing insects, instead of simply dislodging them.
- When using a brush, the same care should be applied, if the brush hairs are too stiff, a lot of damaged insects will result and quality will suffer.
- Harvested cochineal should never be in pots or containers, where more than 4 cm depth of insects piled up. The bottom ones will suffocate and putrefy very rapidly id this is done.
- As soon as the day harvest is turned in, it should be gently separated from earth, clods, debris and wax, to make it clean and ready for its sale. This is done with wind and letting wax and lighter debris to be separated from heavier bodies of cochineal. Much in the same way as wheat is separated from chaff.
- If collection of cochineal is not made on the same day, it should be stored in a fresh and dry place.
- On no account it should be put under the sun or rain, as it will quickly rot and lose much weight and quality.
- No liquid of any kind should contact stored or drying cochineal.

## Chapter 4.

### Tools and equipment required

The field work of rearing the insect cochineal is not very intensive in tools and equipment. There are basic requirements so that the insect is not damaged with handling and also, for the operator to work without being hindered by the thorns from beles. The equipment serves for the purpose of transporting beles and/or cochineal from the field to a different location and its sophistication will depend mainly on the size of the field. (See figure 25, of truck and removable pick up compartments for large cochineal plantations)

## Hand tools

For pruning and selecting cladodes:

- Knife (Serrated, of minimum length of blade 25 cm)
- Clamp (specially made) to grasp cladodes at a distance, without having to touch them.



### For Harvesting cochineal:

- Spoon (big, with angled handle, similar to kitchen spoon)
- Clamp (same as for pruning+selection)
- Brush (soft hair)

### For field preparation:

- Shovel, wide blade (making of ridges)
- Pickaxe (softening soil to be shovelled)



### Equipment:

- Wheel barrow, used for carrying cladodes and harvested cochineal.
- Boxes for cladodes.
- Boxes for cochineal.
- Gloves (thick leather)
- Protecting goggles.
- String for making straight lines of passages and of ridges.

Ali Nefzaoui, coordinador general de la CACTUSNET-FAO, informa que la página web de la red ya está funcionando: <u>www.cactusnet.org</u> en ella se pueden bajar todos los cactusnet newsletters, incluyendo el número 7 dedicado a la grana cochinilla.

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Tlapanochestli presenta su nueva línea de cosméticos Magnu<sup>®</sup>, basados en el pigmento de grana cochinilla, entre los productos que ofrece hay diferentes tonos de lápiz labial y una crema desmanchadora, gracias a la antraquinona que compone al ácido carmínico. Mayores informes en los correos de José Manuel Loera <u>granacolor@prodigy.net.mx</u> y de Ignacio del Río <u>donacarminita@yahoo.com.mx</u>



www.aztecacolor.com

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Congresos



Contacto: Dra. Celina Llanderal Ilcelina@colpos.mx

www.colnat.org



### **English summary**

The first electronic informational Nocheztli for 2008 is full of good news. a) The current world production of cochineal reaches more than 2000 ton per year, a new record. b) Antonio Bustamante shares some information about how prices of dry cochineal and carmine are now seeing based on carminic acid content: \$0.53 and \$0.98 US per point, respectively (www.foodsafe.cl); Antonio also presents a training manual prepared for farmers that are devoted to cochineal rearing in Ethiopia. c) Ali Nefzaoui informs that FAO-CACTUSNET webpage is already working: www.cactusnet.org, this website offers many publications and good information on cactus and cochineal. d) Tlapanochestli presents Magnu®, a brand new cosmetic line elaborated with carmine, more information in www.aztecacolor.com. e) The next international congress on cochineal is coming this year, more info please contact Dra. Celina Llanderal, the web page is www.colnat.org.