8 - 12 OBTAINING TEMPATE (*JATROPHA CURCAS L.*) PLANTS FROM NAKED ROOTS

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Agro-industrial plantations of Tempate have been established in an area of 1000 hectares in Nicaragua. This requires to set up nurseries that are easy to manage and economical.
In Nicaragua it has been recommended to use naked roots in the nurseries, because the management of this system and its use for the establishment of the plantation is cheaper than a nursery using bags. Nurseries using bags cost 11.5 times as much as nurseries based on naked roots, and they require areas three times as large.
The establishment of the nursery starts with the construction of strips of land, sized 10 m, 1.20 m and 0.3 m, for 1000 plants at a distance of 10 x 10 cm. To guarantee the production of healthy plants from the time of sowing on, it is necessary to disinfect and improve the soil using compost, sand and fungicides.
The optimal moment for transplantation is when the plants reach 2 cm of basal diameter and when the color changes from green to grey. The plants are drawn out of the strips of land and the roots are cut in case they are too long and bent or damaged. For the cutting, scissors are used that are disinfected with 5 % formaline or alcohol.
There has to be an equilibrium between the aerial part and the roots system of the plant. Therefore, the lateral leaves are cut, while the apical leaves are not touched. This way we avoid a more intensive transpiration of the plant. The plants are grouped together in bunches of 100 plants, placing around their roots a mixture of water and soil material with fungicides so that it provides protection against drying up and the attack of phytopathogenic organisms.
During the transport of the plants to the plantation areas they are protected against the sun. The naked roots nursery system allows to reduce transportation costs because a large number of plants can be carried on one vehicle. Furthermore, one worker can sow more plants in a given time period.
During planting we take care that the plants remain in an upright position and that the base of the trunk of the plant be at the level of the soil surface.

9 - 12 ARTHROPOD FAUNA ASSOCIATED WITH PHYSIC NUT IN NICARAGUA: A SYNOPSIS OF SPECIES, THEIR BIOLOGY AND PEST STATUS

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The arthropod fauna associated with physic nut *Jatropha curcas* L. (Euphorbiaceae) was collected on smallholder farms and in experimental and commercial plantations throughout the Pacific lowlands of Nicaragua. The species found were classified taxonomically and according to their ecological function in the agroecosystem.
The main economic damage is caused by true bugs, which feed on the fruits. Symptoms are fruit abortion and malformation of seeds. Key pest is *Pachycoris klugii* Burmeister (Heteroptera: Scutelleridae), which is a specialist that passes its entire life cycle on physic nut. Natural enemies of this species are hymenopterous egg parasites, assassin bugs and spiders. Further important species of true bugs are *Acrosternum marginatum* (Pal. de Beau.) (Het.: Pentatomidae), *Chelysomidea variabilis* (Herrich-Schaffer) (Het.: Scutelleridae), *Hyalymenus tarsatus* F. (Het.: Alydidae),

Leptoglossus zonatus (Dallas) (Het.: Coreidae), *Nezara viridula* (L.) (Het.: Pentatomidae) and *Pachycoris torridus* (Scopoli) (Het.: Scutelleridae).
Larvae of the stem borer *Lagocheirus undatus* (Voet) (Coleoptera: Cerambycidae) can cause premature death of physic nut trees. The most frequent leaf eating species is *Pantomorus femoratus* Sharp (Coleoptera: Curculionidae), but various lepidopterous larvae have also been found to feed on the foliage. The longhorn grasshopper *Idiarthron* sp. (Ensifera: Tettigoniidae) and the locust *Schistocerca nitens* (Thunb.) (Caelifera: Acrididae) damage both leaves and fruit.
Most pollinating insects are found in the orders Coleoptera, Heteroptera, Hymenoptera and Lepidoptera. The most frequent predators in physic nut plantations are spiders, wasps, ants, praying mantis, assassin bugs and robber flies.

10 - 13 RUMEN DIGESTION OF RAW, ROASTED AND BOILED SEEDS OF *JATROPHA CURCAS* FROM CHIAPAS, MEXICO

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Two rumen cannulated bulls fed chopped *Pennisetum purpureum* + *Leucaena leucocephala* (75:25) ad libitum were used to assess kinetics of DM, CP and NDF dissapearance of raw (R), boiled (B) (80°C for 120 min) and roasted (RO) (10 min on a hot plate) seeds harvested in Chiapas, Mexico. Seeds coarsely chopped were weighed into nylon bags (53 micron pore size) and incubated in the rumen for 0, 1.5, 3, 6, 9, 12, 18, 24, 36, 48, 72 and 96 h. Bags were dried at 60°C for 48 h and weighed. Kinetics of rumen dissapearance was estimated with the model p = a + b (1-exp-ct). Washing loss for CP (%) was 75.23, 39.84 and 9.84% for R, B and RO respectively. Potential degradation and rate of degradation of CP (%) were 94.9, 80.7 and 85.5% and 0.0816, 0.0992 and 0.0550 (/h) for R, B and RO respectively. Washing loss and potential degradation of DM (%) were 29.6, 21.8 and 18.4% and 67.2, 45.2 and 58.5 for R, B and RO respectively. It can be concluded that solubility of DM is unaffected by heat treatment, however CP solubility is decreased by heat treatment.

11 - 13 PHORBOL ESTERS OF *JATROPHA CURCAS* - BIOLOGICAL ACTIVITIES AND POTENTIAL APPLICATIONS

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Toxicity of *Jatropha curcas* seeds can be caused by several components, including saponins, lectins (curcin), phytates, protease inhibitors, curcalonic acid, and phorbol esters. Phorbol esters which activate the important cellular target protein kinase C (PKC) constitute the most active components which must be removed if oil or seed cake is being used for animal or human nutrition. *Jatropha* oil and phorbol esters exhibit insecticidal and molluscicidal activities over a wide range of organisms, suggesting their potential use in agriculture as biorational pesticides and as mollusc control agents (against water snails which transmit parasites, such as schistosomes or flukes). Phorbol esters are known tumor promotors, but are not mutagenic or carcinogenic themselves. Before using them in agriculture or health control certain precautions and toxicological studies on the fate of phorbol esters in water, soil and plants are necessary to assess the potential environmental risks.

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