# Then development of production facilities for plant molluscicides – drying,grinding and quality assessment

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## Introduction

One of the difficulties faced in managing pest mollusk, *Pomacea* sp, that infest rice plant in Malaysia is the limited choice of effective molluscicides. Those available in the market are of synthetic chemicals that are not only costly but also not so environment friendly. Thus, the main aim of the study was to develop low cost production facilities to produce cheap, effective and environment friendly molluscicide from local plants. The molluscicies may be in the form of dry powder of plant parts. The product can be applied directly into the affected rice field by broad casting. Ultimately this can be adopted by farmers in producing their own pesticide and to use it as part of the integrated ways of controlling this pest. Drying of biological material such as plant parts involved the extraction of moisture from the material by heat and the passage of air mass around it to carry away the release vapor. Under ambient conditions these processes continue until the vapor pressure of the moisture held in the plant equal that in the atmosphere. When drying this material the removal of moisture should be as quickly as possible as too low temperature in the beginning may cause the microorganism to grow before the material is adequately dried. If the temperature is too high while the humidity too low, the material may harden on the surface but not in the inside. This makes it more difficult for the moisture to escape and the material does not dry properly. Too high temperature might also destroy the chemicals contained. This study thus aimed at evaluating the efficiency of solar box in drying the plant material. Another important aspect in the production of molluscicides is the screening method of the product. A standardized method of toxicity assessment is essential so that results can be compared.

## Materials and Methods

1. Drying method. Plant materials were gathered from around the campus. Solar boxes of galvanized iron sheet (GI) of 2.5x2.5x2.5 m were constructed as drying oven and placed in opened area. Box painted black was also used in this study. Leaves in branches were hung in the solar box. Moisture content of leaves was determined before drying and the content were measured daily until the material was adequately dried. Temperature and humidity in solar box were measured hourly. As for comparison, leaves were dried in electric oven at $50^0$ C. Dried leaves were ground into fine powder and kept in airtight container until use.

2. Screening (toxicity) test. The test organism used for the toxicity evaluation was 2 week-old hatchlings of *Pomacea* sp. Clusters of eggs of *Pomacea* collected from the field were spread on nets placed on top of aquariums containing small amount of water. The hatchlings would drop into the water and were given pieces of lettuce for its diet. Ten young snails were placed in small container containing about 250 ml solution of dry powder. Concentrations were based on weight by weight. Water alone was used as control. Experiments were carried out in 5 replicates. Twenty hours after exposure dead snails were removed and live snails were placed in clean water for further observation. The calculation of mortality is taking account on the dead snails in extended observation. The data were treated to Probit Analysis and the toxicity was expressed as $LC_{50}$ 24 h exposure.

## Results and Discussion1

Drying of plant materials. Generally the temperature was almost equal in both unpainted and blackened boxes during the early part of the morning. It was similar to ambient condition. The temperature builds up slowly and by mid day the temperature in the boxes were higher than the ambient temperature. Air temperature in box painted black was about $2^0$C higher than the unpainted box. In turn the temperature in unpainted box was about $1^0$C above the ambient temperature. The temperature in the black box recorded $36^0$ C at about 3.00 pm during the bright non-cast sky. Boxes with plant materials recorded slightly higher humidity ranging from 4 to 8 % RH as compared to ambient condition.

Leaves of yellow flame, *Peltophorum pterocarpum,* for example, took 84 h in 50$^0$C oven to remove about 60 % of its moisture. Unpainted box took 144 h to shed about 53% of its moisture and blackened box took 120 h to remove about 56 % of its moisture content. At this dryness the leaves were ready to be ground into fine powder. The solar boxes required longer period of time to remove moisture from the plant materials as compared to electric oven. The removal was also slightly less than those by electric oven.

2. **Toxicity of plant molluscicides.** The yellow flame powder dried by electric oven was found to be more toxic as compared to those dried in sun boxes. The $LC_{50}$ values for electric oven dry powder, unpainted box and blackened box were 143, 430 and 400 mg/L respectively. *Ixora* sp leaves dried in electric oven gave LC $_{50}$ value of 172 mg/L, while dried in blackened box gave 220 mg/L. *Lantana camara* leaves dried in electric oven was more toxic than those dried in solar box. The $LC_{50}$ values for powder dried in electric oven and solar box were 115 and 650 mg/L respectively. It appeared that the plants dried by solar boxes were less toxic than those dried by electric oven. It was because the powder contained much more moisture and weight more. Therefore it required higher concentration (based on weight of dry powder) to kill the snails.

## Conclusions

As solar boxes took longer time to dry plant materials, some improvement need to be done in order to retain some heat especially during night time or during cast sky. This will continuously remove moisture from the leaves. More studies are also needed to increase temperature in solar boxes so that desired dryness could be achieved faster.

## Benefits from the study

Until the drying efficiency of solar box is much improved the device is not yet ready to be recommended as low cost drier in the production of pant molluscicide

## Patent(s), if applicable:

Nil

## Stage of Commercialization, if applicable:

Nil

## Project Publications in Refereed Journals:

Nil

## Project Publications in Conference Proceedings:

Nil

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