Experimental protocol for the surface treatment of Indian warehouse with a natural insecticide made from azadirachtin for the protection of food from pests

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OBJECTIVES

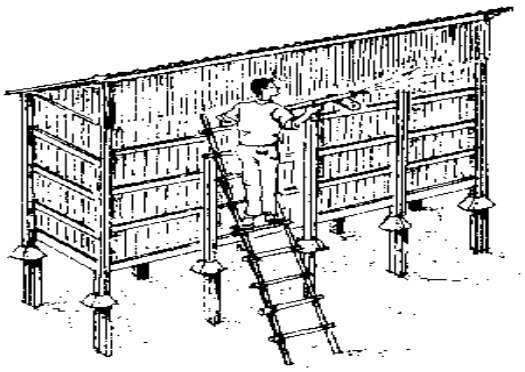
The aim of the study is to evaluate the effectiveness of a natural insecticide made from azadirachtin (commercial name: Oikos) which also acts as repellent and inappetent, applied on the surfaces of rudimentary warehouses for the preservation of grains. This product, registered for the direct treatment of cereals, seems to have a good effect also treating the surfaces of the structures that contain the foodstuffs. The experimental design is planned on the basis of the good results obtained in the italian pilot center "Cerzoo" from which emerged a reduction in the infestation level by 80- 100% in the first three months, and 60-80% in the next three, ensuring an acceptable level of preservation of the product for over six months. The application is carried out in aqueous solution in the form of aerosols using nebulizers with immersion pump. The azadirachtin is the active ingredient extracted from the plant *Azadirachta indica* Juss. (also known as Neem tree / Sabah-bah / Azaddaracht / Margosa according to the local microlanguages) typical of indian areals. The experimentation is carried out in India with the purpose to prevent / reduce infestation of insect pests of the grains stored in warehouses. Normally these structures allow a sufficient level of conservation of the product, probably because of the good isolation of the basal structure from the ground and good air circulation inside of this due to the side walls often realized with *bambuaceae*. However, several insects can penetrate through these walls and they can attack the grains. The simple application of Oikos on all the internal (single treatment) and external surfaces (repeated treatment) will keep the effective air circulationin these structures in addition of its inappetent, repellent and insecticide effect. If this experimental application will be effective, it could prevent or delay the infestation of the product enhancing the traditional indian conservation structures without any chemical direct treatment on food in a perspective of sustainable management.

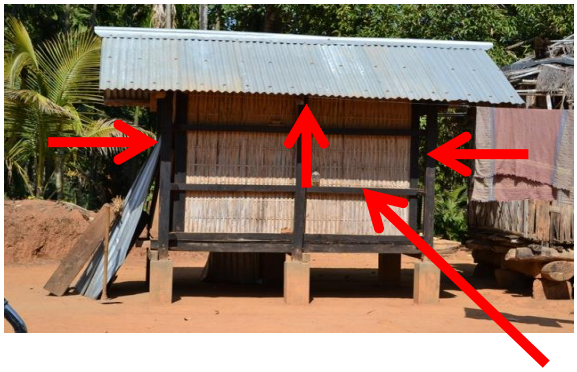
MATERIALS AND METHODS

PREPARATION OF WAREHOUSE BEFORE FILLING WITH CEREALS

- place the warehouse away from trees, in a dry conditions, away from animal, waste and handy for the stages of inspection and control;

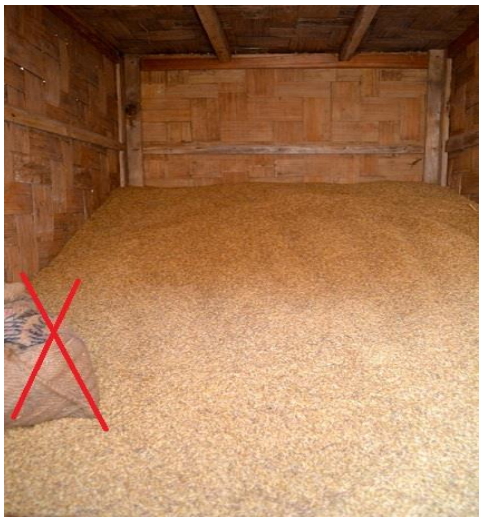
- cleaning of the interior spaces, especially at the corners (basal and apical structure), removing any residue of infested and non-infested grain, dust and cobwebs;
- inspect the warehouse floor, ensuring that it is effectively isolated from the outside;
- close any cracks present on it with a mixture of clay / mud and lime;
- treat (see red arrows) all internal surfaces of each warehouse with the product diluted in water (8% volume / volume) with a dose of 50 mL/m^2 of surface, leaving for last the ceiling, taking care to wet evenly all surface / inner corners and avoiding the “dripping point”;





- wait until the product is completely dried before placing food in the warehouse and do not consume the food in the following 2-3 days;
- realize this kind of application on 3 warehouses of similar dimensions, spaced apart and placed in the same area / village;
- identify the warehouses treated with an acronym (e.g. A1, A2, A3);
- an equal number of warehouses has to be provided without application of the product;
- identify the not treated warehouses with a symbol (e.g. B1, B2, B3);
- different levels of infestations can be compared.

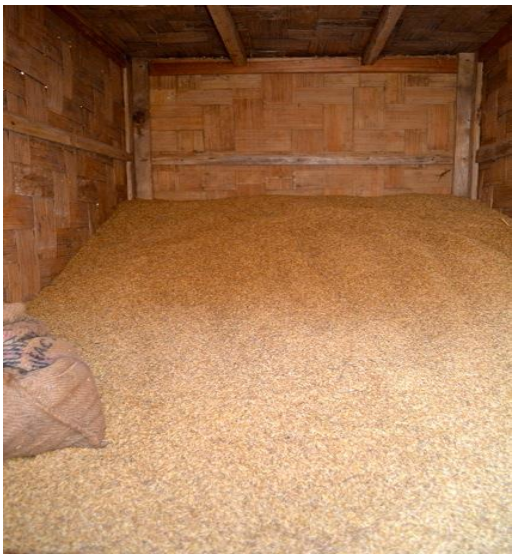
FILLING THE WAREHOUSE WITH GRAIN AFTER THE INITIAL TREATMENT OF SURFACES



- fill the warehouses with the selected crops of the same type and time of collection;
- do not mix old grain with the new one;
- do not mix grain with foreign materials (es. juta bags etc.)
- use a homogeneous product and in sufficient quantities to fill all the selected storehouses;
- use a non-infested product;
- fill in all the warehouse with the same amount of product in the normal manner of management of post-harvest;
- close the warehouse and proceed to treatment with the insecticide diluted in water (8% v/v) with a dose of application of 50 mL/m^2 surface, taking care to treat all external surfaces of warehouse;
- repeat this kind of treatment every 30 days for the whole duration of the experiment, recording dates of the treatments.

SAMPLING AND CONTROL

- at regular time intervals (every 30 days if possible) sample from each warehouse a fixed amount of product. It is recommended to sample approximately 500 g of product through a container/cup in different parts of the pile (surface, center, and in the middle position);



- at the end of each sampling,after closing the warehouse, repeat the treatment of the external surfaces at the same dosage described above;
- carefully observe ALL the sampled material, pouring little by little the sample in a tray at the bottom of a clear and noting the number of observed insects (alive and dead) and the relative date on a note-book;

- duration of test: 180 days;

NOTES

- perform all treatments during the coolest hours of the day with absence of wind;
- apply the mixture immediately after preparation;
- wash the equipment used after the distribution of the product ;
- use adequate equipment for body protection (gloves, masks, glasses) during the preparation and distribution of the mixture ;

Write down on a block-note as many details as possible about the trial (date of beginning and end of the experiment; sampling date, number of experimental thesis made, and their abbreviations, type of cereal and amount of product used in the trial, any unexpected factors emerging during the trial). Also describe the characteristics of warehouses chosen for testing (time and materials of construction, years of actual use as a storage area for products, the presence of fissures / cracks in the walls inside / outside of the structure, type of product stored, how it is stored, the most frequent problems encountered during storage of the last years e.g. rodents, insects, mold, number of openings to the outside; level of isolation from the outside, the solutions adopted for the protection). If possible, collect all this data in a schematic way in a spreadsheet to keep updated regularly. Take photos of each stage of the trial, if possible, as documentation.