

IRS Block Preparation

Contributing Centers: CREC, KCMUCo

WHOPES guidelines- Testing mosquito adulticides for indoor residual spray and treatment of mosquito nets

The WHO cone is 12 cm in diameter, the minimum size required for a sample of a substrate to be tested. Blocks of cement or mud, 1-1.2 cm thick, are prepared in Petri dishes, and dried at $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $80\% \pm 10\% \text{ RH}$). These and the substrates not requiring pre-preparation, such as wood or thatch, are sprayed with insecticide to make a homogeneous residual deposit of the desired concentration of active ingredient per unit area. Spraying is done using a Potter Spray Tower[®], which is internationally recognized as the most precise method of chemical spraying in the laboratory. All substrate samples are then stored unsealed under controlled temperature conditions ($30\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$), humidity (80%), air circulation and ambient light cycles until ready for testing. A minimum of seven replicate blocks per dosage are prepared, at least three for bioassay and four for initial chemical analysis, selected at random.

The plywood, mud, cement and sand used in the preparation of blocks should be obtained from the same source for every study to minimize variation in the physical and chemical properties of these substrates between studies.

1. Purpose

This SOP outlines the procedures to be followed for the production of cement and mud blocks. These blocks are later used to test the efficacy of different products and new formulations for IRS applications in the laboratory.

2. Procedures

a. Block preparation

Blocks should be prepared and dried at $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $80\pm 10\% \text{ RH}$. Blocks should then be stored unsealed after spraying at $30\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $80\% \text{ RH}$, with ambient light cycles and air circulation until testing.

i. Plywood.

1. Cut the plywood into 10cm diameter circles.
2. Place a label on the bottom of the plywood and insert details on the initials of the person preparing the block and the date of preparation.

ii. Mud

1. Use a lab coat, dust mask and safety goggles when making up mud blocks.
2. [The recipe for the mixing of mud, sand (if appropriate), cement (if appropriate) and water should be inserted here. The recipe should reflect local practices for the use of mud in houses]
3. Label the bottom of the petri dish with a labeling stating the initials of the person preparing the block and the date of preparation.
4. Cut a 10cm diameter piece of A4 paper to line the petri dish. This facilitates the removal of the block from the petri dish when it is needed for an assay.
5. Sieve the sand and soil separately to remove stones, gravel and lumps.
6. Weigh the sand [if appropriate] and mud, and measure out the water using a glass measuring cylinder.
7. If the study protocol or Study Director dictates stabilization of mud blocks with cement can be added to the mixture.
8. Add all raw materials together in a plastic bowl. Stir the mixture with a spoon labeled “mud” for 3-5 minutes until it has an even appearance. Use the back of the spoon to smooth the surface of the block in small circular motions until it is as smooth as possible.
9. Prepare enough of the mix mixture to make all of the mud blocks required for the study.
10. Fill the petri dish to the surface with the mud and level the surface with the back of the “mud” spoon.
11. Put blocks in a block storage room under the correct drying conditions $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $80\% \pm 10\%$ RH for minimum of 1 week.

iii. Concrete

1. Use a dust mask, safety goggles, lab coat and gloves when making up concrete blocks.
2. [The recipe for the mixing of cement, sand and water should be inserted here. The recipe should reflect local practices for the use of cement in houses]
3. Prepare enough cement mixture to prepare all of the blocks required for the study.
4. Cut a 10cm diameter piece of plain A4 paper to line the petri dish. This facilitates the removal of the block from the petri dish when needed for an assay.
5. Sieve the sand and cement separately to remove dirt and lumps

6. Weigh the sand and cement and measure out the water (using a glass measuring cylinder) to the required amounts.
 7. Add the cement to the sand in one plastic bowl. Stir the mixture with a spoon labeled “concrete”, then add the water and continue to stir for 3-5 minutes until it has an even appearance.
 8. Fill the petri dish to the surface with the concrete and level the surface.
 9. Put blocks in a block storage room under the correct drying conditions $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $80\% \pm 10\% \text{RH}$ for minimum of 4-5 days.
 10. Once set, immerse the concrete blocks (still in petri dishes) in tap water for 3 days.
 11. Put the blocks back in the block storage room for 24 hours or until dry.
 12. A label should be placed on the bottom of the concrete blocks with the initials of the person who prepared the blocks, and the preparation date.
 13. Concrete blocks should be left in the block storage room for a minimum of 1 month to cure at $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $80\% \pm 10\% \text{RH}$ before used in assays.
- b. pH Testing. The pH should be between 6-8 for blocks to be used for testing. pH testing should be conducted on the day they are to be sprayed with insecticide.
- i. Using pH meter
 1. Use a scalpel blade to scrape 5g of mud or concrete from the block. For plywood, use sandpaper to remove 1g of plywood from the surface. Add 15mL tap water and mix thoroughly.
 2. Swirl pH meter in tap water before use to remove any particles from the bulb. Ensure meter is calibrated.
 3. Put pH meter in the solution so the bulb is fully submerged. Wait until reading stabilizes.
 4. Record the reading on a label on the underside of all blocks made that day.
 - ii. Using litmus paper
 1. Use a scalpel blade to scrape 5g of mud or concrete from the block. For plywood, use sandpaper to remove 1g of plywood from the surface. Add 15mL tap water and mix thoroughly.
 2. Wearing gloves, take a clean strip of litmus paper, holding it by one end, and dip into the solution for 5 seconds.
 3. Use the colored chart on the litmus paper packaging to estimate the pH to the nearest whole number.
 4. Record the reading on a label on the underside of all blocks made that day.

- c. Spraying Blocks
 - i. Follow SOP for block spraying using Potter Tower.
 - ii. On day of spraying, the chemical code of the insecticide sprayed, test item code, and protocol number should be written on a label on the bottom of the block.

- d. Discarding Blocks
 - i. Unsprayed. The expiry for untreated mud blocks is 2 months after blocks are made, 6 months for concrete and plywood. Untreated blocks can be disposed in normal waste bins.
 - ii. Sprayed. Sprayed blocks should be disposed following national insecticidal waste guidelines for each country.

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