

# Potential approach to regulate and monitor moisture for *Brachytrupes membranaceus* eggs

## For cricket rearing in the village of Sanambele, Mali

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Photo taken by Florence Dunkel 2011

Sanambele is a rural farming village with 1200 residents in southern Mali where children often do not get enough complete protein each day; can cricket farming fill the current protein deficit? Can they produce enough to feed children and improve chicken production for adults? We conducted relative humidity and temperature trials to determine how Sanambeleans might meet environmental needs of their local food cricket, *Brachytrupes membranaceus* eggs, while considering villagers' resources. Cricket eggs have specific moisture requirements for development. Climatic barriers to year round cricket rearing in Sanambele need to be overcome. Using village-produced cotton and clay pots, these barriers may be overcome, making possible another complete protein for children to prevent kwashiorkor, and possibly a small economic engine.



Sanambelean children who hunted grasshoppers for extra complete protein abandoned the practice since 2009 heavy pesticide use in hunting areas prevented (Photo taken by Wendy Nickisch 2009)



Sanambele chicken for dinner guests (Photo by Florence Dunkel 2009)

### Hypothesis tested:

Cotton will be useful in village for determining/creating moisture for eggs (null hypothesis). Alternative hypothesis tested was cotton is not useful in gauging moisture for eggs.



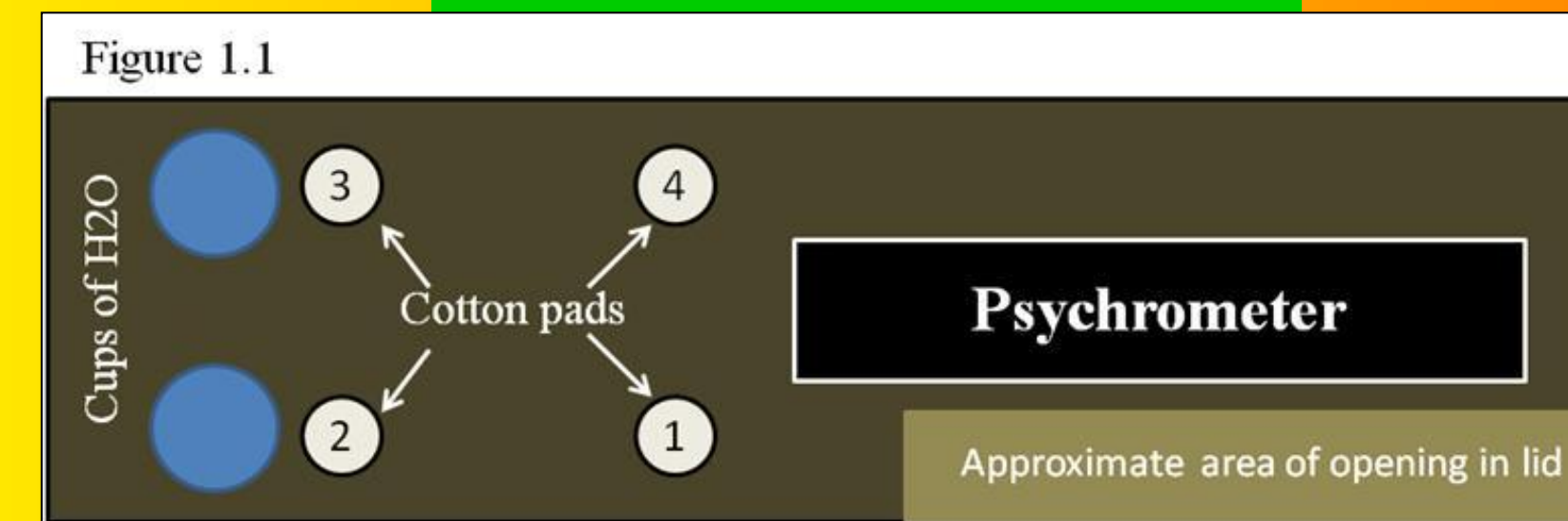
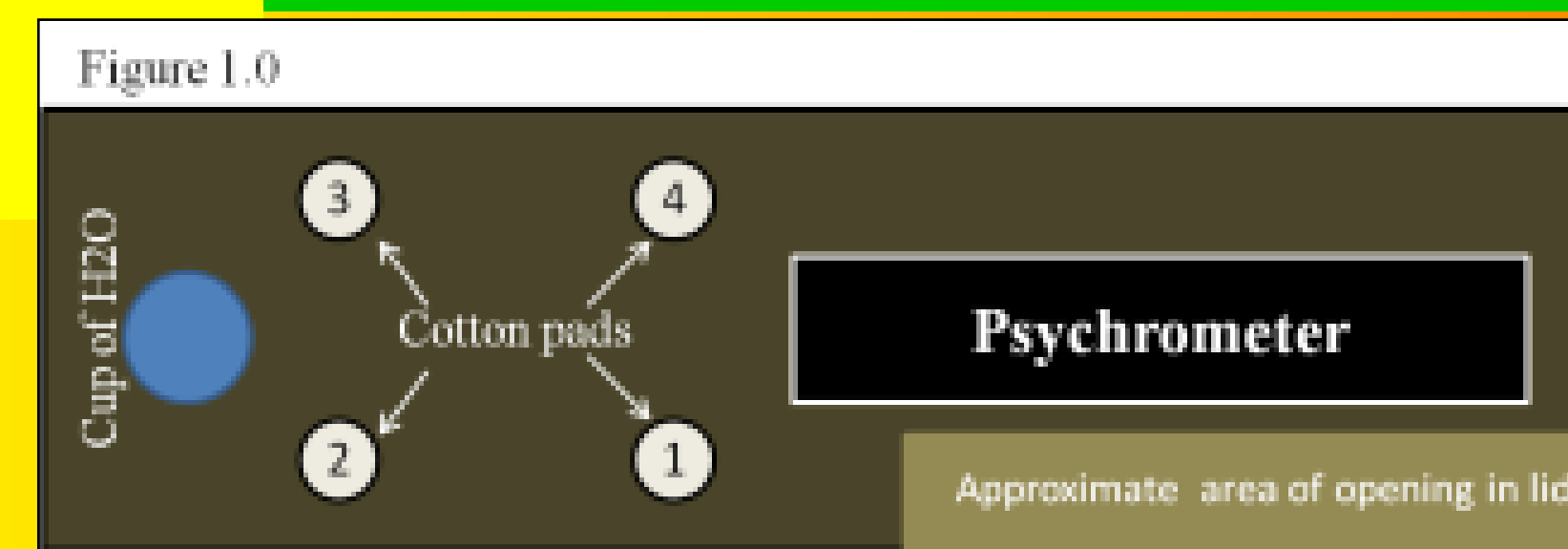
B. Membranaceus

### Methods and Materials:

Figure 1.0: one cup method  
Figure 1.1 two cup method  
Figure 1.2 Sanambele scenario



actual



### Results:

Table 1.0. Relative Humidity Trials (Figures 1.0., 1.1.)

Date	AM/PM	Relative Humidity: Inside Container	Cotton Pad Moisture				Relative Humidity: % Outside Container
			1	2	3	4	
11/20/2013	PM	55	M	M	M	M	*
11/21/2013	AM	59	LM	LM	LM	LM	*
11/21/2013	PM	54	BD	LM	LM	LM	*
11/22/2013	AM	54	D	LM	LM	BD	42
11/22/2013	PM	51	D	BD	BD	D	41
11/23/2013	AM	48	D	D	BD	D	39
11/23/2013	PM	42	D	D	D	D	31
RE-WETTED REMOVED CUP OF H2O							
11/23/2013	PM	48	M	M	M	M	42
11/24/2013	AM	47	M	M	M	M	38
11/24/2013	PM	53	LM	LM	LM	LM	43
11/25/2013	AM	57	BD	LM	LM	LM	45
11/25/2013	PM	49	BD	BD	BD	BD	44
11/26/2013	AM	53	D	D	D	D	45
RE-WETTED ADDED 2 CUPS OF H2O							
11/26/2013	PM	54	M	M	M	M	40
11/27/2013	AM	52	M	M	M	M	40
11/28/2013	AM	50	BD	LM	LM	BD	43
11/29/2013	AM	50	D	D	D	D	40

M=MOIST, LM=LESS MOIST, BD=BARELY DRY, D=DRY  
\*No data taken

Table 1.1. Relative Humidity Trials Sanambele Scenario (Figure 1.2)

Date	AM/PM	%Relative Humidity: Inside Container	Cotton Pad Moisture					%Relative Humidity: Outside Container
			1	2	3	4	5	
11/27/2013	AM	56	M	M	M	M	M	40
11/28/2013	AM	54	BD	LM	LM	BD	BD	43
11/29/2013	AM	51	D	D	D	D	D	40
RE-WETTED REMOVED CUP OF H2O								
11/29/2013	PM	57	M	M	M	M	M	45
11/30/2013	AM	56	M	LM	LM	M	M	42

M=MOIST, LM=LESS MOIST, BD=BARELY DRY, D=DRY

### Discussion

RH was higher consistently in the containers, but how much was unpredictable. Use of psychrometer created too much air exchange (introducing drier air into container). Cotton pads were great indicators of evaporation. Once crickets lay eggs in Sanambele, villagers will need to transfer them and keep them moist. Cotton and water are available in the village. *B. membranaceus* eggs need the moisture to be maintained. They will be reared in a village with no climate-controlled chambers, but based on our data RH can be influenced with additional moisture and cotton will be useful to gauge the moisture of eggs without disturbing development. *B. membranaceus* farms have not been reported in peer-reviewed literature.

### Recommendations:

- Raise house crickets (*Acheta domesticus*) in the lab
- Use clay pots as containers to incubate eggs
- Use sand for egg laying
- Use food village of Sanambele would have available
- Determine how *A. domesticus* differs from *B. membranaceus* during embryogenesis.
- Measure with digital psychrometer to reduce air exchange

### Conclusions:

Although the climate varies annually in village of Sanambele, Mali, these data indicate Sanambeleans may be able to manipulate RH. RH was significantly higher in test containers, which will slow evaporation rate and keep eggs moist longer. If we can get eggs to develop then the chance of raising *B. membranaceus* year long for children's complete protein source and feed for chickens is promising. To ensure success further trials to raise crickets in Sanambele will help in completing the egg and life cycle development.

### Acknowledgements:

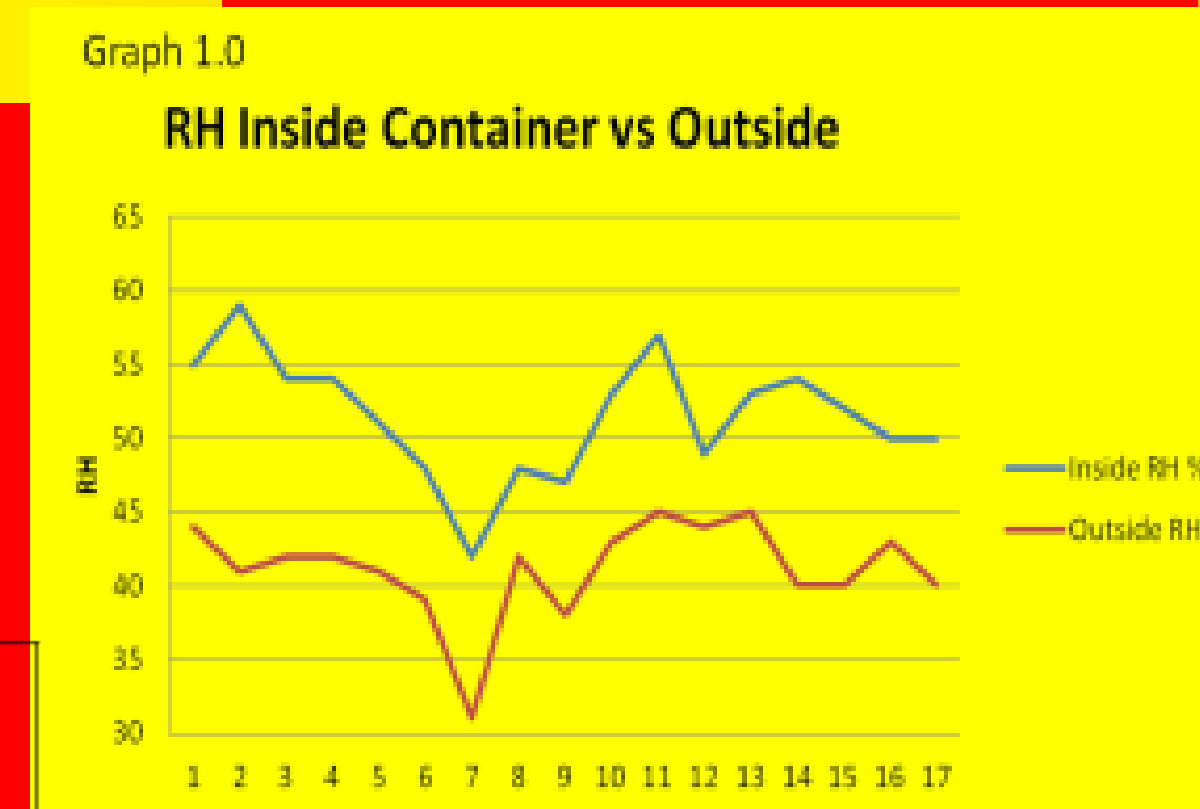
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### Introduction:

Entomophagy is the consuming of insects by humans. More than 1900 edible insect species consumed around the world; 13% are crickets (Huis et al. 2013). Insects provide high-quality protein due to their high fatty acid and micronutrient content (Huis et al. 2013). The local food cricket in Sanambele, *B. membranaceus* is a good source of protein, carbohydrate and energy (Adeyeye and Awokunmi, 2010.) Sanambele has 2 seasons: dry season (mid-June to mid-September). Temperatures can reach as high as 45°C (113 °C) during March with a relative humidity (RH) of 9-27% (Luong et al. 2012). Crickets lay eggs in sand to maintain ideal RH for their eggs to absorb water, without saturated, which leads to fungal issues or bursting. Cricket eggs contain everything needed for embryogenesis except water, which is absorbed through the eggshell (Masaki and Walker 1987). To ensure eggs do not dry out and complete development, moisture will need to be maintained in the Sanambelean cricket farms year-round. We aimed to take a resource readily available to a Sanambeleans that can indicate for them when eggs are too dry and need moisture. They do not have a psychrometer or equipment to measure relative humidity, but they have cotton, the material used in a psychrometer. Can locally grown cotton be used as an indicator of ideal RH for eggs development? This paper will be about whether that is plausible.



actual