

# Formic Acid Fumigator

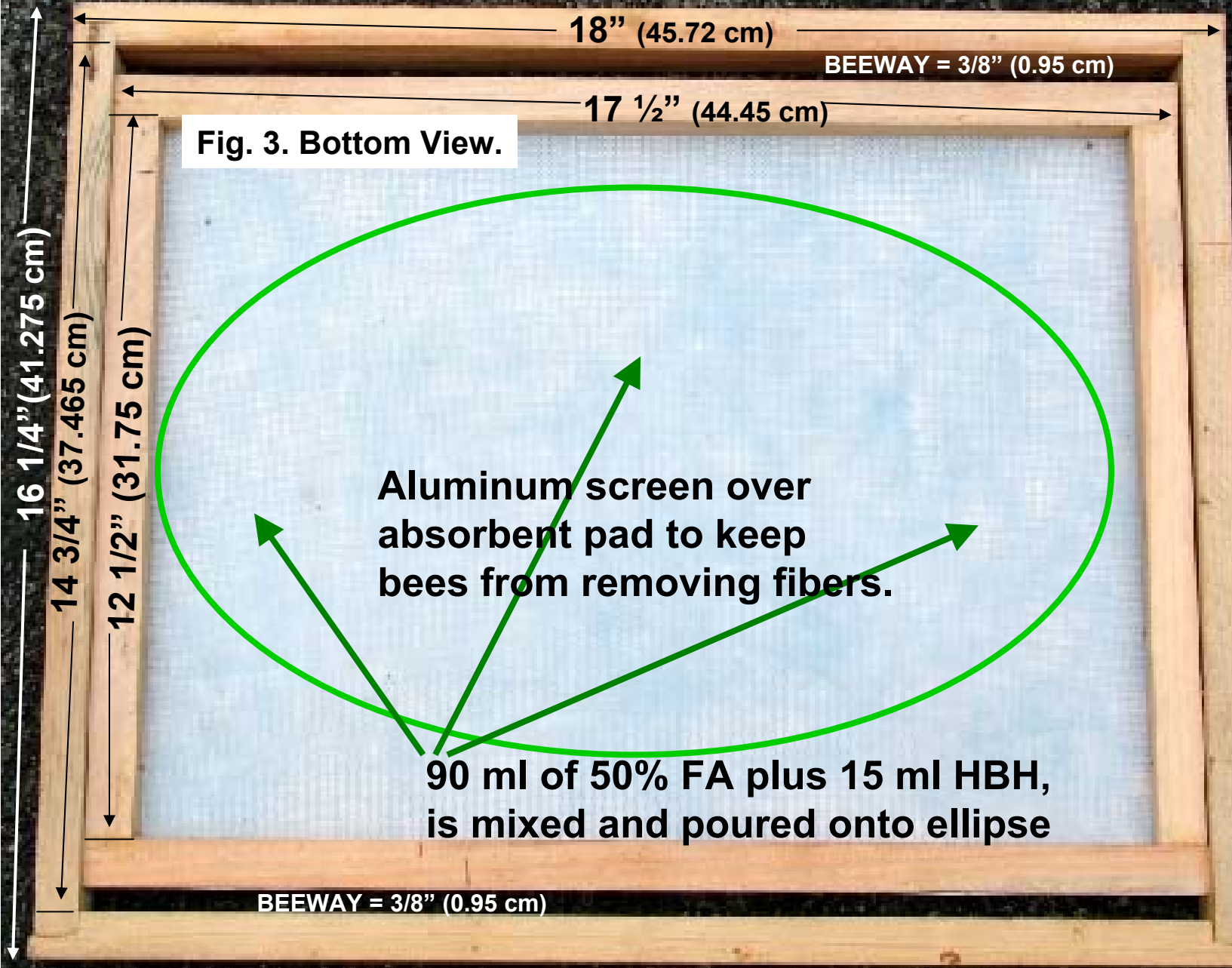


**Fig. 1. 50% Formic Acid Fumigator standing on edge.**

**Top View outside dimensions: 18" by 16 1/4" (45.72 x 41.275 cm)**



**Fig. 2. Top View, Outside dimensions: 18" x 16 1/4" (45.72 x 41.275 cm).**

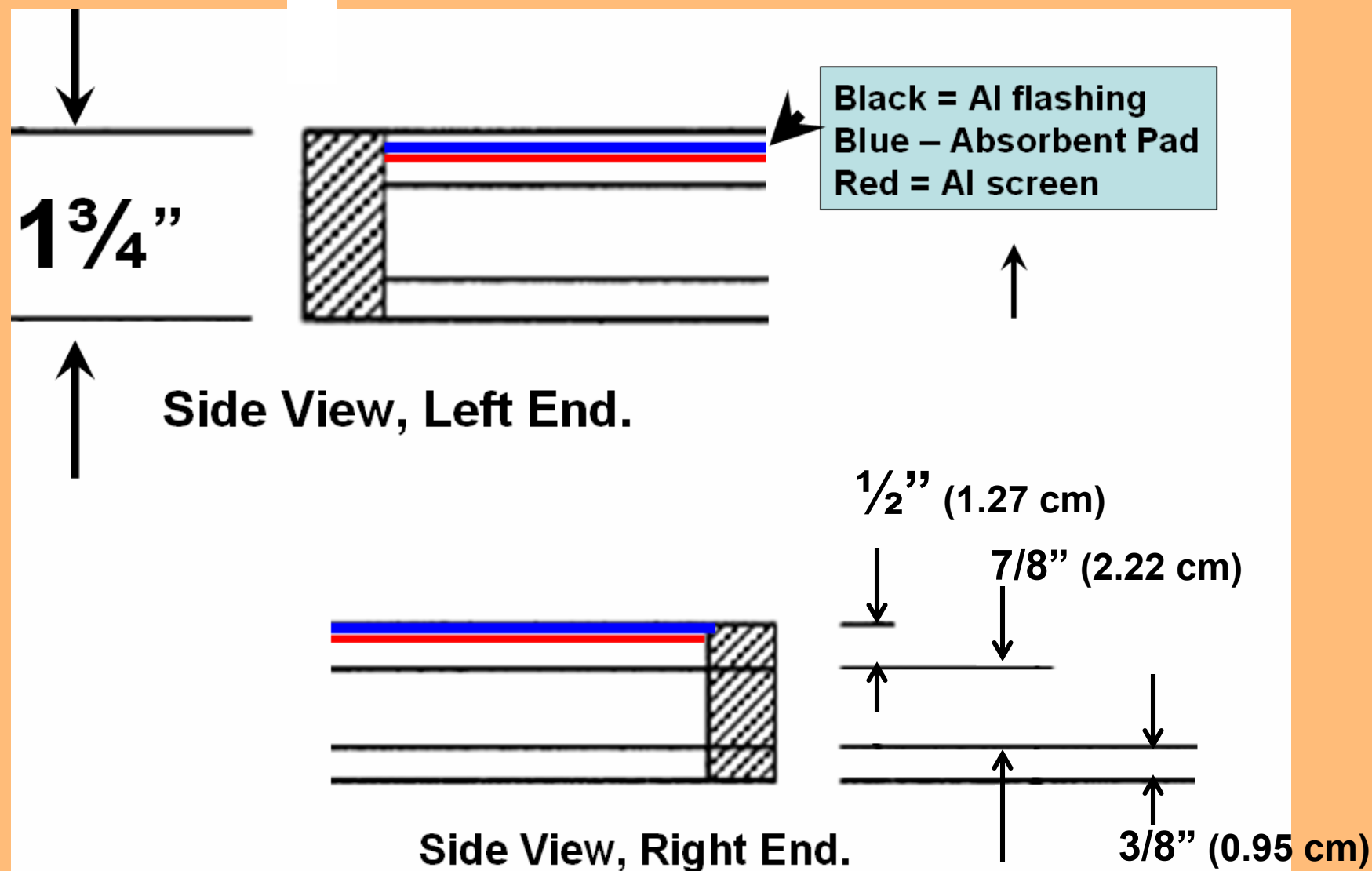


**Fig. 3. Bottom View.**

**Aluminum screen over  
absorbent pad to keep  
bees from removing fibers.**

**90 ml of 50% FA plus 15 ml HBH,  
is mixed and poured onto ellipse**

**BEEWAY = 3/8" (0.95 cm)**



**Fig. 4. Side view detail.**

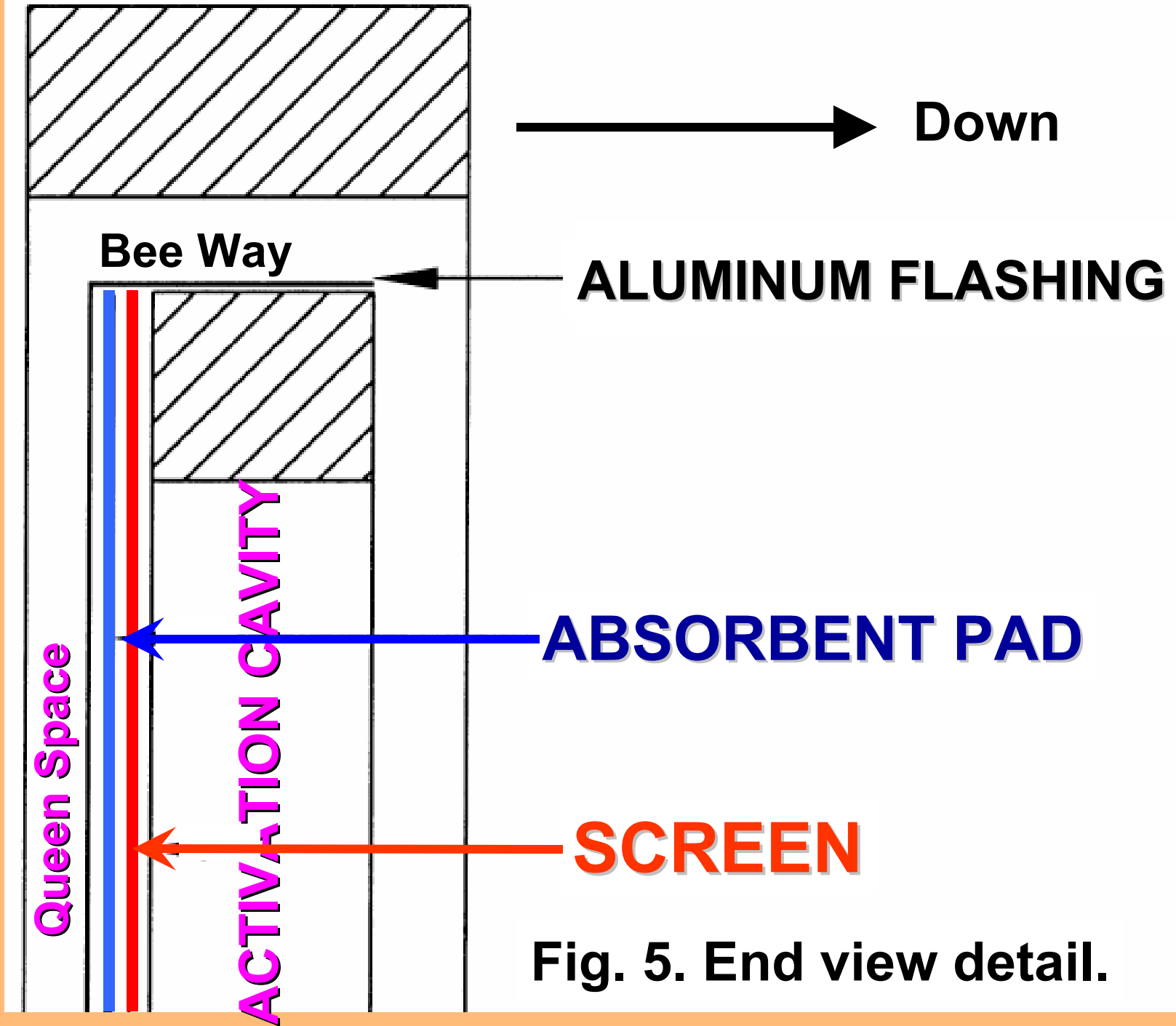
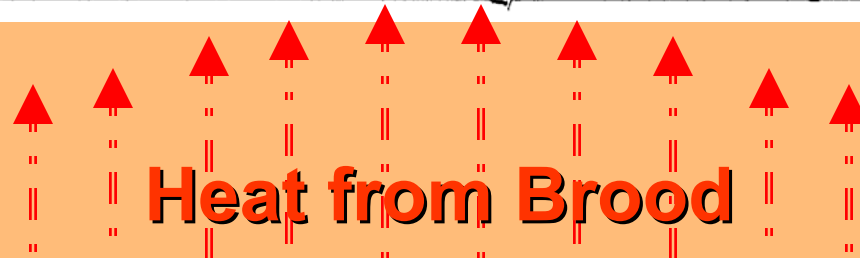
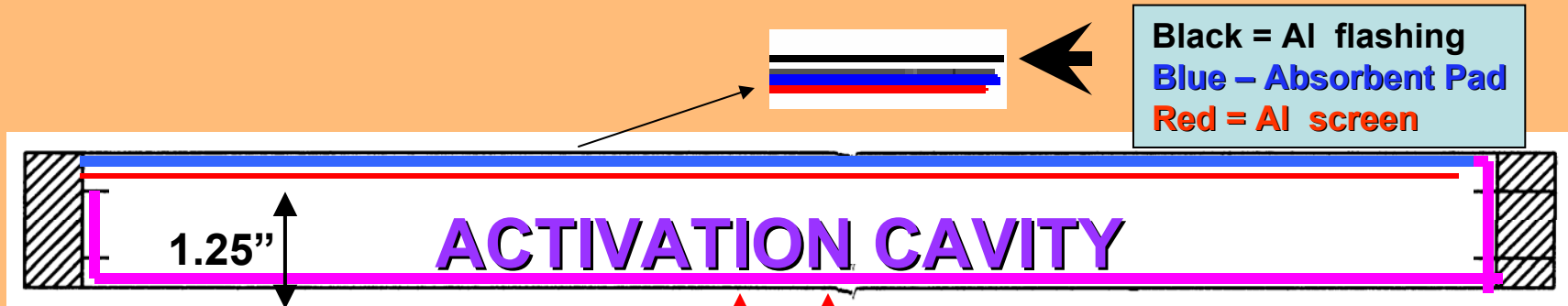


Fig. 5. End view detail.



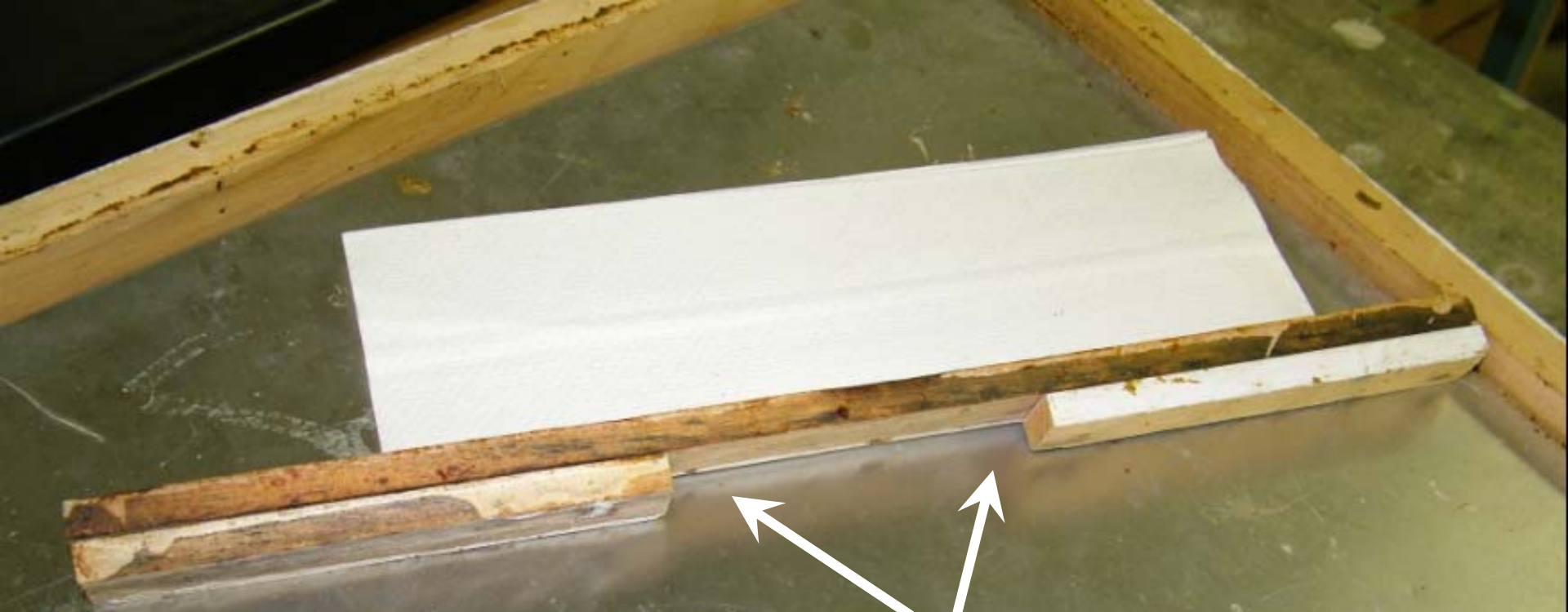
The space [purple lines] below the Aluminum screen [red] is critical to the function of the fumigator. Heat from the brood rises into this 'activation cavity'; the heat causes the 50% formic acid and HBH to quickly evaporate, and the bees vigorously fan this formic-HBH vapor throughout the hive. In three separate experiments (Sep 01,2000) -10 hives each- when 5 or more frames of brood were present, the temperature in the brood nest was 94° F, in the Activation Cavity - 92° F, and at the entrance - 90° F. By noon the next day, virtually all formic acid had evaporated and the fumigator was removed. Brood cells were opened and all mites were dead; no bee brood were killed; only a very few varroa invading food at the bottom of the cell were still alive.

Fig. 6.

## **Application:**

- 1. Ambient Temperature should be 60 to 90° F (15.5-32.2° C).**
- 2. Apply treatment between 13:00 & 18:00 (1-6 PM).**
- 3. Manage all brood frames in one or two brood chambers.**
- 4. Add 85 ml (2.8oz) of 50% FA solution to container, then 15 ml (1/2 oz) HBH, mix thoroughly, pour onto absorbent pad in fumigator. Place above upper brood chamber.**
- 5. Tape all openings shut; if using screened bottom board, use solid Bottom Board or cover the screen with masonite plastic or aluminum sheet.**
- 6. Reduce entrance to 3" x 3/8" (7.5 x 1cm) at center.**
- 7. Remove fumigator the next day between 12:00 & 18:00 (noon and 6PM).**

**In most cases, only one treatment is needed per season. We often go two seasons between treatments, depending on # of infested brood cells (and # of incoming mites from dying and/or wild colonies). Fig. 7**









**Fig. 8. Entrance cleat reduced to 3.5" x 3/8" (7.5 x 1 cm) at the center.**

**Fig. 8.**



**KEY:**

	Adult Female
	Adult Male
	Egg
	Protonymph
	Deutonymph ♀
	Deutonymph ♂

**DRONE CELLS**

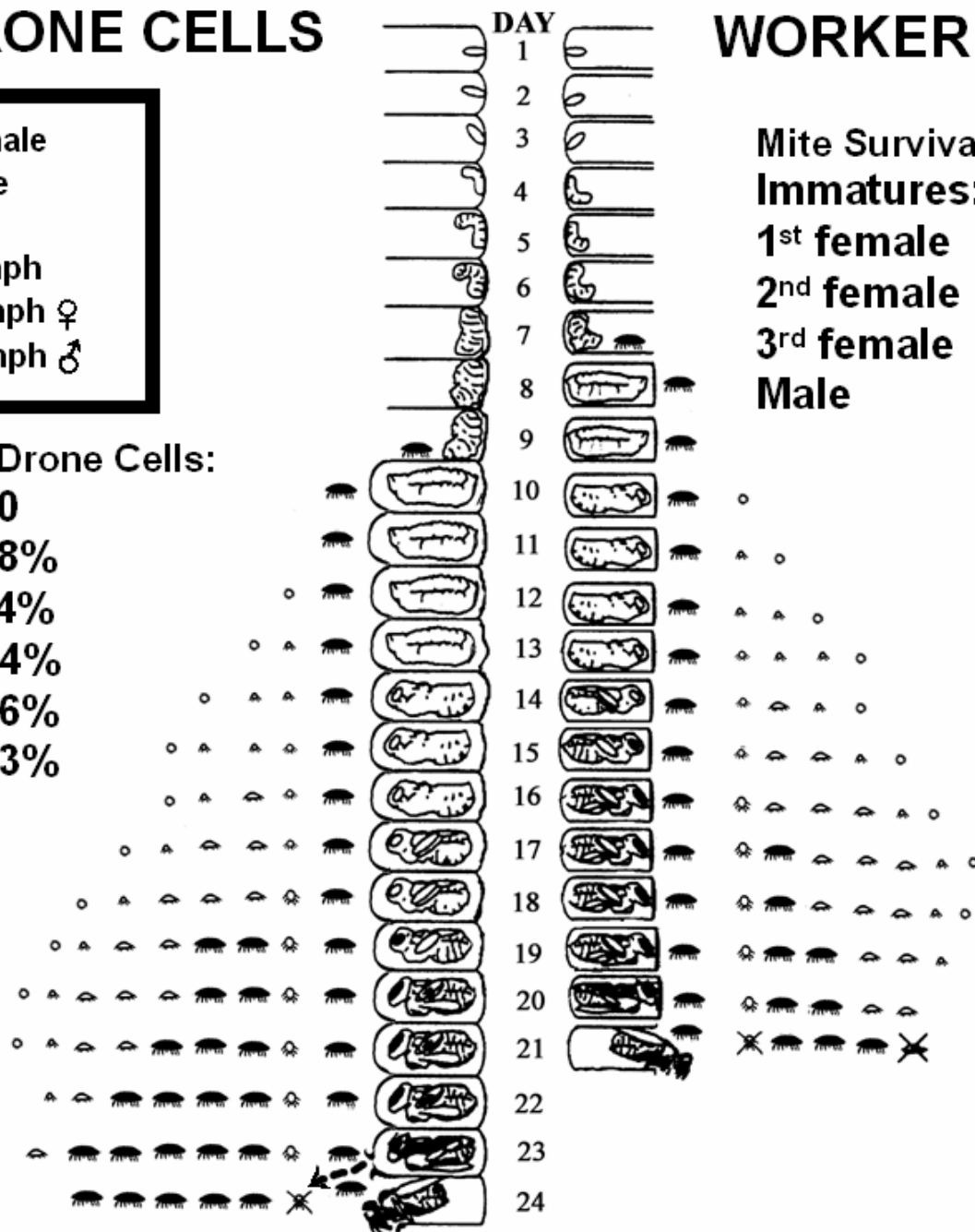
**WORKER CELLS**

**Mite Survival in Drone Cells:**

**Immatures: 0**  
**1<sup>st</sup> female 98%**  
**2<sup>nd</sup> female 94%**  
**3<sup>rd</sup> female 84%**  
**4<sup>th</sup> female 76%**  
**5<sup>th</sup> female 63%**  
**Male 0**

**Mite Survival in Worker Cells:**

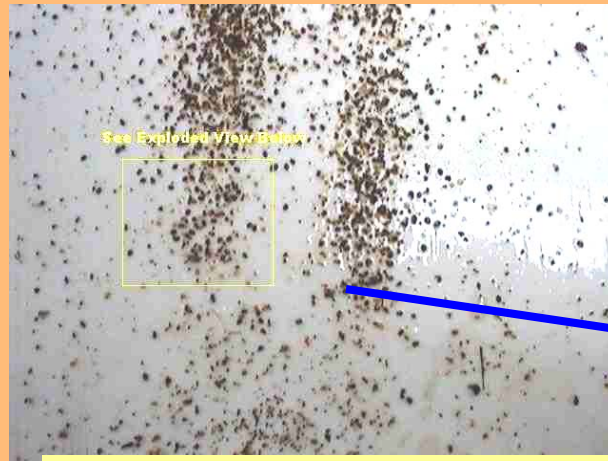
**Immatures: 0**  
**1<sup>st</sup> female 94%**  
**2<sup>nd</sup> female 38%**  
**3<sup>rd</sup> female 1.3%**  
**Male 0**



**Fig. 9. Results of Using the 50% Formic Acid Fumigator: top three pictures show initial treatment on 09/12/2000. Bottom two pictures show second treatment on 09/28/2000**



**Old Style Fumi-gator**



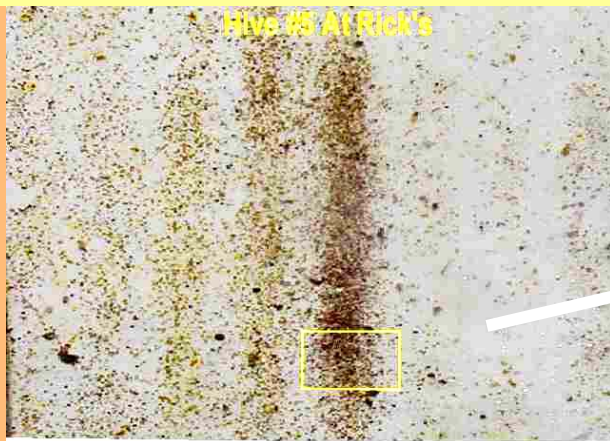
**See Exploded View Below**



**Test Hive #5 Rick's; 12Sep00.**

**Results Hive #5, Rick's. Close-Up Hive #5, 49 mites.**

**Second Treatment 13 Days Later:**



**Hive #5 At Rick's**



**Rick's Hive #5 30, Sep 2000.**

**Exploded View, 30 Sep 2000, 8 mites.**

# **Video Results of Using the 50% Formic Acid Fumigator**



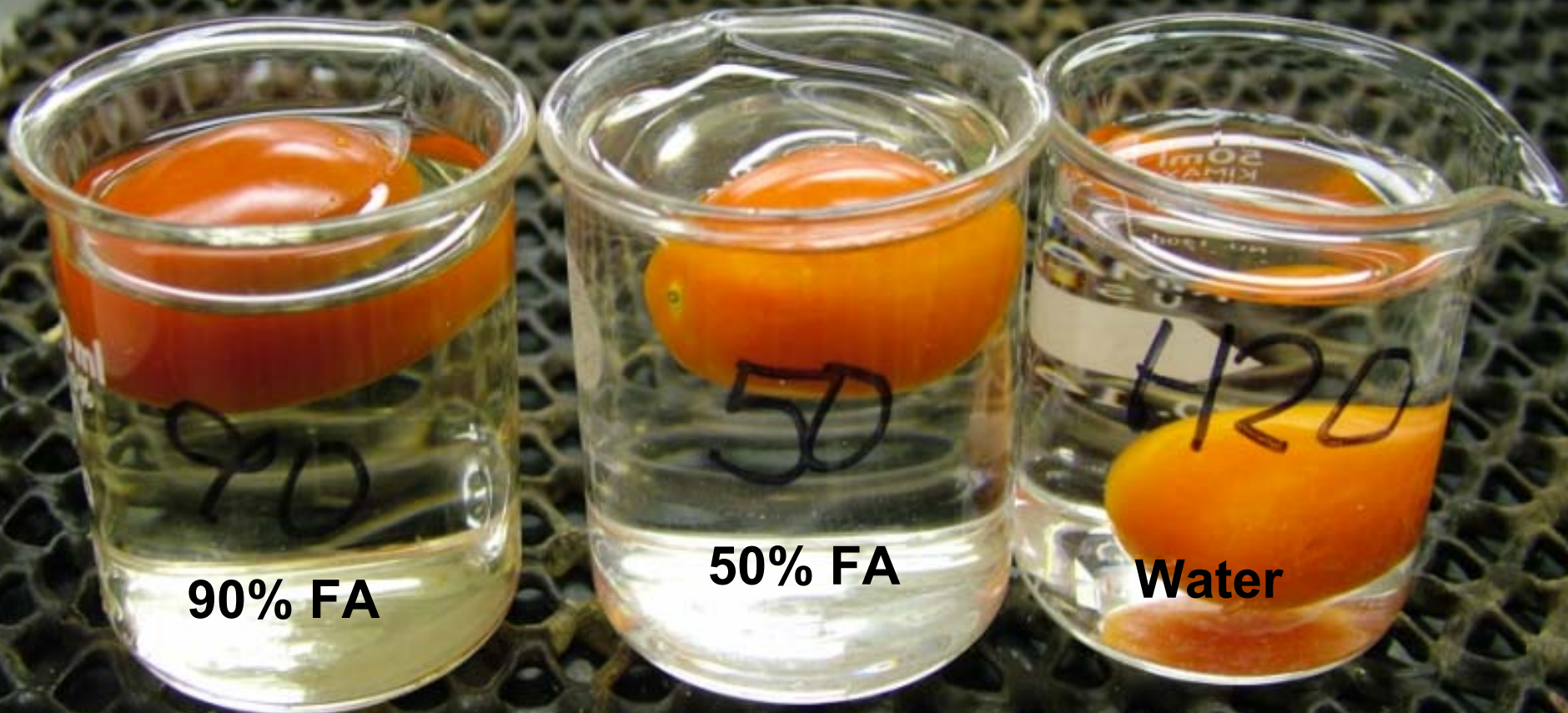
**Video I**

**Detector Board Demonstration**



**Video II**

**Mite Drop**



**A simple way to estimate 50% Formic Acid: a cherry tomato sits about 2.5mm above the surface of 50 % FA (center); sits 4-5 mm above the surface of 90% FA (left) and sinks in tap water (right) [23 March 2006].**

## **Use Honey-B-Healthy® to Prevent Queen Loss**

**HBH contains spearmint and lemongrass essential oils.**

**Two teaspoonfuls in a quart of 1:1 sugar syrup delivers a total of one cc of both essential oils (0.5 cc each).**

**Because we use the natural emulsifier, lecithin, the essential oils are evenly distributed throughout the syrup.**

**Honey-B-Healthy produces rapid build up of bees and (in our opinion) helps to reduce pathogens. However, Honey-B-Healthy alone does not significantly reduce mite numbers.**

**It prevents queen loss when treating with 50% Formic Acid.**

**It calms the bees. It also helps to introduce queens: spray**

**The brood frames and queen cage with a little syrup containing HBH, and the bees will accept the queen in a direct**

**release with no chance of balling. It also helps to reduce**

**stings: sprinkle the bees and mix a little on your hands**

**and watch the difference in bee behavior- - you will get**

**very few or no stings at all.**

# Constituents of Lemongrass Oil

Lemongrass oil is purchased From INDIA:

It is distilled from two Tropical Grasses:

*Cymbopogon citratus* (DC.) Stapf

*Cymbopogon flexuosus* (Nees) Stapf.

Constituents: Citral (75-85%)

Methylheptanone

Citronellal

Geraniol

Limonene

Dipentene

**Others?**

Lemongrass calms and attracts the bees, much like the Nasanoff Gland.

# Constituents of the Honey Bee Nasanoff Gland:

## Pheromone

Nasanoff

## Chemical

### Geraniol

Nerolic Acid

Geranic Acid

### (E)-Citral

### (Z)-Citral

(E-E)-Farnesol

Nerol

Others?

## Function:

Orientation

"

"

"

"

"

"

?

**The underlined items are present in HBH.**

## Why Spearmint Oil?

We tested many essential oils, from menthol and spearmint to wintergreen and thymol and many others. Spearmint had the best results in reducing diseased brood. However, Honey Bees took sugar syrup with spearmint slowly: taking a week to consume one quart of 1:1 sugar syrup.

Bob did a lot of research to see if he could keep Spearmint, and find something to make it more attractive. For some reason, he tried Lemongrass Oil, and the rest is history.

We have seen colonies take an entire quart of HBH (lemon-grass + spearmint) in just four hours. Why does spearmint have an impact on Honeybee health?

This is pure speculation, but...a hypothesis

We think it has a parallel mode of action in Honey bees as to Tamiflu in humans; Tamiflu, oseltamivir, is part of a family of flu-fighting medicines called neuraminidase Inhibitors, derived from Shikimic acid, obtained only from the Chinese Star Anise, *Illicium verum* Hook f. Magnoliaceae.



# Typical Results:

- 1. Varroa Mites are killed in capped brood cells as well as on the bees.**
- 2. Detector boards show large mite drop for 13-14 days after treatment (time required for brood emergence).**
- 3. A few varroa mites in newly capped cells survive the fumigation: they are found with larvae. They immerse themselves in larval brood food at the bottom of the cell, and this protects them from the formic acid.**
- 4. Honey left above the fumigator does not absorb formic acid, which is dense (sp. gr.= 1.22) and sinks.**

## **Cost for FA treatment using the Bob Noel Formic Acid Fumigator.**

**Cost of 15 gallons of 90% FA, about \$100 (\$142 with deposit).**

**One gallon of 90%FA = \$6.66 (\$9.47).**

**Dilution of 1 gal. to 50%, makes up about 1.8 gallons (6.81 liters).**

**@ \$6.66/gal. or  $\$6.66/6.8$  liters = \$0.979 per liter.**

**One treatment requires 90cc or .09 liters of mix,  $(.09 * \$0.979) = \$0.088$  (or \$0.125) per treatment [cost of FA].**

**One gallon of 90% FA [\$6.66] will make 1.8 gallons of mix at 50%, = 6.81 liters =  $6,810\text{cc}/90 = 75.67$  treatments.  $(\$6.66 / 75.67 = \underline{\$0.088}$  or  $\$9.47/75.67 = \underline{\$0.125}$  per treatment)**

**Source for Formic Acid: Chemicals & Solvents, Inc.,  
1140 Industry Ave., SE, Roanoke, VA;  
phone: 703-427-4000. They sell a 15 gallon, heavy plastic drum of 90% FA + \$42 drum deposit for \$142.**

# **Cost of HBH Concentrate - eliminates Queen Loss (about 25% in hives treated with FA only.)**

A bottle of HBH costs \$12.95, = 8 ozs = 237 cc

We add 15cc of HBH per treatment of 90cc of FA,

$$= 12.95 / (237/15) = 12.95/15.8 \text{ doses} = \$0.82 \text{ per hive.}$$

One 8 oz bottle of HBH is sufficient for 15.8 colonies.

One 16 oz bottle of HBH is sufficient for 31.6 colonies.

Cost of Syrup [one quart of 1:1 Syrup]:

Sugar:  $1.1 \text{ lb}/50 * 24.00 = \$0.53/20 = \$0.03$  per treatment.

Add 20cc HBH to 1 Qt of 1:1 syrup:  $(20/237)*12.95 = \$1.09$ ;

1 Qt of Syrup does 20 hives  $(\$1.09/20) = \$0.055$  each.

Total for HBH-Syrup:  $\$.03 + \$.055 = \$0.085$  per hive.

**Total cost of one FA treatment (less labor):**

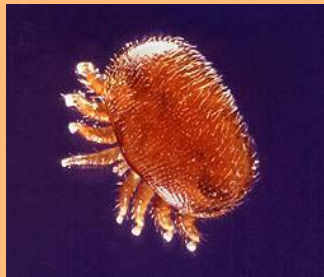
**FA \$0.088 + HBH \$0.82 + Syrup \$0.055 = \$0.963.**

**After mixing with HBH, the final concentration of  
Formic Acid is about 43%.**

Fig. 1.

**Will the honey bee become...**

**EXTINCT?**



Images from the web.

