Filter Capture for Improved Spent Irrigation Water Sampling

A work in progress

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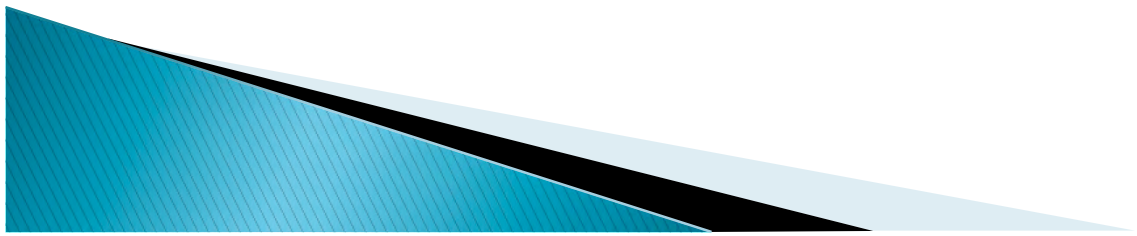
Rationale: if random testing by USDA and others is finding problems that routine 48-hr testing is missing, and this is leading to recalls, then we need better testing.

The problem may not be the tests themselves, but that levels are about 1 log higher in the sprouts than in the water. That means: for every 10 organisms in the sprouts, only 1 organism gets into the water.



If we take ten samples and do 10 tests, the chance of detection increases by 10X

This costs 10X as much as one test…forget it.

Filter-capture is a way to concentrate the organisms from several liters onto one or more filters that can used as the sample for a single test. If 10 liters can be filtered, this may increase our chance of detection by 10X

At a cost of less than 2 tests

Collecting Bean Water

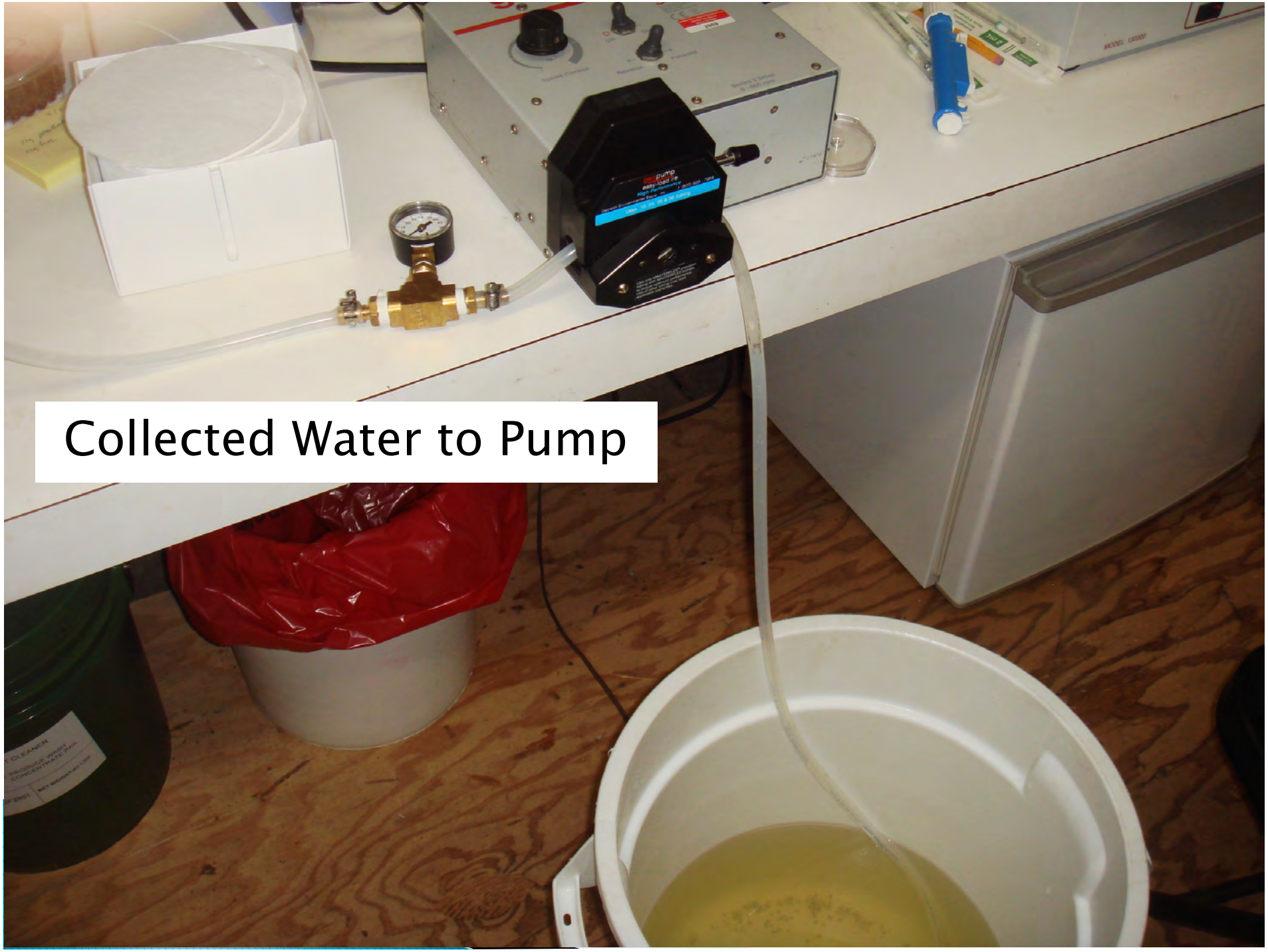
Collecting Roto Water

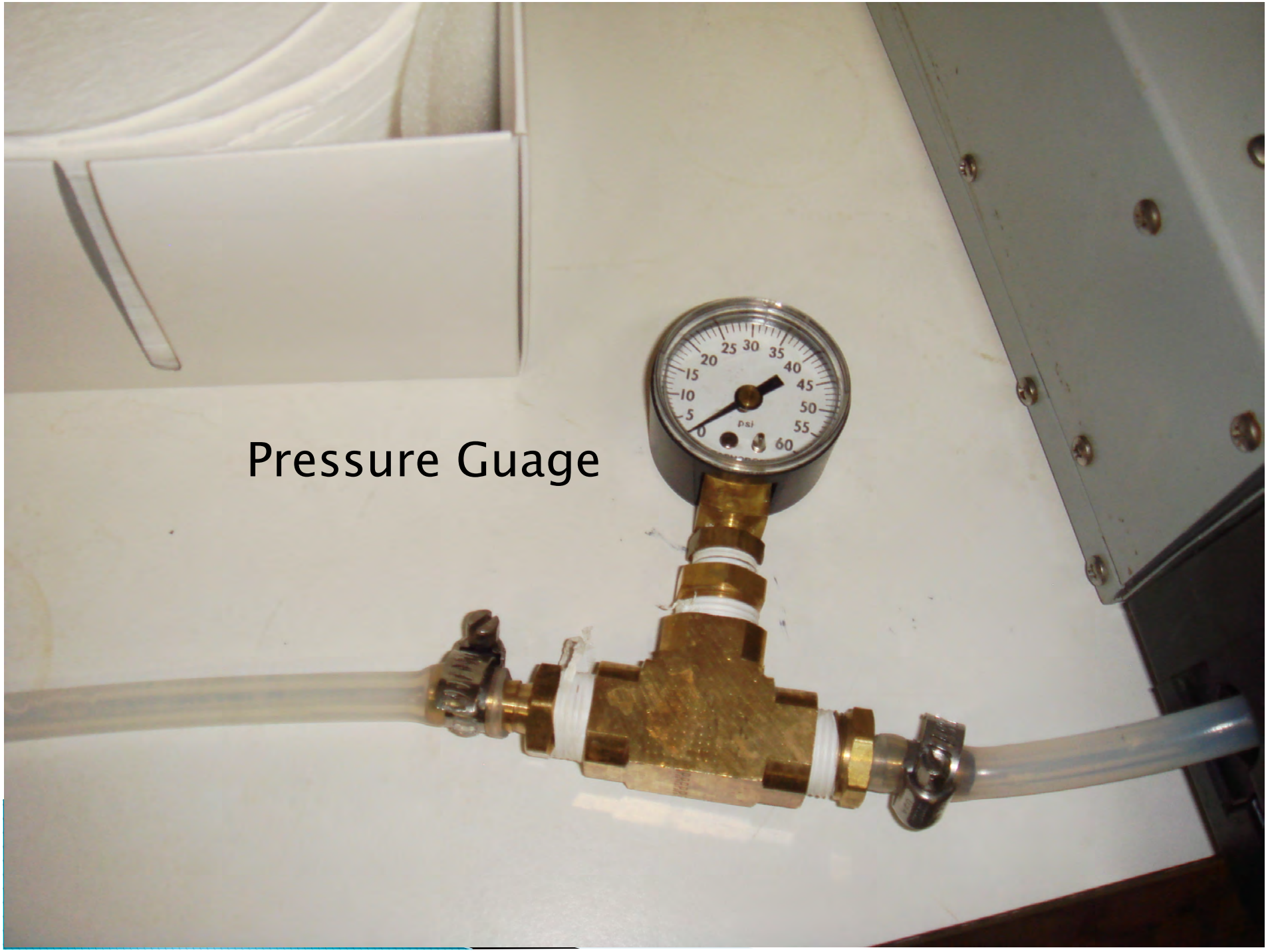
Collecting Tray Water

Tray Water Detail

–up

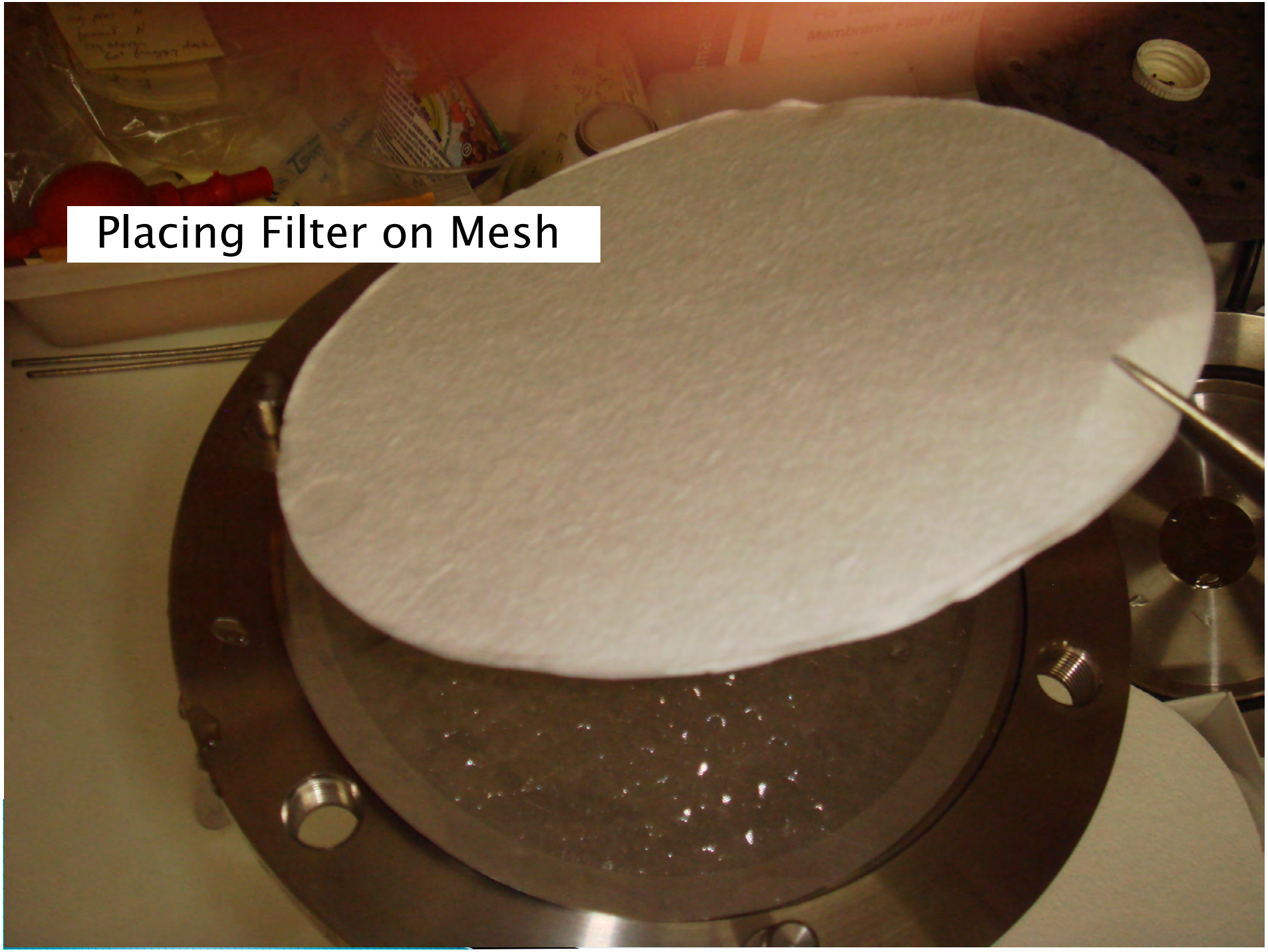
PRIORITY MAIL
Brother Holders
REFRIGERATE
SPROUTS
TRASH LINERS
BOEKEL


Collected Water to Pump


Pressure Guage
0
5
10
15
20
25
30
35
40
45
50
55
60
psi

etri Dish
Contains 100 Disposable
Dishes, 50x9mm
For Bacte
Membrane
FLAT RATE
BOX
TRY FREE
CARRIER PICK-UP
ups.com/pickup
142 mm filter holder

Mesh on filter holder
For Bacterial Analysi
Membrane Filter (MF)


Placing Filter on Mesh

Filter in Place
For Bacterial
Membrane Filter
TRY FREE
CARRIER PICK-UP
ULINE

Putting Cover On

Pumping Started

Putting Filter (Sample) in Bag

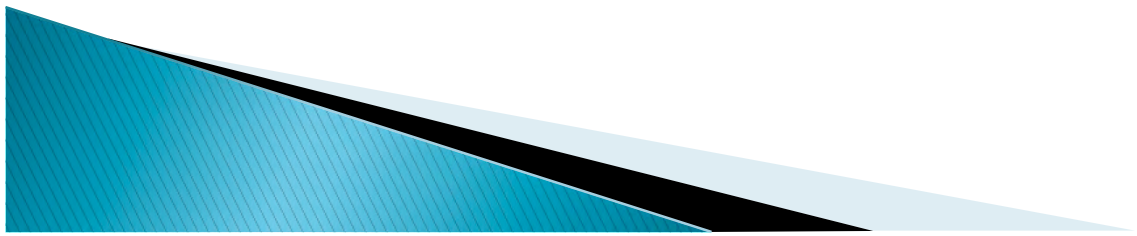
Filter Ready to go to Lab

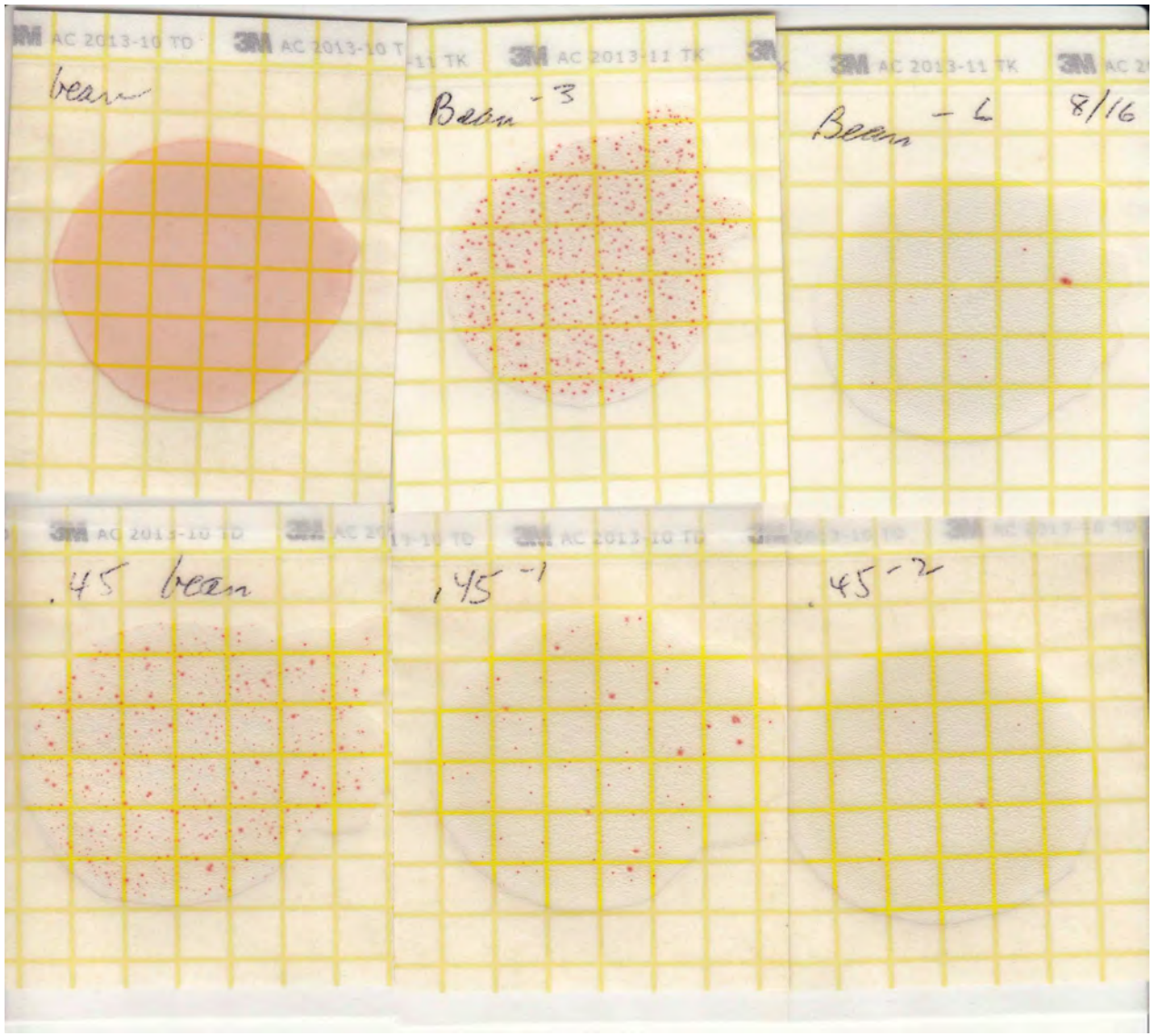
Challenges and unknowns

-sprout water is difficult to filter: contains exudates from the seed that clog the filter

So, several stages, with finer pore size, are required. These different filters can be stacked in the filter holder (up to a point?) to minimize the number of runs through the filter

The final filter needs to be .45 micron (smaller than most microbes)




Beam
Beam - 3
Beam - 4
8/16
.45 Beam
.45 - 1
.45 - 2

10 liters of 48 hr bean sprout or pea shoot water are relatively easy to filter down to.45 microns. (4 stages)

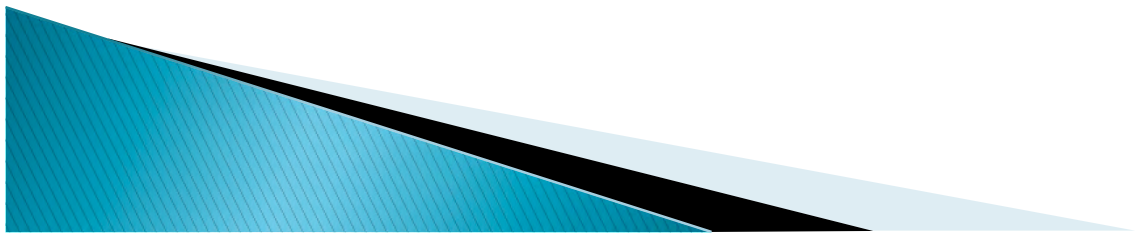
10 liters of 48 hr alfalfa are very difficult.

Still working on the right sequence of filters.

(5 or more stages)

Other questions:

Since the process concentrates all organisms, will this create too much “background” for enrichment and testing? –Some evidence that it won’t.

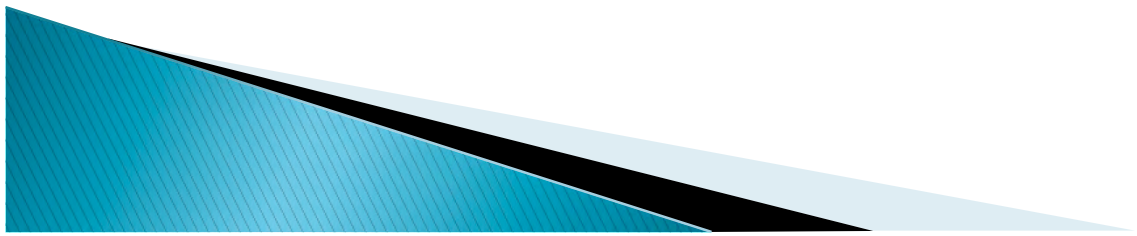


Questions, cont…

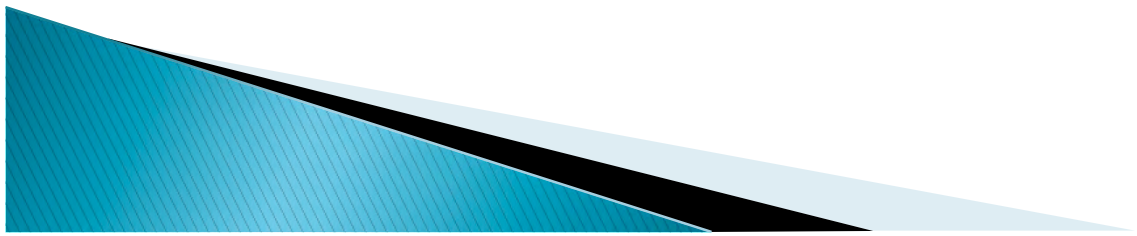
-Are there safety problems with this method?

-Greater likelihood of cross-contamination (false positives)?

-Likelihood of getting positives that pose no health risk, but require disposal of product?

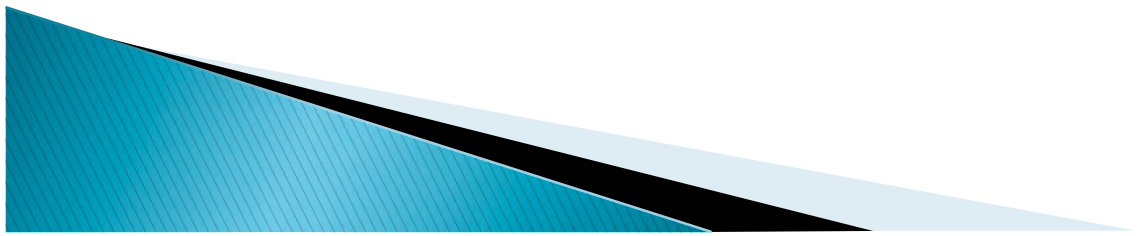
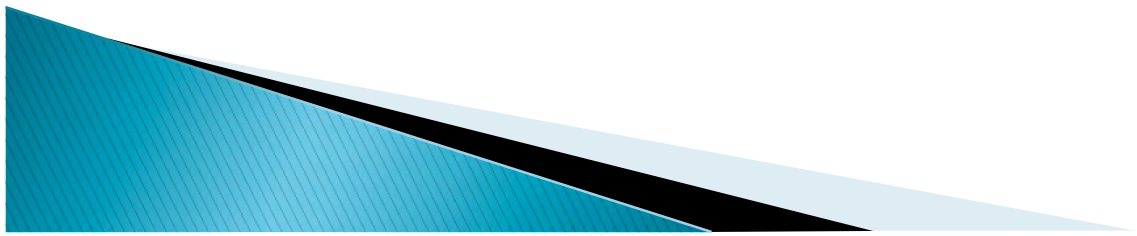


- If the bugs are worked out, could filter-concentration be a simple, practical, affordable procedure for sprout producers?



Evaluating alternative treatments

How's it going?



- Appendix A: Anti-microbial treatments for sprouting seeds
- For each treatment, list the contact information, name, address, phone number & email address for the (point of contact POC).
- Hot water treatment (Bari et al. 2008. JFP, 71, p830-834); pilot scale validation (Bari et al. 2010, JFP, 73, p752-757)
- 2000 – 20,000 ppm calcium hypochlorite treatment (Montville and Schaffner, 2004, JFP, 67, p758-765); commercial scale evaluation (Brassica/IEH report to be published)
- Peroxyacetic acid or Tsunami 100 (10,000 – 30,000 ppm); commercial scale evaluation (Buchholz and Matthews, 2010, Lett Appl Micro, p462-468) Has this been approved by EPA for use at 10,000ppm?
- Levulinic acid and SDS; commercial scale evaluation (Zhao et al., 2010, 73, p2010-2017) Does this have regulatory approval, is the mixture commercially available, and is it able to be used on organic seeds?
- Acidified sodium chlorite (Liao, 2010, JFS, 74, p M159-M164) EPA approved up to 1500ppm (use at 800ppm)
- Germin-8-or = (Keeper by BioCide) Chlorine Dioxide -EPA approved up to 1500ppm (use at 200ppm) – NOP approved (http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5091703)
- Fit (Beuchat et al., 2001, JFP, 64, p152-158) GRAS (A product that is GRAS for certain uses can be used as GRAS for other processes by self-determination.)
- Gaseous Acetic Acid, (Delaquis et al JFP, Vol. 62, No. 8, 1999, Pages 953-957)
- Fumigation with Ammonia (Himathongkham, JFP Vol. 64, No. 11, 2001, PPs 1817-1819)