

Making  
the  
RC Spray System **V2**  
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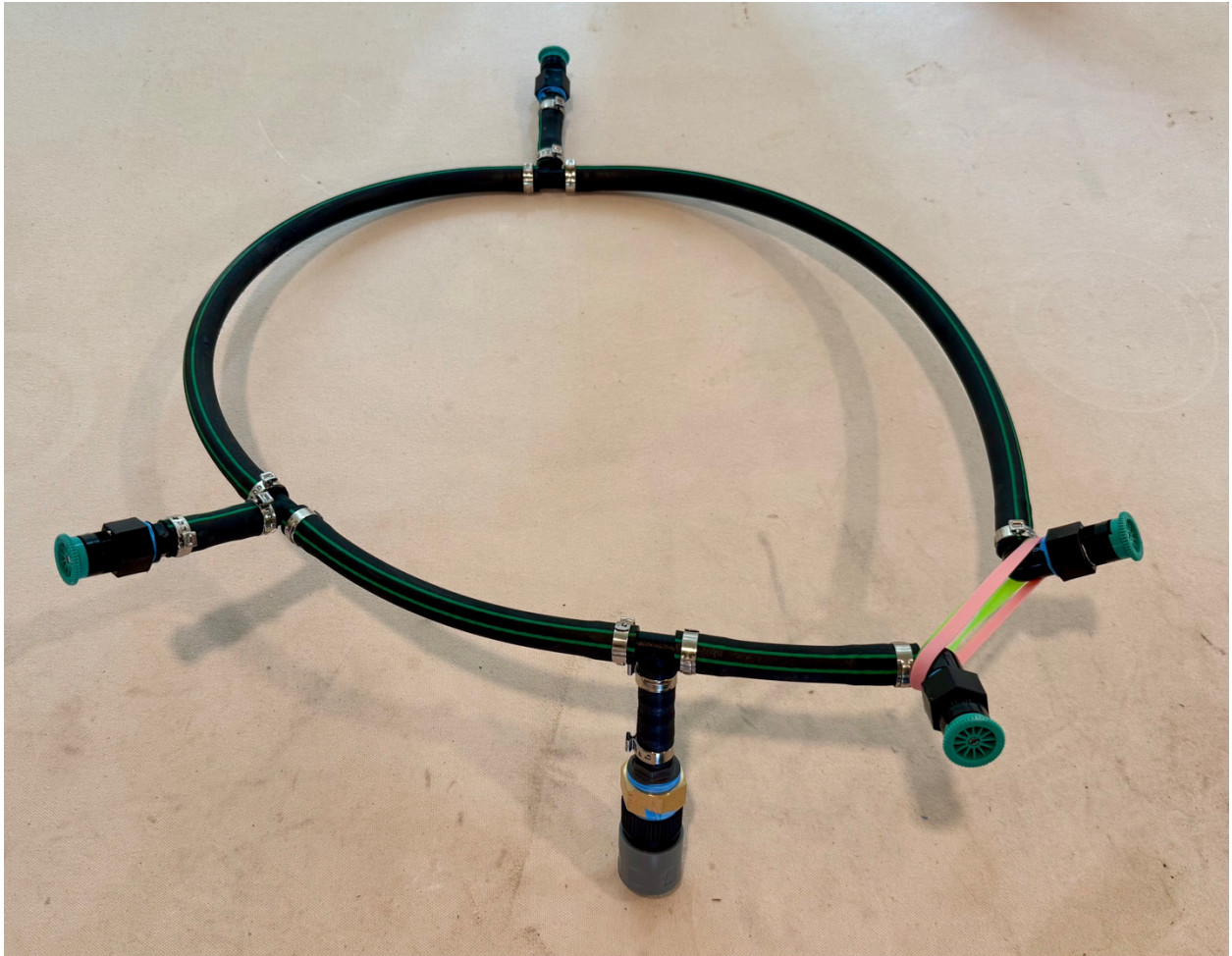


# Making a Coconut Tree Halo and Pump Cart RC (Ricordi/Cannon) Spray System by Brown Cannon

The RC Spray System was created through a collaboration between Alberto Ricordi and Brown Cannon. We developed the system to apply products to coconut tree fronds and hearts to repel coconut rhinoceros beetles. I'm presently using a 2.5% to 3% solution of basil oil mixed with other ingredients in the following proportions. The 3% mixture consists of 1 gallon of water, 4 ounces of basil oil, 1 ounce of Neem Oil and 1 ounce of Dawn dish soap. One gallon of the mixture applied every other week should protect 8 to 10 trees. Presently I have about thirty trees fitted with the system; twenty are on the North Shore. I'm cautiously optimistic the system will work. Nothing we have created is proprietary. Everything is experimental and everything can be improved upon. Combating the beetle will require all of us on our Hawaiian Islands to collaborate and find ways to manage this invasive pest. In 2013, when the beetle first arrived, pesticides would probably have eliminated the problem as the beetles were confined to a very small area, but to think pesticides are the answer today is folly. Injecting trees twice a year, for the foreseeable future, could create an environmental disaster. We need to be thoughtful, but we need to act quickly. Please join us and help create a groundswell of innovation. We can figure this out.



## RC Spray System Halo



The RC Spray system halo is made using the following components:

- RainBird Swing Pipe
  - All the flexible black pipe used in the construction of the halo is RainBird Swing pipe
- One Quick Coupler
- Four Spray Nozzles
- Fourteen 17.8mm-21mm stainless ear clamps

Start by assembling the quick connect coupler:



Parts list from left to right:

- FPA-075 .75" Funny Pipe Adapter MPT (**A**).
  - Pacific Pipe, Honolulu
    - \$.39/unit
- AP-106 .75" x .75" Swivel ADP FIPT x FHT (**B**).
  - Drip Depot (online)
    - \$2.93/unit
- Liulo Tool 3/4" Plastic Water Hose Fitting Male and Female (**C**).
  - Amazon
    - \$1.20/unit
- Brass .75" GHT Male x .75" NFT Female (**D**).
  - Amazon
    - \$2.15/unit
- FPA-075 .75" Funny Pipe Adapter MPT (**A**)
  - Pacific Pipe, Honolulu
  - \$.39/unit

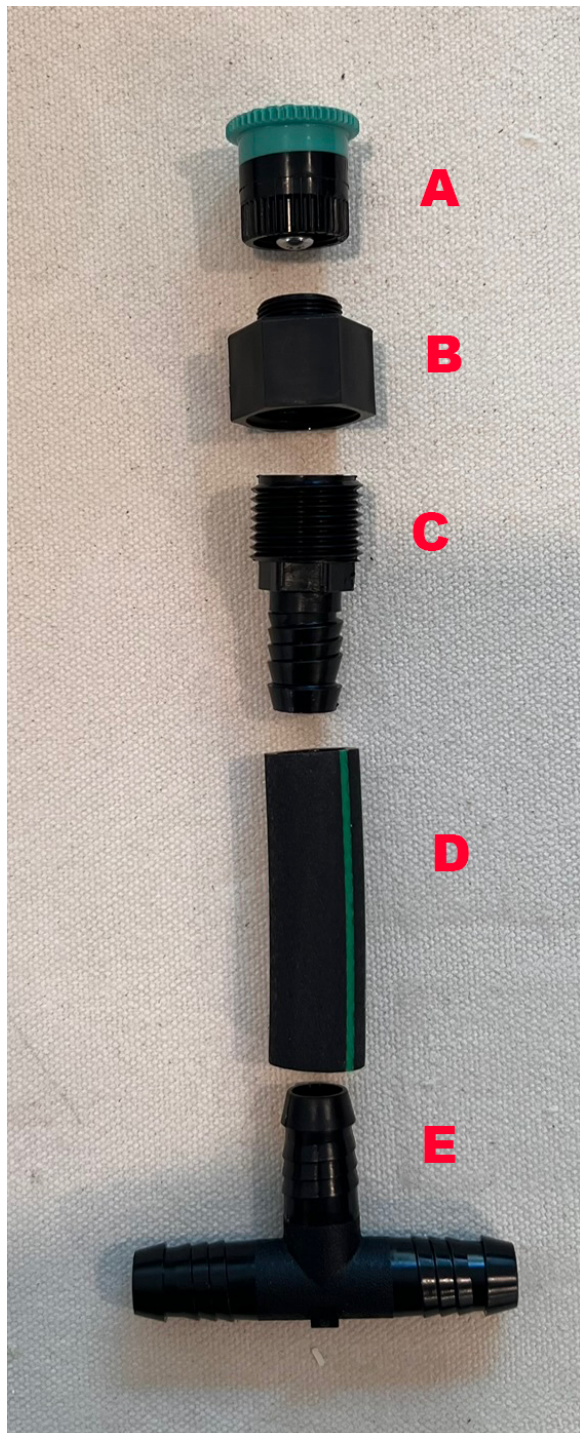


Assembling from left to right, make two of the quick connects:

1. Attach **A** to the pipe thread end of **B**. Use seven wraps of Teflon tape and attach snugly.
2. Attach the male end of **C** to the hose thread end of **B** making sure there is a washer in place in **B**.
3. Attach the male end of **D** to the female end of **C**, making sure there is a washer in **C**.
4. Finally, wrap the second **A** with seven wraps of Teflon tape and attach it to the female pipe thread end of **D**.

Use a pair of dykes (pilers) with a long nose to cut out the backflow preventer in all the quick couples. **This helps with the flow and eliminates an O-ring that will deteriorate in the basil oil.**

Next, assemble **two** Spray Nozzle Units:



Parts list from top to bottom:

- Hunter 4A 4' Nozzle ADJ 0-360 DEG (**A**)
  - Pacific Pipe, Honolulu
    - \$.93/unit
- PSA-M Plastic Shrub Adapter (**B**)
  - Pacific Pipe, Honolulu
    - \$.38/unit
- FPA-0500 .50" Funny Pipe Adapter MIPT x INS 3400-005 (**C**)
  - Pacific Pipe, Honolulu
    - \$.39/unit
- RainBird Swing pipe (**D**)
  - Pacific Pipe, Honolulu
    - \$24.03/100 feet
    - \$.24/foot
    - \$.02/inch
- 1/2" Funny Pipe T (**E**)
  - Pacific Pipe
    - \$.49

Assembling from top to bottom and make four Spray Nozzle Units.

- Screw on **A** to a Teflon taped **B**.
  - Fold a strip of Teflon tape in half and wrap it once around the threaded end of **B**.
  - Screw on **A** snugly.
- Next wrap the threaded end of **C** with 7 wraps of Teflon tape and screw it into **B**.
- Cut a 2 1/4" piece of Funny Pipe **D** and insert it on the end of **C**. A rubber mallet is helpful.
- Insert the other end of the 1/2" Funny Pipe **D** onto the "T" **E**.



Next, assemble two End Spray Nozzles



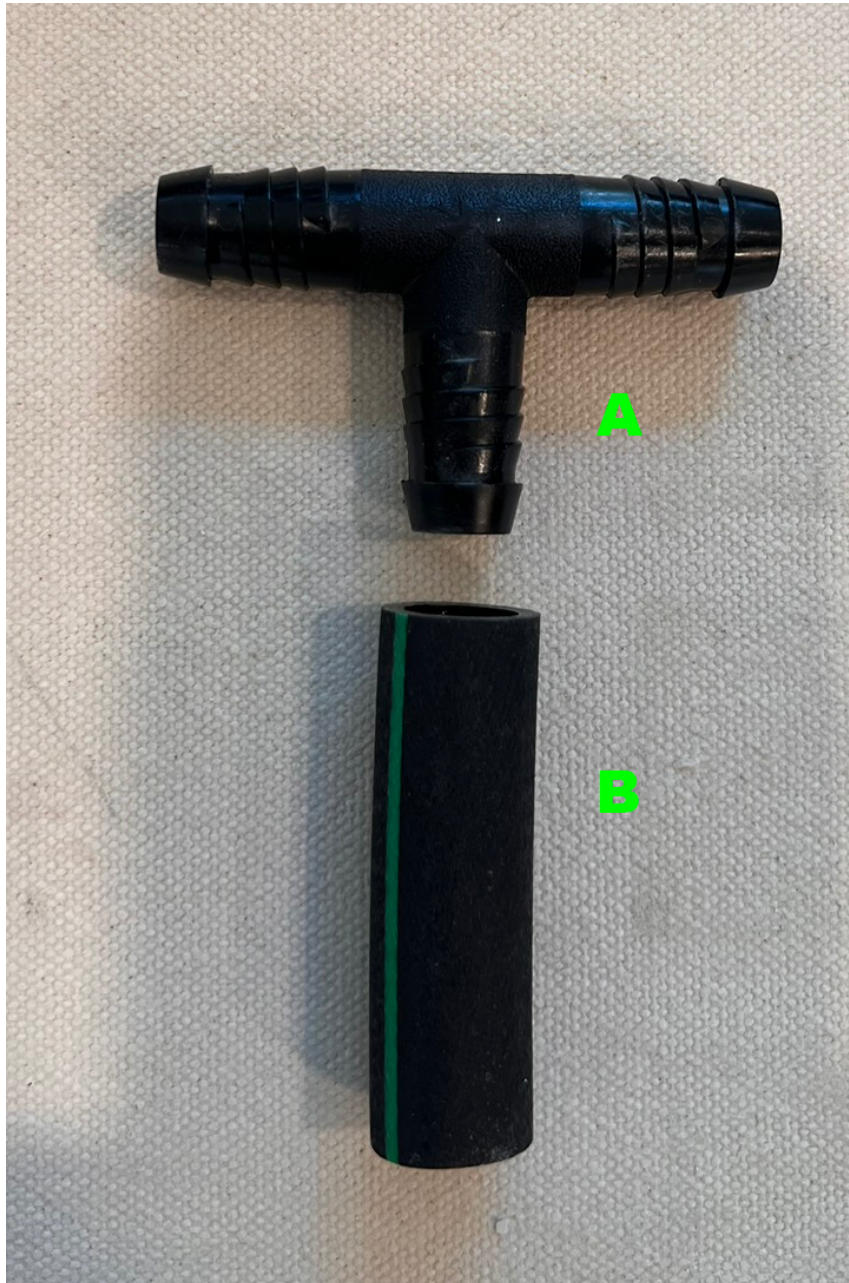
This takes the place of a quick couple and is joined by two silicone rubber bands ( purchase at Amazon).

Use Teflon tape to wrap the treads.

One of the sprayers should be angled further back to allow the spray to be arced up and into the palm heart.

I don't have the part number for the end pipe fitting, but they can be purchased at Pacific Pipe.

## Connection to Tree Hose



From top to bottom the parts for the connection from the halo to the Funny Pipe running down the coconut tree.

- 1/2" Funny Pipe "T" (A)
  - Pacific Pipe
    - \$.39/unit
- RainBird Funny Pipe (B)
  - Pacific Pipe
    - \$24.03/100 feet

Assembling from top to bottom

1. Cut a piece of Swing pipe B 2 1/4" long and insert the center of the "T" A into the pipe B.









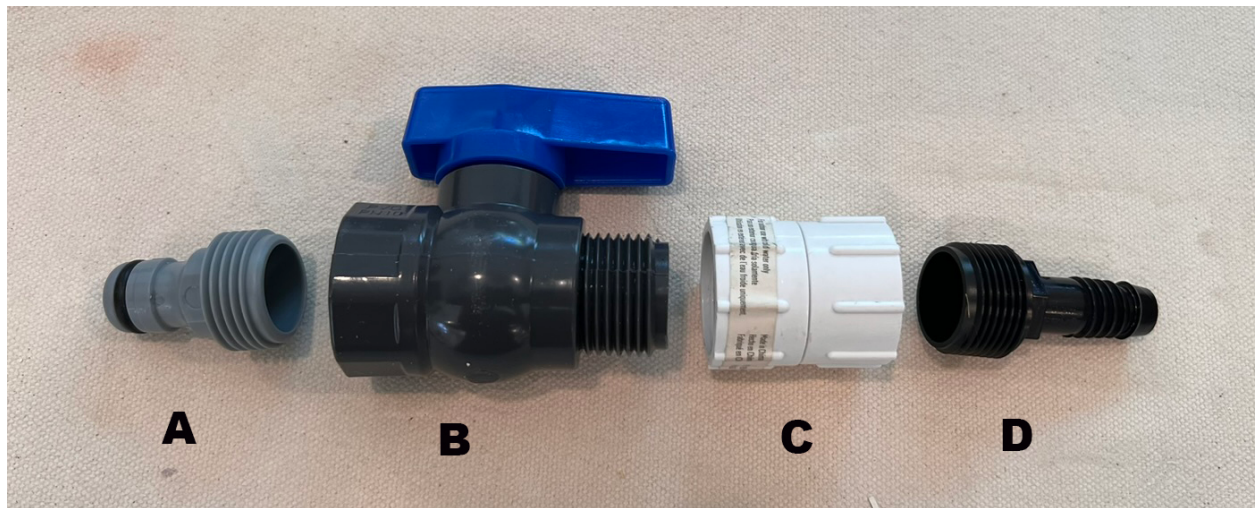
Sprayer angles.

You are now ready to assemble the halo.

1. Cut a 52" length of Swing pipe.
2. Now cut the 52" length into thirds (about 17" each).
3. When adding fittings to the pipe make sure the green lines are pointed up and the arc of the pipe remains circular.
4. Start by inserting one of the End Spray Nozzles into the beginning end of a 17" pipe piece and add two clamps loosely to the swing pipe for later tightening (optional).
5. Next install a Spray Nozzle Unit.
6. Add another 17" length of swing pipe with ear clamps loose on the pipe.
7. The spray nozzles should lay back about 30 to 40 degrees and then adjusted later with water at pressure.
8. Attach the next Spray Nozzle Unit with loose clamps and another 17" of swing pipe with loose clamps.
9. Cut the last 17" swing pipe about 13" from the Spray Nozzle Unit and attach the Tree Hose Unit so it will point down the tree. Again, add ear clamps loosely to the hose.
10. Attach the quick coupler unit to the Tree Hose unit.
11. This should leave you with about 4+" of swing pipe to terminate the ring system. At the end of the pipe, you install another End Spray Unit. One of the End Spray Units will point up at a greater angle to spray the tree heart.
12. After you have used your pump with water to test the sprayers for the correct arcs, you then tighten all the ear clamps.



Terminating the hose at the bottom of the coconut tree.



Parts for the hose termination valve left to right.

- Male end of the Liluo Tool 3/4" Plastic Water Hose Fitting Male (A).
  - Amazon
    - \$1.20/unit
- 3/4" GHT Heavy Duty Plastic Garden Hose Shut Off Ball Valve Standard Water Shut-Off Ball Valve (B)
  - Amazon
    - \$2.50/unit
- AP-106 .75" x .75" Swivel ADP FIPT x FHT (C).
  - Drip Depot (online)
    - \$2.93/unit
- FPA-075 .75" Funny Pipe Adapter MPT (D).
  - Pacific Pipe, Honolulu
    - \$.39/unit

## Assembly of Hose Termination Valve:

1. Screw in male end of the quick connect adapter **A** to the female end of the ball valve **B**, making sure the washer is inserted into the ball valve **B**.
2. Attach the hose pipe end of **B** to the hose pipe end of **C** making sure the washer has been inserted.
3. Apply seven wraps of Teflon to **D** and screw it on snugly to the pipe thread end of **C**.
4. If you are using the heavier blue Teflon tape, 5 wraps will be enough.

You are ready for a climber to install the halo and pipe down the tree. The pipe down the tree will be part of a role of 100' of Rainbird Swing Pipe. Once the climber gets the halo situated, he can use two silicone rubber bands to complete the circle. The bands will allow the circle to expand. As the climber goes down the tree, he attaches the pipe with a 1/2" pipe strap clamp and two screws. I have made the top pipe strap clamp tight fitting so it will hold the halo in place. I used a spacer of Duct Tape for this purpose. Every six feet or so, the climber can add a 1/2" pipe strap clamp with screws to secure the pipe loosely down the tree. The pipe needs to be loose so it can freely move up as the tree grows.




## Battery Powered Spray Cart



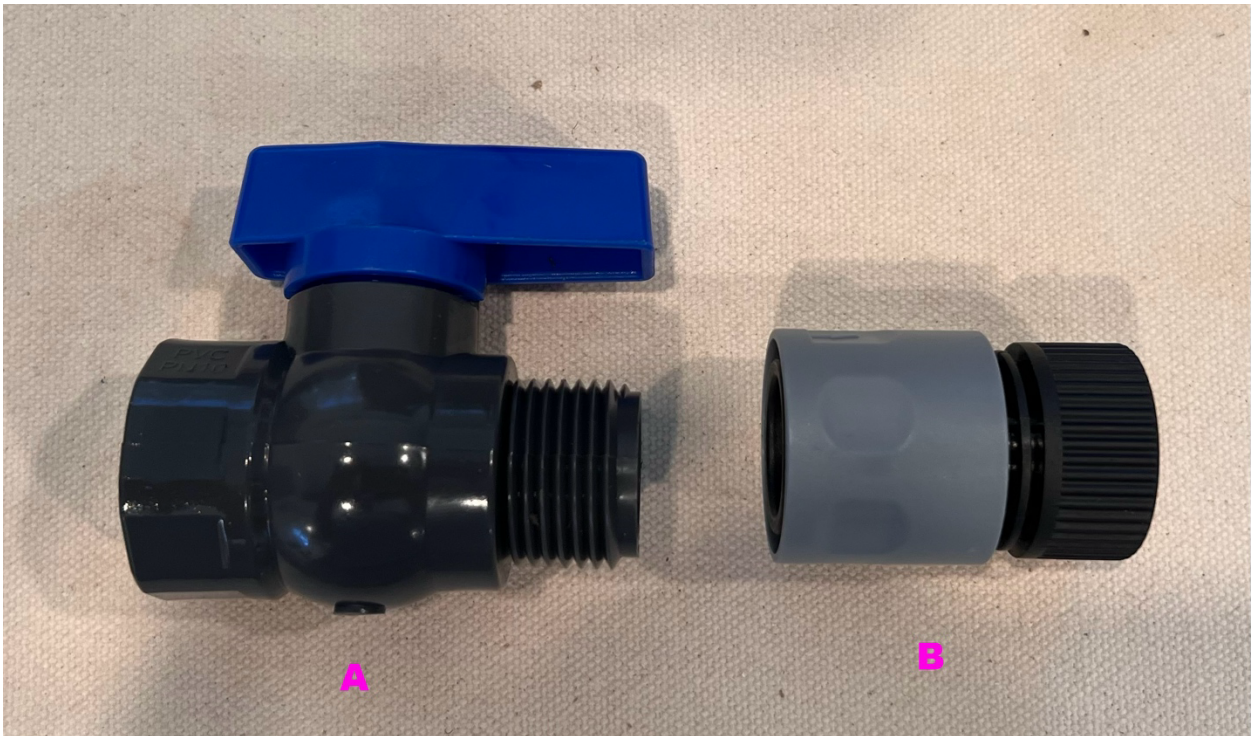
## Spray Cart Parts and Design

The RC Spry Cart is made using the following components:

- Gorilla Cart
  - Home Depot
    - \$149
- Rubber floor mat
  - Lowes
    - \$15 for 1/2 of a matt
- **Shurflo 5059-1310-D011 5.3 GPM Automatic Demand 12V**
  - Amazon
    - 
- Mxuteuk 8FT SAE 16AWG Wire Harness with On/Off
  - Amazon
  - \$27.20
- 12V Lead Acid battery (deep discharge)
  - Auto Parts Store
    - \$200
- Buckets
  - Home Depot
    - \$10
- **Horiznext rain Barrel Spigot kit, Brass GHT 3/4 Water tank Faucet, Bulkhead Valve for 5-gallon Bucket spigot rainwater Drum 55-gal Container downspout Collector in Garden**
  - Amazon
    - \$6
- Hose & Reel
  - Home Depot
    - \$35

- Garden Hose Splitter High Flow, 3/4" GHT Inlet Brass Heavy Duty Hose Diverter 2-Way Full Flow (better than the one in the photo)
  - Amazon
    - \$20.69
- I have attached the pump, battery, valve and hose reel using zip ties.
- Different size barrels can be used for different properties. A 5-gallon bucket works well for a few trees, or a 10-gallon Brute trash can work for larger properties with more trees.
- A 3/4" hole saw is the correct size for the rain barrel spigots.

## Pump Hose Termination Valve



### Parts for the Pump Hose Termination Valve:

- 3/4" GHT Heavy Duty Plastic Garden Hose Shut Off Ball Valve Standard Water Shut-Off Ball Valve (A)
- Liulo Tool 3/4" Plastic Water Hose Fitting Male and Female (B)

### Assembly of the Termination Valve:

1. Attach A to the male end of the hose coming from the DC water Pump, making sure the washer is in place.
2. Attach B to A making sure the washer in B is in place. Snug everything up tight.

This assembly will quick couple onto the end of the hose termination fitting running down the coconut tree from the halo.





Pump Assembly

From Left to Right:

- The female end of the hose from the bucket (the bucket hose has two female connections) attaches to a brass fitting that is a 3/4" male hose thread to a female 1/2" pipe thread. Use plenty of Teflon tape on the pump male 1/2" pipe thread.
- I didn't use the pump filter on this version of pump.
- On the outlet side of the pump there is a brass female 1/2" pipe thread to a male 3/4" hose thread. Attach a two-way brass valve to the 3/4" hose thread and anchor it down zip-ties
- Once the halo is installed and the tree is fitted with the Swing pipe, it's time to start pumping 2 1/2% -3% basil every two weeks. Here are my thoughts on how the system will be best used to accomplish the task. This looks intimidating, but once you understand the flow, hoses and valves, it's simple.

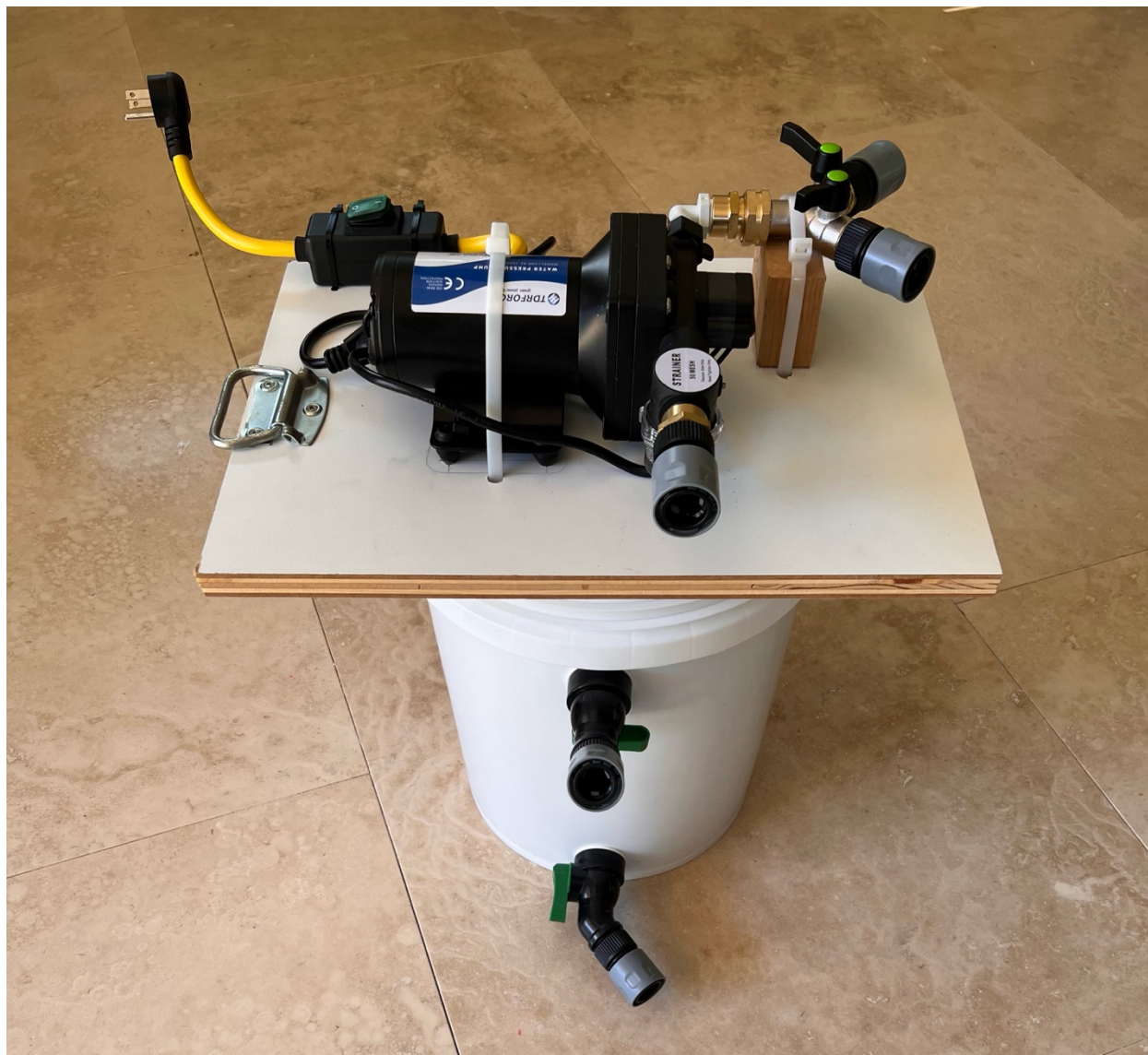


- Pumping instructions

Once the halo is installed and the tree is fitted with the Swing pipe, it's time to start pumping 3% basil every two weeks. Here are my thoughts on how the system will be best used to accomplish the task. This looks intimidating, but once you understand the flow, hoses and valves, it's simple.

1. Mix a three-gallon batch of 3% basil oil and add Neem oil for a sticker and Dawn liquid for an emulsifier. The ratio is 4:1:1 per gallon (4 oz. basil, 1 oz. Neem, 1 oz. Dawn per one gallon water. Recently I have gone to a 3:1:1 thinking too much basil might overwhelm a damaged tree. Also, it would be better to spray in the evening so direct sunlight doesn't cause any burning of the tree fronds.
2. Attach the hose from the pump to the tree and open the two valves at the tree.
3. **Keep the valve from the pump to the tree closed** and open the valve on the bucket with the basil mixture. Make sure the valve going to the overflow is closed.
4. Attach the battery cable or extension cord and begin **and turn on the power. Slowly open the pump valve to the tree. Too much pressure can pop fittings.** Once the fluid reaches the sprayers, close the valve.
5. Slowly open the valve back up until it is spraying a nice arc into the heart of the palm.
6. **After the tree has been sprayed,** disconnect the power and open **both valves.** This allows the remaining liquid in the tree pipe to drain back into the overflow bucket.
7. **Close both valves on the pump.**
8. Close both valves at the tree, uncouple the pump hose and move to the next tree.
9. **Hook up to the next tree and start the process over.**

## Pump Assembly #2



This is a pump system designed for homes with limited space and only a few trees.

The pump has three features:

1. The pump platform
2. The hoses
3. The 5-gallon spray bucket and an overflow bucket (not shown)



#### Pump Platform Part's List

- Pump (**Remco 5.3 GPM pump 5537-1E1-58C**)
  - Amazon
  - **\$244.00**
- Valve and wood brace (Dingabi Brass 2-Way Valve)
  - Amazon
  - \$20.69
- 3 Quick Connects (Liulo quick connects)
  - Amazon
    - \$8.50 set of 8
- Switch (Dealtus waterproof)
  - Amazon
    - \$15.00

On an 18" X 13" board attach the pump assembly.

### The Hoses

- Purchase two 25' hoses. Keep one hose full length and cut two lengths off the second hose.
  - Cut one 15"
  - Cut one 45"
    - \$30
- The long hose will have a male and female end quick couple.
- Each of the two short hoses will have two male ends.
- You will need to purchase three female hose repair ends to attach to the short hoses.

### The 5-gallon spray bucket

- 5-gallon bucket
  - Home Depot
    - \$6.00
- Through bucket valves (**Unede ¾" Brass Water Container Rain Barrel Faucets Spigot**)
  - Amazon
    - \$10.00

Use a 3/4" hole drill and drill the 5-gallon bucket for the two valves, top and bottom. Screw on the female end of the quick coupler to the through valves.

Use a pair of dykes (pilers) with a long nose to cut out the backflow preventer in all the quick couples. You want fluid to be able to flow in both directions.



## Operating the Pump

- Mix your spray formula and stir it well with a paint mixer and drill.
- Attach the two shorter hoses to the bucket using the quick couples
- Plug pump to power
- Open all valves except the short hose returning to the bucket. This is the valve on the left side of the 2-way brass valve as you look out from the pump.
- Run the hose to the tree and hook up the quick couple to the tree hose and open both valves at the tree.
- Turn on the pump and let it run until you see spray coming out of the halo.
- Once spray starts quickly close the valve on the brass 2-way.
- Slowly open the valve back up until it is spraying a nice arc into the heart of the palm.
- Continue for a few seconds, shut the valve off and repeat two more times. This gives the tree an adequate amount of spray.
- The pump motor is still on but not running because all the valves are off and the motor has built up pressure that causes the motor to turn off.
- Turn the switch to off on the motor.
- Open the valve on the short hose that goes back to the top of the 3-gallon bucket and then open the valve on the hose to the tree. All the unused fluid from the tree hose will flow back into the bucket. Once it quits flowing, you can shut both valves on the 2-way brass valve to off.
- Go to the tree and close the two valves.
- Attach the hose to a second tree. Turn on the valves at the tree and start the process over.

## Cleaning the pump and hose system

- Once you have completed spraying and drained the hose from the last tree, close all the valves.
- Empty the remaining contents of the spray bucket into another container. You can use the motor to do this or disconnect the two quick couple hoses and dump the bucket contents. Reattach the spray bucket.
- Add a few drops of Dawn dish soap to the spray bucket **with ½ cup of vinegar** and if you have warm water available fill the spray bucket to half with warm water. If warm water isn't available, cold will work
- You are going to use this soapy water to wash out the pump and hose
- Open all the valves on the pump and bucket. Direct the end of the long hose going to the tree back into the spray bucket and start the pump. You should now be cleaning the hose and pump with a continuous wash of water. Run the pump for a minute or two. Repeat this a couple of times with fresh water, **vinegar** and soap. This process should increase the life of the pump, valves and hoses. Finally, rinse with fresh water.

## Alternate Methods of Construction and Operation

The construction and operation of the halo and pump may seem intimidating. Have someone make the components and ask your yardman to pump once every two weeks or whatever frequency you determine is the most effective. I have found that the actual pumping only takes a few minutes per tree once the system is in place and the pump is understood.

At the present time, a mixture of 4:1:1 ounces of basil oil, Neem and Dawn to a gallon of water is my choice based on my research. My research indicates, this is the best and least environmentally invasive option to repel the beetle. These recommendations could change over night as more people discover effective, environmentally safe alternatives. The delivery system itself should continue to work with other spray formulas.

I have learned that the basil oil will cause rubber products to deteriorate. Wash well after each use with two rinses of soapy water and one Rinse of fresh water.

I'm starting to use pumps and O-rings made from Viton to reduce the corrosive effect of the basil oil. My cheaper water transfer pumps didn't hold up to basil oil.

Here are some observations after six months of spraying:

- This system takes a lot of work. It is not a plug and play.
- A 2.5% to 3% solution of sweet basil oil is corrosive to rubber products over time.
- Timming is everything. If you get a heavy rain the day after spraying, you may need to repeat the spraying sooner than two weeks.

- Trying to get a day with no rain and reasonable winds on the north shore can be a challenge.
- I believe basil oil is a beetle repellent, but if you're too late to the party and the trees have reached a level of medium to heavy damage before you start spraying, you may chase the beetles away, but your trees may be too sick to recover.
- Trees seem to survive beetle attacks better if they haven't been heavily trimmed. However, untrimmed trees can be a huge liability issue so use your best judgement on this one.
- I will be spraying trees in East Honolulu where trees have not been attacked so far. I believe this is my best chance to prove that basil oil sprayed twice a week will deter beetle infestations. I'm sure the beetle will be in our hood shortly but I'm hoping early spraying will protect some trees.
- If you decide not to do anything to aggressively fight the beetle at least water your trees and fertilize them. Let them fight the fight with health on their side.
- In case you haven't figured this out, everything in red is a change to the equipment or new findings.