Pitcher Drip Irrigation

A major advance in drip irrigation using clay pots

Dr Bernie Omodei
Measured Irrigation
5/50 Harvey Street East, Woodville Park SA 5011
Mobile 0403 935277
Email bomodei@measuredirrigation.com.au
Website www.measuredirrigation.com.au

January 2025

Pitcher ready to be buried

Pitcher Drip Irrigation Controller

Contents

2. How to make DIY low cost pitchers

Small pitcher made from two 9cm terracotta pots (AU$1.27 each at Bunnings)
Medium pitcher made from two 12cm terracotta pots (AU$1.76 each at Bunnings)

Step 1. Select two identical unglazed terracotta pots and seal one of the drain holes (for example, use silicone adhesive or masonry adhesive)

Step 2. Apply a bead of silicon sealant or masonry adhesive to the rim of the pot with the sealed drain hole

Step 3. Carefully position the upper pot directly above the lower pot

Step 4. Gently press the pots together and allow 24 hours for the sealant to cure

Connect a 13mm barbed poly tee to the pitcher using a 13mm rubber grommet. A 13mm rubber grommet requires a 16mm hole. Attach an 8cm length of 13mm polypipe to provide an air inlet/outlet for the pitcher.

2. Installation of the Pitcher Drip Irrigation Controller

Select a drip irrigation zone where all the plants in the zone have the same irrigation requirement.

Installation when each plant is watered by a single dripper.

1 Select a typical dripper and replace it with a subsurface pitcher. Note that the corn seedling will draw more water from the pitcher as the corn grows.

.

`

2 Connect the pitcher to the controller so that water can flow from the controller to the pitcher.

3 Connect the water supply for the zone to the inlet of the controller
(at least 5 kPa pressure).

4 Connect an irrigation dripper inside the controller.

5 Connect the irrigation application to the outlet from the controller

6 Turn on the water supply and all the plants will be watered automatically with the water they need and without power.

Installation when each plant is watered by multiple drippers.

1 Select a typical plant and replace the drippers dedicated to the plant with subsurface pitchers. Connect the pitchers to the controller.

2 Connect the water supply for the zone to the inlet of the controller (at least 5 kPa pressure).

3 Connect irrigation drippers inside the controller, one for each pitcher.

4 Connect the irrigation application to the outlet from the controller

5 Turn on the water supply and all the plants will be watered automatically with the water they need and without power.

3. How to use the Pitcher Drip Irrigation Controller

The discharge from each dripper during an irrigation event is the same as the average on-demand discharge from the subsurface pitcher (or pitchers) since the previous irrigation event.

If any plant irrigated by a subsurface pitcher (or pichers) starts to look unhealthy, move the subsurface pitcher (or pitchers) to a healthy plant.

Use mulch to reduce evaporative losses.

In order that Pitcher Drip Irrigation is effective, it is important that the subsurface ptchers provide water to the dedicated plants only. To prevent a subsurface pitcher from providing water to other plants, you could install a subsurface barrier to exclude foreign roots.

Circular barrier before it is buried

Circular barrier after it is buried

If you decide that your plants are receiving too much or not enough water, you can adjust the water usage rate by replacing the irrigation dripper inside the controller by the adjustable dripper provided. If your plants are receiving too much water, increase the flow rate of the adjustable dripper. If your plants are not receiving enough water, decrease the flow rate of the adjustable dripper.

4. Key features

1. All plants in the zone should have the same irrigation requirements
2. All plants in the zone are irrigated by the same number of drippers
3. Unpowered (no batteries, no solar panels, no electronics, no computers, and no WiFi)
4. Use for subsurface or surface drip irrigation
5. Use pressure compensating (PC) drippers or non pressure compensating (NPC) drippers
6. The water supply pressure should be at least 5 kPa
7. Provided the water supply pressure is at least 10 kPa, you can deliver water by gravity feed to at least 400 2 L/H drippers (2 L/H @ 100 kPa) on level ground
8. The water usage is controlled by the demand from the plants
9. The discharge from each dripper during an irrigation event is the same as the average on-demand discharge from the subsurface pitcher (or pitchers) since the previous irrigation event
10. As the water needed by your plants changes as the plants grow, the discharge from each dripper during the irrigation event adjusts automatically
11. The water usage increases significantly during a heat wave
12. Water in the controller is protected from debris, algae, mosquitoes and thirsty animals
13. Provided the water supply is continuous, you can leave your irrigation application unattended for months on end
14. A tap timer may be used so that irrigation is only available between sunset and sunrise

5. Conclusion

The technique of using pitchers to water plants has been known for at least 2000 years. It is well known in India where it is called pitcher irrigation. Round porous clay pots are buried into the soil near the crop and filled with water. The water seeps out slowly through the porous walls of the pot and reaches the roots of the plants. As the plants consume the water, more water will seep out from the pot.

A major advance in drip irrigation can be achieved by integrating drip irrigation and pitcher irrigation. This remarkable irrigation technology is called **pitcher drip irrigation.** Compared with the most sophisticated drip irrigation technologies, pitcher drip irrigation is far more water efficient and at a fraction of the cost.

Conventional drip irrigation controllers are either sensor-based or weather-based. The most water-efficient sensor-based controllers use expensive soil moisture probes to determine the start time and the run time of next irrigation event. With pitcher drip irrigation the soil moisture probes are replaced by a Pitcher Drip Irrigation Controller. Instead of using soil moisture to control irrigation scheduling, plant demand for water is used.

As the crop grows, the demand for water will also grow, and so the crop can be left unattended throughout the growing season.

Conventional weather-based irrigation controllers use reference evapotranspiration data from the Bureau of Meteorology to determine irrigation scheduling. This means that the water usage needs to be adjusted whenever the crop coefficient changes. There are 2 major disadvantages of weather-based irrigation controllers.

- The weather conditions at a weather station of the BOM may differ significantly from the on-site weather conditions.
- To determine the water usage required by your crop at its current stage of growth, the reference evapotranspiration *from* the BOM is multiplied by your best estimate of the crop coefficient. The irrigation scheduling needs to be adjusted manually as the crop grows and the crop coefficient changes. Furthermore, the theoretical evapotranspiration is a crude estimate of the actual evapotranspiration.

For pitcher drip irrigation, the irrigation scheduling is controlled by the water demand of the plants, and so the two major disadvantages of weather-based irrigation controllers become irrelevant.

For drip irrigation or crops, pitcher drip irrigation may be the most water-efficient and cost-effective technology ever.