Performance of Drip Irrigation Emitters at Sub-Standard Pressure

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Introduction
Low Pressure Drip Irrigation

• Initial interest:
  – International Development Enterprises (IDE)
  – Low tech, low pressure system used to irrigate small garden plots in developing countries
Would such a system find acceptance and be useful for irrigating potential gardens at remote home sites on the Navajo Reservation that lack access to pressurized water.
Demonstration and Research Project: NMSU Agric. Sci. Center - 2004

- Materials provided by IDE
- Supplemental funding: US BOR - WCFSP
- Objectives:
  - Evaluate system
  - Determine irrigation requirements of various vegetable crops
  - Serve as demonstration to interested farmers/gardeners
NMSU - ASCF
Location and description

- **SW of Farmington** just inside the Navajo Reservation on east-central portion of the CP
- **Area of ASCF:** 254 ac
- **Elevation:** 5640 ft
- **Avg. Ann. Precipitation:** 8.1 in
- **Avg. consecutive frost-free days:** 162 (42 yr. avg.)
- **Predominate Soil Classification:** Typic Camborthid, fine loamy, mixed, calcareous mesic family (sandy loams to loamy sands)

http://library.nau.edu/speccoll/exhibits/belknap/cpmap.html
Typical Setup:

- Chile peppers
- Tomatoes
- Sweet corn
Thin-walled polyethylene tape

Single overhand knot

Microtubule
Overall Evaluation

• System is relatively inexpensive and functioned fairly well, but:
  – PE tape was flimsy and broke down in sunlight after a few seasons.
  – Manufactured in India.
    • Not readily available.
    • Cost savings for components neutralized by shipping costs.
    • Some problems with algae buildup in microtubules.
New Study Initiated (2009)

• How would more readily available drip components function at the low (substandard) water pressure typical of that provided by low elevation tanks (e.g. those in truck beds, trailers, rainwater catchment systems, etc.)?
Concerns

• The pressure provided to a drip system emitter (dripper) by the height of the water level (or head) in a low elevation vessel is lower than that recommended by drip emitter manufacturers:
  ▪ Pressure (psi) = height of water level above emitter (feet) x 0.433
    (or 2.31 feet of head provides 1 psi of pressure)
  ▪ Manufacturer recommended pressure typically > 10 psi (23 ft of head)
  ▪ Head from gravity vessels typically ranges from 3 or 4 feet (back of pick-up truck) to maybe 7 or 8 feet (rainwater catch barrel) = Equivalent psi range of 1.3 to 3.5 psi (13 to 35% of minimum recommended).
Specific Objectives of our Study

• Evaluate the effect of low (substandard) water pressures on:
  – Flow rate (FR)
  – Water application uniformity (WAU)
  of various models of drip emitters that are readily available from US distributors.
Emitters: Point Source vs. Line Source

- Drip Lines
- Point Source
- Line Source
- Emitters
- Tubing
- Tape

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