DRIP IRRIGATION STUDIES FOR VEGETABLE CROPS IN THE ARKANSAS VALLEY OF COLORADO

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INTRODUCTION

Drip irrigation is becoming increasingly popular with vegetable growers in the Arkansas Valley of Colorado. Most of the drip-irrigated acreage has been devoted to cantaloupe production with a smaller acreage dedicated to onions. Since water costs remain relatively low in the Valley, the impetus for adopting drip irrigation has proven to be improved earliness, quality and yield.

This paper will briefly outline two projects using drip irrigation. The objective of the first study was to examine the effect of various plasticulture methods on drip-irrigated cantaloupe. In the second study, the effect of furrow and drip irrigation on onion yield and salt movement in the soil profile were examined.

PROCEDURES

Cantaloupe Study

This study was conducted at the Arkansas Valley Research Center in Rocky Ford in 2000. Beds, 45 inches wide and 60 inches between centers, were shaped in early April. Drip lines were placed 1-2 inches from the center of the bed at a depth of 3 inches The test area was then sprayed with pre-plant herbicides for weed control. The beds were covered with clear embossed plastic mulch (Mechanical Transplanter) on April 14 using a one-bed mulch layer.

A fresh-market cantaloupe variety, *Earligold* (Hollar Seeds), and a western shipping type, *Early Delight* (Petoseeds) were used in this trial. Cantaloupe seeds or four-week-old transplants were set through holes in the plastic mulch in a single row down the center of the bed at an in-row spacing of 18 inches. Each plot was one bed wide (5 feet) and 17 feet long and was replicated three times.

The following twelve production methods were evaluated:

1. *Earligold* transplanted April 18 into clear mulch and covered with a perforated row cover plus a spun-bound polyester fabric cover.
2. *Early Delight* transplanted April 18 into clear mulch and covered with a perforated row cover plus a spun-bound polyester fabric cover
3. *Earligold* transplanted April 18 into clear mulch and covered with perforated plastic.
4. *Early Delight* transplanted April 18 into clear mulch and covered with perforated plastic.
5. *Earligold* transplanted April 25 into clear mulch and covered with slitted plastic.
6. *Early Delight* transplanted April 25 into clear mulch and covered with slitted plastic.

7. *Earligold* transplanted April 25 intoclear mulch and covered with perforated plastic.
8. *Early Delight* transplanted April 25 into clear mulch and covered with perforated plastic
9. *Earligold* seeded April 18.
10. *Early Delight* seeded April 18.
11. *Earligold* transplanted May 5
12. *Early Delight* transplanted May 5

All row covers were suspended by wire hoops spaced 3-4 feet apart and were made of clear polyethylene plastic or spun-bound polyester fabric (American Agrifabrics Pro17). The plastic row covers were either perforated (Mechanical Transplanter) or slitted plastic (Ken-Bar Inc.). The fabric rows cover were placed directly over the plastic row covers for the earliest treatments only (April 18) and removed on May 4. Large slits were cut into the tops of the plastic row covers for ventilation in early May and the row covers were completely removed off the transplanted and seeded treatments in late May to early June depending on the treatment. Generally, row covers were removed from a treatment when the first fruiting flowers were discovered.

Drip lines were used exclusively for irrigation. A single irrigation was used for germination. From the beginning of vine growth to 7 days before harvest, soil moisture was maintained by 3 to 4 irrigations per week. Irrigations were discontinued once harvest commenced.

Cantaloupe were harvested at full slip every 1 to 2 days for three weeks. Marketable melons were weighed and counted at each harvest. Melons were considered marketable if they weighed over 2 lbs. and were free of any physical defects.

Onion Study

This trial was conducted on a Rocky Ford silty clay loam at the CSU Arkansas Valley Research Center in 2000. Beds 44 inches wide (from center to center) were shaped prior to planting. In half the plots, drip lines were placed down the center of the bed at a depth of 2-3 inches. Two seed rows, spaced 18 inches apart, were seeded on top of the beds. The Sweet Spanish onion variety, *Vision,* (Petoseeds) was planted on March 9, 2000. Plots were irrigated by either gravity-flow furrows or drip lines as needed. Each plot was replicated four times in the trial. (Note: In 2001, the experiment was repeated and total irrigation amounts were recorded).

Weeds, insects, and disease, were controlled with standard production methods for the area. Plots were harvested on September 21 and graded on October 26.

Soils samples were taken in the plots in the center of the bed, in the seed row, and in the middle of the furrow in March, June and September. Samples were taken in 0-6" and 6-12" increments and analyzed for electrical conductivity (EC_e).

RESULTS

Cantaloupe Study

Yield and earliness of drip-irrigated "Earligold" and "Early Delight" cantaloupe grown with different plasticulture combinations.

Variety and Seeding or Transplanting Date	Row Cover	First Harvest	Ave. Fruit Size (lbs)	Market. Yield (lbs per acre)
Earligold Transplanted April 18	perforated plus fabric	June 19	2.90	34,882
Early Delight Transplanted April 18	perforated plus fabric	July 6	3.68	25,162
Earligold Transplanted April 18	perforated	June 24	2.89	37,991
Early Delight Transplanted April 18	perforated	July 3	3.78	31,158
Earligold Transplanted April 25	slitted	June 26	3.21	35,633
Early Delight Transplanted April 25	slitted	July 7	3.94	21,335
Earligold Transplanted April 25	perforated	June 28	3.23	39,784
Early Delight Transplanted April 25	perforated	July 7	4.02	18,534
Earligold Seeded April 18	none	July 10	3.51	49,197
Early Delight Seeded April 18	none	July 12	3.48	43,491
Earligold Transplanted May 5	none	July 10	3.90	38,776
Early Delight Transplanted May 5	none	July 12	3.92	36,197
LSD (0.05)=			0.50	2,867 9,370

Onion Study

Yield and market class distribution of drip and furrow-irrigated onions.

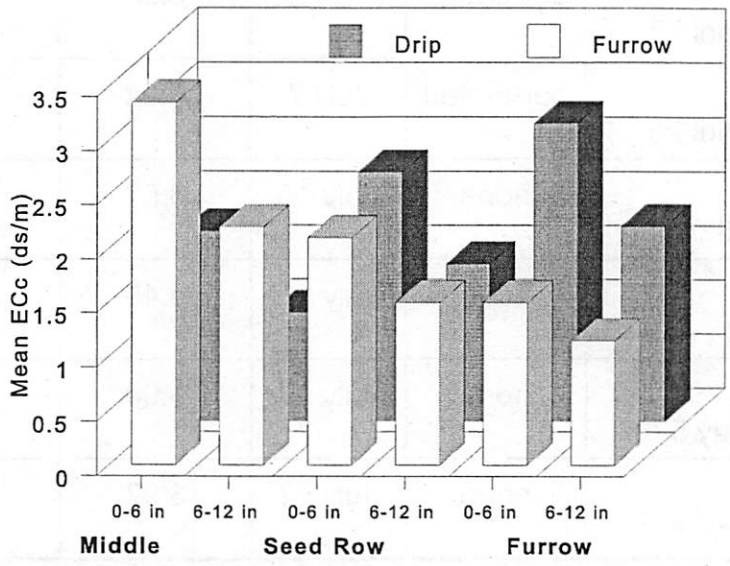
Treatment	*% colossal and jumbo (>3")*	*% mediums (2"-3")*	*Total Marketable Yield (cwt/A)*
Drip-Irrigated	44.2	50.4	385.5
Furrow-Irrigated	49.3	49.9	416.1
LSD (0.05) =	ns	ns	ns

Irrigation frequency and amounts for drip and furrow-irrigated onions*.

Treatment	*Total number of irrigations*	Amount of applied water
Drip-Irrigated	26	1.32 acre feet
Furrow-Irrigated	12	6.83 acre feet

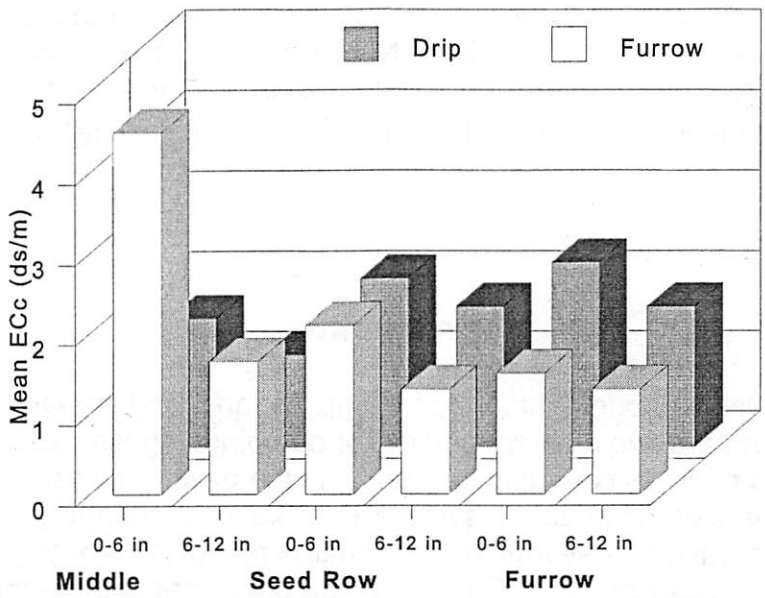
* Irrigation amounts were recorded in 2001. Amounts do not reflect the amount of water consumed by the crop, only the total water diverted for irrigation.

ECe Comparison Between Drip and Furrow Irrigation - June 2000



Sample Location on Onion Bed vs. Sample Depth

Ece Comparison Between Drip and Furrow Irrigation - September 2000



Sample Location on Onion Bed vs. Sample Depth

CONCLUSIONS

Cantaloupe Study

Drip irrigation is the primary component of an intensive production system for cantaloupe and makes it possible to employ other components of plasticulture. Plastic mulches and row covers, when used in conjunction with drip irrigation, can dramatically increase the yield and earliness of cantaloupe grown in the Arkansas Valley compared to a conventional bare ground and furrow-irrigated system.

Onion Study

Drip-irrigated onions had comparable yields to furrow-irrigated onions with only a fraction of the total water use. Salt accumulation was concentrated near the wetting front for both irrigation methods. In a drip-irrigated system, special consideration should be given to bed size and configuration as well as drip line spacing relative to the seed row. Having the seed rows closer to the drip lines may facilitate the movement of salt out of the root zone.