

Irrigation System Comparison For the Production of Ranger Russet and Umatilla Russet Potato

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Introduction

Potato is most often produced using sprinkler irrigation. Over the past 5 years various drip-irrigation layouts have been tested for potato production at the Malheur Experiment Station. One option for drip irrigation that we have not tested in recent years would be to plant potatoes in exactly the same way that potatoes are grown under sprinkler and furrow irrigation in 36-inch beds. Since we were studying drip-irrigation designs, an additional treatment was added to every replicate where potato was grown in conventional beds. Plots of all treatments were lengthened in 2004 so that both 'Umatilla Russet' and 'Ranger Russet' could be grown in each planting configuration. In addition, sprinkler-irrigated Umatilla Russet and Ranger Russet potatoes were grown alongside the drip irrigation experiment. This allowed a comparison of sprinkler irrigation, drip with conventional 36-inch hilled beds, and drip irrigation with various flat bed configurations.

Methods

Umatilla Russet and Ranger Russet were grown using sprinkler irrigation and 4 drip irrigation layouts at 18,150 plants/acre (Table 1). The drip-irrigation cultural practices are described in Shock et al. "Planting Configuration and Plant Population Effects on Drip-Irrigated Umatilla Russet potato Yield and Grade" found in this report. The sprinkler-irrigation cultural practices are described in Pereira et al. "A SINGLE EPISODE OF WATER STRESS REDUCES THE YIELD AND GRADE OF RANGER RUSSET AND UMATILLA RUSSET POTATO" also found in this report.

Drip tapes were shanked into the beds on May 6. Treatment 2 had a single drip tape shanked in over conventionally hilled potato in single rows in 36-inch beds (Table 1). Treatment 3 had 2 rows 36 inches apart on a nominal 72-inch bed (72 inches furrow to furrow) with a drip tape directly above each row of potatoes (Table 1). Treatment 4 had 2 rows of plants 36 inches apart on a 72-inch bed with the drip tapes offset 7 inches to the inside of the bed from each potato row. Treatment 5 had 4 rows of plants on a 72-inch bed with 16 inches between the pairs of rows, and the paired rows 14 inches apart, with the drip tape centered between the pairs of rows. Plants were staggered in the paired rows.

Planting dates and methods, irrigation management, cultural practices, harvest timing and methods, and grading and quality evaluations are all described in the two preceding reports cited above.

The drip plots were in a completely randomized design with the two varieties as split plots. The replicated sprinkler-irrigated plots were alongside the drip irrigation experiment. For simplicity, data were handled as if the sprinkler-irrigated treatments were part of a completely randomized trial, which was not the design. Data were analyzed with the General Linear Models analysis of variance procedure in NCSS (Number Cruncher Statistical Systems, Kaysville, UT) using the Fisher's Protected LSD means separation t-test at the 95 percent confidence level.

Results and Discussion

The reports cited above describe the soil moisture and water applied. Irrigation plus rainfall varied from 22.15 inches for sprinkler irrigation to 12.59 inches for one of the drip-irrigated treatments (Table 2). More water was applied to the sprinkler treatment than any of the drip treatments and the sprinkler-applied water treatment resulted in the lowest marketable yield per applied water, 13.4 cwt/acre-inch. The drip treatments with the tape in line with the plant row (treatments 2 and 3) produced less marketable yield per applied water than the treatments with the drip tape offset from the plant row (treatments 4 and 5). Averaging over production systems, Ranger Russet produced significantly more yield of applied water (19.98 cwt/acre-inch) than Umatilla Russet (15.88 cwt/acre-inch). There was no significant interaction between irrigation system and variety for yield/water applied in terms of cwt/acre-inch.

The yields for all irrigation systems were relatively low in this trial, a reflection of the poor quality of this site (Table 3). There was a strong interaction between variety and irrigation system. The greatest marketable yield occurred with Ranger Russet grown on a flat bed with a single drip tape for each row of plants (treatment 3). Overall Ranger Russet was more productive under drip irrigation than Umatilla Russet. Ranger Russet was not more productive than Umatilla Russet under sprinkler irrigation (Table 3).

Where the drip tape was shanked directly in line with the potato plants, the production system on flat beds (treatment 3), was 26.7 percent more productive of marketable tubers than the production system with the drip tape in conventional beds (treatment 2).

Table 1. Irrigation systems compared for potato production, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Table 2. Marketable yield, water applied, and water use efficiency for irrigation systems compared for potato production, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Table 3. Ranger Russet and Umatilla Russet performance under five irrigation systems, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.