MALHEUR EXPERIMENT STATION

Potato Dark-End Research 1988

Special Report 848
October 1989

Agricultural Experiment Station
Oregon State University

COMPARISON OF FALL AND SPRING BEDDING FOR FURROW IRRIGATED POTATOES FOLLOWING FALL MOLDBOARD OR CHISEL PLOWING

Clinton Shock, Tim Stieber, Eric Eldredge,
Bob Sojka, and Elizabeth Kennedy-Ketcheson.
Malheur Experiment Station
Oregon State University
Ontario, Oregon 1988

Purpose

The decision to fall or spring bed potatoes is often dictated by weather and processor contract agreements. Although there are advantages to both fall and spring bedding, soil conditions are often wet in the spring in Malheur County, Oregon. Spring bedding of wet soils leads to soil compaction and decreased water infiltration. The primary objective of the study was to determine the effects of fall or spring bedding on tuber yields and quality under furrow irrigation.

Determining the most effective method of fall potato ground preparation was the second objective of the trial. Land for potato production is normally moldboard plowed in the fall. Chisel plowing may provide better placement of residues in bedded ground and thus promote higher infiltration under furrow irrigation.

The third objective of the study was characterizing the soil environments under the tillage treatments and relating these to resultant potato quality.

Procedures

In the fall of 1987, two 75 foot by 100 foot strips were either moldboard or chisel plowed in a north-south direction (Figure 1). Four eight-row strips (36 inch rows) were bedded in an east-west direction across the plowed strips (Figure 1); two in the fall and two in the spring.

Two ounce Russet Burbank seed was planted 9 inches apart and 9 inches deep on April 22. Spring soil sampling of the tillage treatments indicated no differences in soil N. On May 3, 120 lbs N/ac as ammonium nitrate were sidedressed along with 3 lbs ai/ac of Temik. An additional 30 lbs N/ac were broadcast on July 29 as indicated by petiole analyses.

The field was furrow irrigated in alternate furrows starting May 27. Tuber initiation was June 4. The field was irrigated using a soil moisture criterion of 65 percent of field capacity monitored with neutron probe. The neutron probe access tubes were located at the bottoms of each plot to avoid unnecessary foot traffic in the harvest row. Infra-red canopy measurements were made on average twice per week throughout the season, using a Standard Oil Scheduler. The scheduler calculated crop water stress index (CWSI).

The soil environments under the tillage treatments were characterized by measuring soil strength with a recording penetrometer and by measuring bulk density at multiple bed locations. The beds were evaluated prior to irrigation and August 24.

On September 20, potatoes were harvested from 50 feet from the center of each plot where soil moisture and CWSI data had been collected. The potatoes were graded into four basic categories: US Number Ones, US Number Twos, undersized, and rotten tubers. The Number One tubers were divided into three sizes: Greater than ten ounces, six to ten ounce, and four to six ounce. The Number Two tubers were divided into two sizes: Greater than ten ounces and four to ten ounce. All tubers less than four ounces were considered undersized.

A tuber sample from the harvested potatoes was measured for specific gravity by the weight-in-air/weight-in-water method. Stem-end fry color was determined by frying center slabs of 20 potatoes per plot for 2.5 minutes at 375°F. The light reflectance of each slab was read using a Photovolt reflectance meter centered 0.5 inches from the stem-end. Reflectance values were utilized to determine the percent USDA No. 3 and No. 4 fry color in the sample.

Results and Discussion

The winter of 1987-88 was dry with only 4.95 inches of precipitation between the October hilling and the April 20 planting. The spring bedding operation was performed on much dryer than average soil, which likely minimized the effect on compaction and soil bulk density, but resulted in dryer bed conditions. Slightly greater top growth in the fall bedded plots was observed in early June. By mid-June there were no visible top growth differences among the treatments.

The neutron probe did not detect any significant differences in soil water content between the fall and spring bedded plots (Table 1). Moldboard plow had significantly greater soil water content than the chisel plowed areas when averaged over the fall and spring beddings. The bulk density and soil resistance measurements have not yet been fully analyzed. The neutron probe readings need to be adjusted for bulk density differences between the moldboard and chisel plowed plots.

The effects of moldboard and chisel plowing on yield, grade, and tuber quality, did not reach statistically significant levels. The trend with chisel plowing was increased US Number Ones ($p = 0.15$) and less undersized tubers ($p = 0.11$) (Table 2). Chisel plowing plus fall bedding had the highest yield of Number One tubers and the lowest levels of Number Twos, undersized tubers, and rot (Table 2).

Fall bedding had significantly more Number One tubers and proportionally less Number Two tubers (Table 2). The five cwt/ac decrease in rot with fall bedding was highly significant (Table 2).

Specific gravity was significantly greater under fall bedding (Table 3). Dark-ends were marginally less for potatoes grown on fall bedded soil compared with potatoes grown on spring bedded soil (Table 3).

Table 1. Season-long soil water content of 1988 tillage treatments. Malheur Experiment Station, OSU, Ontario, Oregon.

Bedded	Fall Tillage	Average Soil Water Content							
		June		July		August		Season	
		1′	2′	1′	2′	1′	2′	1′	2′
		Inches/Foot							
Fall	Chisel	2.90	3.71	3.05	3.74	2.81	3.54	2.93	3.66
Fall	Plow	3.07	3.81	3.05	3.78	3.05	3.72	3.05	3.77
Spring	Chisel	2.85	3.71	2.98	3.53	2.76	3.38	2.87	3.51
Spring	Plow	3.07	3.82	3.06	3.74	3.08	3.69	3.07	3.74
LSD(.05)	Fall x Spring	NS	NS	NS	NS	NS	NS	NS	NS
LSD(.05)	Chisel x Plow	0.17	0.09	NS	NS	0.14	0.15	0.14	0.14

Table 2. Yield and grade response to tillage treatments, 1988. Malheur Experiment Station, OSU, Ontario, Oregon.

Bedded	Fall Tillage	Total Yield	Grade			
			Ones	Twos	Culls	Rot
		cwt/ac				
Fall	Chisel	514	268	157	89	0
Fall	Plow	506	224	184	95	2
Spring	Chisel	505	193	228	77	6
Spring	Plow	539	203	233	97	6
F fall vs spring		ns	**	***	ns	****
F chisel vs plow		ns	10%[1]	ns	11%[1]	ns
F A x B		10%[1]	9%	ns	ns	ns

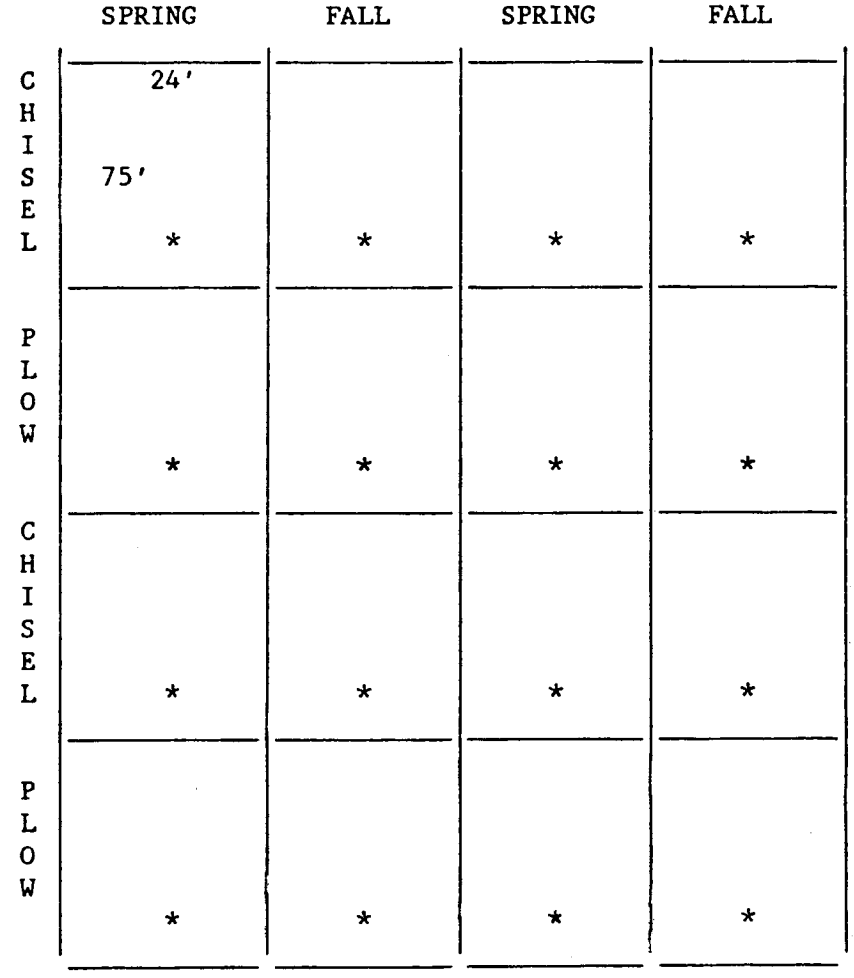
[1]Statistical differences at the probability indicated
ns = Not statistically different
** = 1% level of significance, *** = 0.1%, **** = 0.01%

Table 3. Specific gravity and fry color responses to 1988 tillage treatments. Malheur Experiment Station, OSU, Ontario, Oregon.

Bedding	Fall Tillage	Specific Gravity	Average Fry Color Reflectance	USDA No. 4 Dark-ends
			%	
Fall	Chisel	1.082	40.1	7.5
Fall	Plow	1.080	41.0	5.0
Spring	Chisel	1.079	37.9	10.7
Spring	Plow	1.079	33.7	10.2
F fall x spring		*	ns	25%
F chisel x plow		ns	ns	ns

Figure 1. Plot diagram for potato tillage study. Malheur Experiment Station, OSU, Ontario, Oregon 1988.

Field Diagram 1988



*Neutron probe sites