

Defining Optimum Row Width for Different Potato Varieties

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Justification: Literature that explains why Columbia Basin growers plant potatoes into 34 inch rows is elusive if not nonexistent. From a study published by Pavek and Thornton in 2006, it was learned that when there was a planter skip in one row, the adjacent or neighboring row did not realize a yield gain. We suspect that the standard Columbia Basin row width (34 in) is too wide and a more narrow width would improve economic return.

Purpose: Identify the row width that maximizes grower revenue by optimizing land use efficiency, yield, and tuber size profile for certain varieties.

Background: Alturas, Russet Burbank, and Umatilla Russet were all planted into 30-, 32-, 34-, and 36-inch wide rows in 2011. Ranger Russet, Russet Norkotah and Chieftain were added during 2012. Typical in-season data and post-harvest data were captured. Varieties were allowed to grow for the full season and harvested after 150 DAP.

Results: When the varieties were planted closer together (30 inch row width) we discovered that vine length increased when compared with wider row width (Figure 1). When varieties were analyzed separately, most varieties responded the same way; the exceptions being R. Burbank and Ranger R. (Table 1). Across all varieties except Ranger, total yield and economic revenue increased as row width was reduced from 36 inches to 30 inches (Table 1, Figure 4). Ranger produced the highest economic return at 32 inch row width. Although R. Burbank economic return was similar across all row widths (Table 1), when it was combined with Alturas and Umatilla for statistical analysis, there was a significant quadratic trend with 30 inch row width producing the highest yield and economic return (Figures 2 & 3). One might expect to see a decrease in average tuber size (weight/length) as rows are planted closer together, but there were not significant differences across varieties or years (Table 1). As yield increased with the reduction in row width, the percent of >6 oz and >12 oz tubers remained unchanged relative to total yield (Figure 4).

Recommendations:

We are confident that Columbia Basin growers can switch from 34 inch to 32 inch row width and improve their bottom line across all varieties. However, we will require another year or two of small plot research before we will completely stand behind this recommendation. One interesting fact is that both the early dying, small vined variety, R. Norkotah, and the late dying, large vined variety, Alturas, responded the same with a reduction in row width – they both produced more yield and economic value per acre – even after the economic value was adjusted for the extra seed cost of reduced row width planting.

Table 1. Results from 2012-13 or 2011-13 WSU row width by variety trial which included six varieties by four row widths.

ENTRY	Row* Width inches	2011-13 WSU Row Width X Variety Trial										Seed-Cost Adjusted Process Value** Gross \$/A	
		TOTAL YIELD (CWT/A)	US # 1's* > 4 oz ----- % of Total Yield	US # 2's* > 4 oz & < 4 oz	(Final Harvest)		PROCESS YIELD		Specific Gravity				
					AVERAGE TUBER WEIGHT oz	TUBERS/PLANT NUMBER	US 1's and 2's > 6.0z CWT/A	> 12.0z CWT/A					
Alturas (2011-13)	30	788	74	7	19	6.7	8.9	522	a	143	a	1.091	a
	32	729	73	6	21	6.6	9.1	468	ab	133	a	1.085	ab
	34	668	74	8	18	6.7	8.6	450	b	136	a	1.082	b
	36	661	75	5	20	6.6	9.1	432	b	113	b	1.082	b
	p-Value	0.0024	ns	ns	ns	ns	ns	0.0024	0.0032			ns	0.0176
Ranger R. (2012-13)	30	735	75	4	22	6.2	9.2	456	ab	134		1.084	ab
	32	798	76	6	18	6.5	9.9	512	a	137		1.088	a
	34	651	75	4	21	6.6	8.6	411	bc	139		1.086	b
	36	626	79	4	17	6.6	8.7	422	b	134		1.084	b
	p-Value	0.0016	ns	ns	ns	ns	ns	0.0432				ns	0.0412
R. Burbank (2011-13)	30	669	71	5	24	6.5	8.0	408	a	129		1.080	a
	32	615	71	7	22	6.7	7.6	382	ab	138		1.082	a
	34	594	75	6	19	6.6	7.8	381	bc	121		1.077	a
	36	582	74	6	20	7.1	7.7	374	c	156		1.079	a
	p-Value	0.0765	ns	ns	ns	ns	ns	0.0500	ns	ns		ns	ns
R. Norkotah (2012-13)	30	617	70	2	28	5.7	8.3	310	a	73		1.073	a
	32	582	67	3	30	6.0	7.8	305	a	112		1.076	ab
	34	480	64	2	34	5.5	7.1	216	b	72		1.071	c
	36	463	67	2	32	5.5	7.2	213	b	69		1.071	bc
	p-Value	0.0027	ns	ns	ns	ns	ns	0.0027	ns	ns		ns	0.0418
Umatilla R. (2011-13)	30	778	70	2	28	5.5	10.8	391	a	83	a	1.086	a
	32	670	71	1	29	5.4	10.1	308	b	65	b	1.085	ab
	34	605	71	2	27	5.5	9.1	291	c	65	b	1.086	b
	36	575	71	2	27	5.6	10.0	289	c	68	b	1.084	b
	p-Value	0.0001	ns	ns	ns	ns	ns	0.0001	0.0001			ns	0.0066
Chieftain (2012-13)	30	801	91	2	6	9.5	6.6	689	a	360	b	1.067	na
	32	811	92	1	7	9.2	7.8	673	b	381	a	1.066	na
	34	786	92	2	7	9.7	7.2	675	bc	362	b	1.069	na
	36	640	92	1	7	8.8	7.6	531	c	262	c	1.069	na
	p-Value	0.0302	ns	ns	ns	ns	ns	0.0302	0.0204			ns	
Averaged across varieties grown 2011-13 (Uma, RB, Alt)	30	745	71	5	24 a	6.3	9.2	490	a	134	a	1.086	a
	32	671	72	4	24 a	6.2	8.9	414	b	123	ab	1.084	ab
	34	612	73	5	22 b	6.3	8.5	388	c	111	b	1.082	b
	36	616	73	5	23 ab	6.4	9.0	368	c	112	b	1.082	b
	p-Value	0.0001	ns	ns	0.0249	ns	ns	0.0001	0.0176			0.0159	0.0001

*In-row spacing was 10 inches. Percent values may not total 100% due to rounding. **Bolded** values are significantly different from each other at the 5% level using Fisher's LSD Test when followed by a different letter. Values for each variety and category are not significantly different if followed by the same letter.

**Economic value based on a typical Columbia Basin processing or fresh market (R. Norkotah only) contract minus seed cost differences. Cut and treated (fungicide and insecticide) seed costs were estimated at \$20.00/CWT. A seed piece weight of 3 oz was used in the seed cost calculation. A fresh market value was calculated for Russet Norkotah.

Figure 1. Average Vine Length at each Row Width
(averaged across all varieties, measured July 9, 2012)

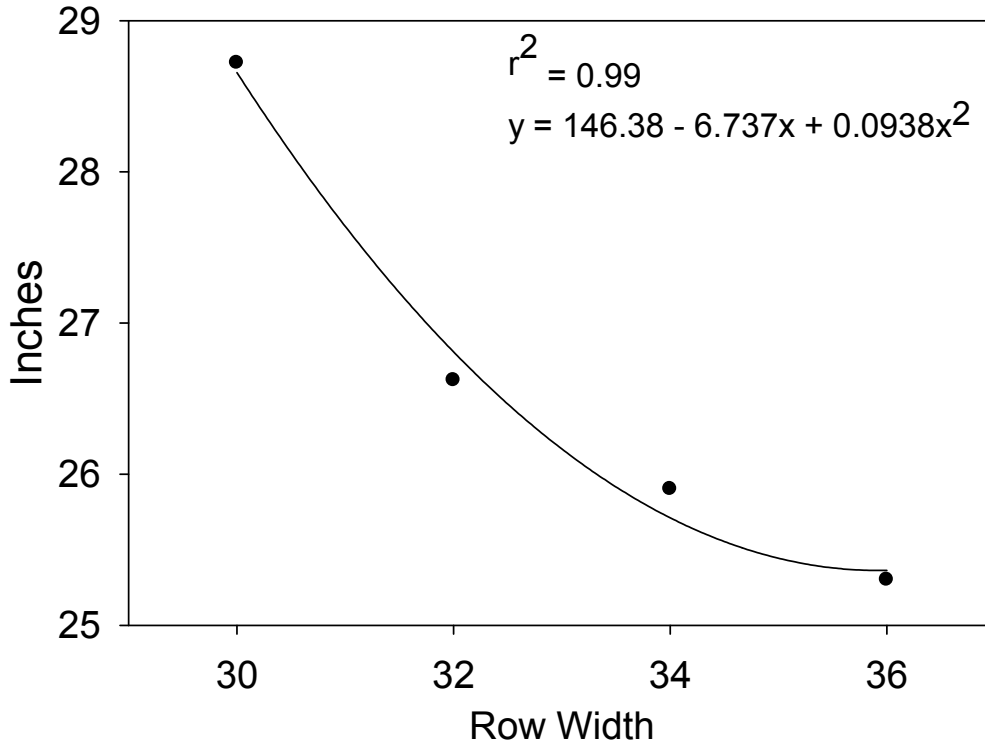


Figure 2.
CWT/A

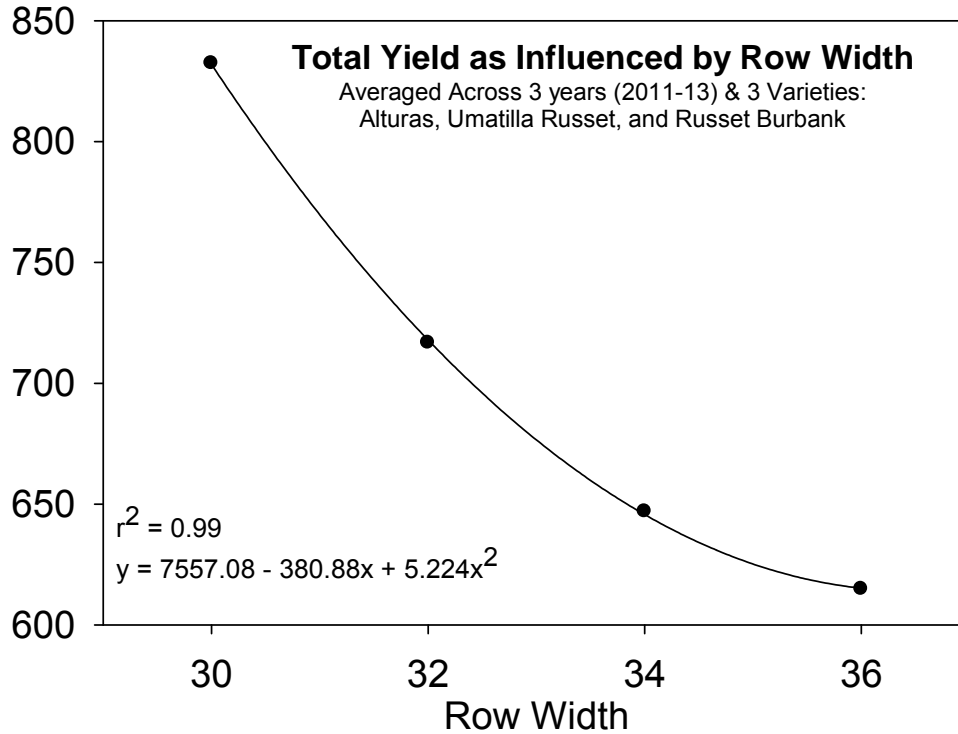


Figure 3.

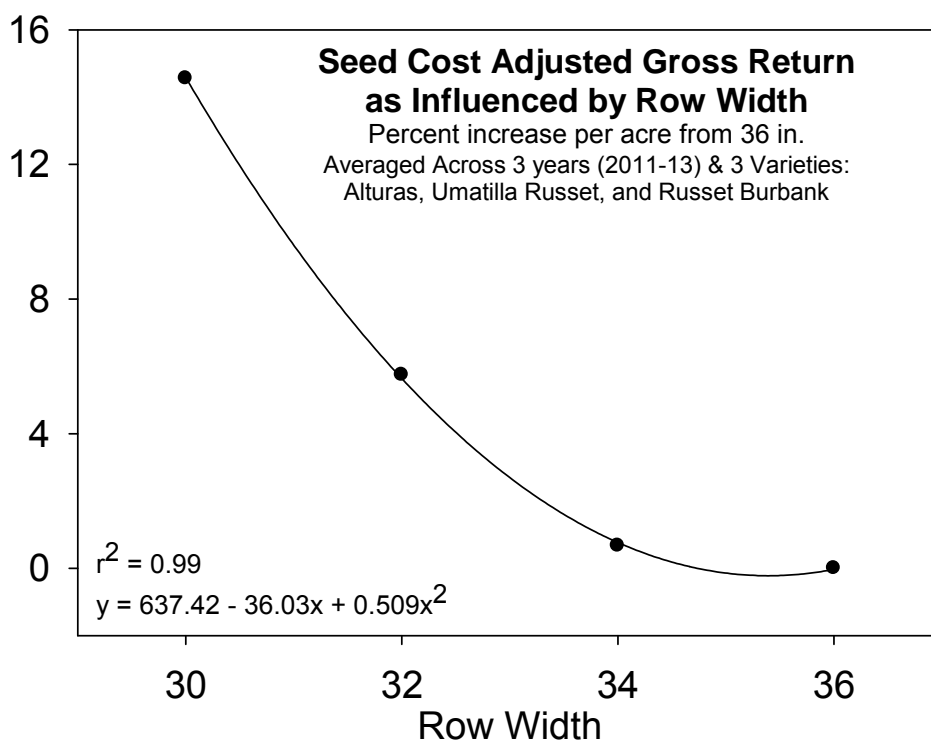


Figure 4.

Greater than 6 oz and > 12 oz Yield as a percentage of total Yield across 4 row widths
 (averaged across 2011-13 and Alturas, R. Burbank, and Umatilla)

