



Potato Progress

Research and Extension for Washington's Potato Industry

Published by Washington State Potato Commission www.potatoes.com

Andrew Jensen, Editor. Submit articles and comments to: ajensen@potatoes.com

108 Interlake Rd., Moses Lake, WA 98837; Fax: 509-765-4853; Phone: 509-765-8845.

Volume V, Number 5

April 5, 2005

Nitrogen Management for Ranger Russet and Umatilla Russet in the Columbia Basin

Ashok K. Alva

USDA-ARS, Vegetable and Forage Crops Research Unit, Prosser, WA, 509-786-9205,
aalva@pars.ars.usda.gov, www.usda.prosser.wsu.edu

SUMMARY

Balanced application of pre-plant and in-season N is important for production of high yields of good processed quality potatoes. Nitrogen management evaluations in the past were mostly conducted on 'Russet Burbank' cultivar. Information on optimal N management is limited for some of the recent cultivars, which are increasing in acreage in the Pacific Northwest. Here I summarize results of two years (2001 and 2002) field experiment data using either 50, 100, or 150 lbs/ac pre-plant N (including the soil residual N content). The total N over the entire growing period was 300 lbs/ac across all pre-plant N treatments. An additional treatment of 400 lbs/ac total N was also evaluated with 100 lbs/ac pre-plant N. Within these four main treatments, sub-treatments comprised application of in-season N fertigation at either 2, 3, or 5 frequencies in the year 2001, and 5 or 10 frequencies in the year 2002, starting three weeks after emergence. Tuber yields of both cultivars were not significantly influenced by either different pre-plant N rates (50 to 150 lbs/ac) or total N rates (300 to 400 lbs/ac). Tuber specific gravity was also not significantly influenced by the different pre-plant N rates or total N rates. Application of most of the N by fertigation during in-season with only about 50 lbs N/ac as pre-plant appears to be the best management practice for production of high yields of good quality tubers in the Pacific Northwest. A detailed evaluation of these and other results are presented in a refereed paper that will be published in the Journal of Vegetable Crop Production (2004, in press), and a brief summary of these results was published in Potato Country Magazine (May - June 2004, p 8-11).

INTRODUCTION

Most potato production in the Pacific Northwest is done on light texture soils with low organic matter content, which have low capacity for retention of nutrients and water. Nitrogen uptake efficiency can be improved by optimizing the rate and frequency of preplant and in-season N application. Current N management recommendations are based on studies conducted mostly on 'Russet Burbank.' Acreage of 'Russet Burbank' has decreased steadily in recent years, and is being replaced by new varieties including 'Ranger Russet' and 'Umatilla Russet.' In this paper, two years field study data on the evaluation of effects of rates/frequencies of pre-plant and in-season N management for 'Ranger Russet' and 'Umatilla Russet' varieties are summarized. The field experiments were conducted for two years (2001-2002) in a Quincy fine sand near Paterson, Benton County, Washington, under center pivot irrigation.

METHODS

Year 2001 Experiment:

Potato-wheat-2 yrs corn rotation system was followed in the trial site. The land preparation and other cultural practices were similar to commercial production practices. 'Ranger Russet' and 'Umatilla Russet' cultivars were planted (March 30, 2001) on 8-12 inch raised ridges at 34 inch spacing. The main treatments included different rates of pre-plant N (including the residual soil N at 12-inch depth of soil sampled in early spring) at either 50, 100, or 150 lbs/ac with a total N rate of 300 lbs/ac across all pre-plant N treatments. A fourth treatment was included with 100 lbs/ac pre-plant N, with a total N rate of 400 lbs/ac for the entire growing period. The residual soil N in the trial site, prior to planting, was 50 lbs/ac, therefore, pre-plant N rates applied were 0, 50, and 100 lbs/ac to attain the above pre-plant N rates. The in-season N rates were: 250, 200, 150, and 300 lbs/ac. All treatments received three fertigation 10, 18, and 21 days after emergence at 45, 30, and 30 lbs/ac per, respectively. The variable in-season N application began 4 weeks after the seedling emergence. The sub-treatments included application of either 145, 95, 45, or 195 lbs N/ac in 2, 3, or 5 equal doses in weekly applications. Therefore, in-season N rates per application varied from 22.5 to 97.5, 15 to 65, and 9 to 39 lbs/ac for the 2, 3, and 5 in-season frequency treatments, respectively. All in-season applications were done using UAN (32% N) on the foliage, immediately followed by irrigation to wash the foliage. The recommended practices of irrigation, pests, diseases, and weed management were adapted throughout the entire growing season. The subplot size was 6 rows (17 feet) each of 40 feet long. The tuber yield per plot was measured from two middle rows of 20 feet each. A subsample of tubers was graded in different size tubers (>12 oz, 8-12 oz, 4-8 oz, <4 oz, and U.S. No. 2 plus culls) and total tuber yield was partitioned into yields of different size tubers.

Year 2002 Experiment:

The 2001 experiment was repeated with the following modifications: (i) the in-season N rates were applied at either 5 or 10 applications starting 3 weeks after seedling emergence, and (ii) the extractable soil N (12 inch depth) in the experiment site sampled before planting was close to zero. Therefore, all pre-plant N rates, i.e. 50, 100, and 150 lbs/ac were applied using urea N, broadcast and incorporated before planting. The total N for the entire growing season was 300 lbs/ac across all 3 treatments. The fourth treatment with 100 lbs/ac of preplant N for a total target N of 400 lbs/ac was also evaluated. The N rates at each application and scheduling of in-season N for the different pre-plant N rate treatments are shown in Table 1. This experiment was planted on March 25, 2002 for 'Ranger Russet' and April 6, 2002 for 'Umatilla Russet' cultivars.

RESULTS

Year 2001 Experiment:

The tuber yield levels were somewhat similar between the two cultivars used in this experiment (Fig. 1). In 'Ranger Russet', the tuber yields were slightly lower in the 50 lbs/ac pre-plant treatment compared to that in the other pre-plant N rates across all three in-season N application frequency treatments. The tuber yield decreased slightly with an increase in pre-plant N treatment from 100 to 150 lbs/ac. The magnitude of this decrease was greater in the treatment which received 5 applications of the in-season N as compared to that with 2 or 3 applications. However, this difference was statistically non-significant (ANOVA table is not presented). Across both cultivars, a major portion of the total tuber yield was in the size group of 4 to 12 oz tubers. Analysis of variance (ANOVA) test of the tuber yield by each cultivar, showed the effects of pre-plant N rates or the in-season N application frequencies were non-significant on the total tuber yield as well as tuber yields in different size grades (ANOVA table not presented).

Year 2002 Experiment:

Tuber yields varied from 27.1 to 30.5 and from 27.8 to 30.8 tons/ac, respectively, for ‘Ranger Russet’ and ‘Umatilla Russet’ cultivars across all preplant N rate and in-season N frequency treatments (Fig. 2). The proportion of tuber yield of >12 oz size grade was greater for the ‘Ranger Russet’ as compared to that for the ‘Umatilla Russet’ cultivar. The converse was true for the proportion of tubers of <4 oz or 4 to 8 oz size classes. The proportion of U.S. No. 2 plus culls was extremely small to negligible in the ‘Umatilla’ cultivar. At the in-season N application frequencies of 5, the tuber yield was generally greater in 2001 as compared to that in 2002 experiment in both the cultivars. This is in line with the industry-wide annual fluctuation in yields linked to climatic variations.

ACKNOWLEDGMENTS

The author appreciates the support and cooperation by our industry partners, AgriNorthwest Company, Kennewick, WA, who provided the site and other field assistance to carry out this study in a commercial production condition. Special thanks to Martin Moore and Mike Hassell of AgriNorthwest Company Research Department for cooperation with all plant analysis and for the field study. The author also appreciates Marc Seymour, William Boge, Louis Faro, Melanie Wilson, and Tami Baugh for technical assistance to conduct this study, and preparation of this manuscript.

Table 1. Schedule and rates of foliar application of in-season (IS) N using urea ammonium nitrate (UAN, 32% N) for two potato cultivars in the 2002 experiment. Soil residual N at planting was negligible.

-----N-rate (lbs/ac)-----				----N rates applied on a weekly basis 3 weeks after emergence (lbs/ac)---									
Total	Preplant	In-season	IS Freq	3	4	5	6	7	8	9	10	11	12
300	50	250	5	20	30 + 30	40 + 40	30 + 30	30					
			10	10	20	30	30	40	40	30	30	10	10
300	100	200	5	20	30 + 20	30 + 30	30 + 20	20					
			10	10	10	30	30	30	30	20	20	10	10
300	150	150	5	20	20 + 20	20 + 20	20 + 20	10					
			10	10	10	20	20	20	20	20	10	10	10
400	100	300	5	30	40 + 30	50 + 50	40 + 30	30					
			10	10	20	30	40	50	50	40	30	20	10

Weeks 4, 5, and 6: Two applications were made on each week in 5 frequency treatments to avoid application of high N rate at one time to minimize potential foliar damage.

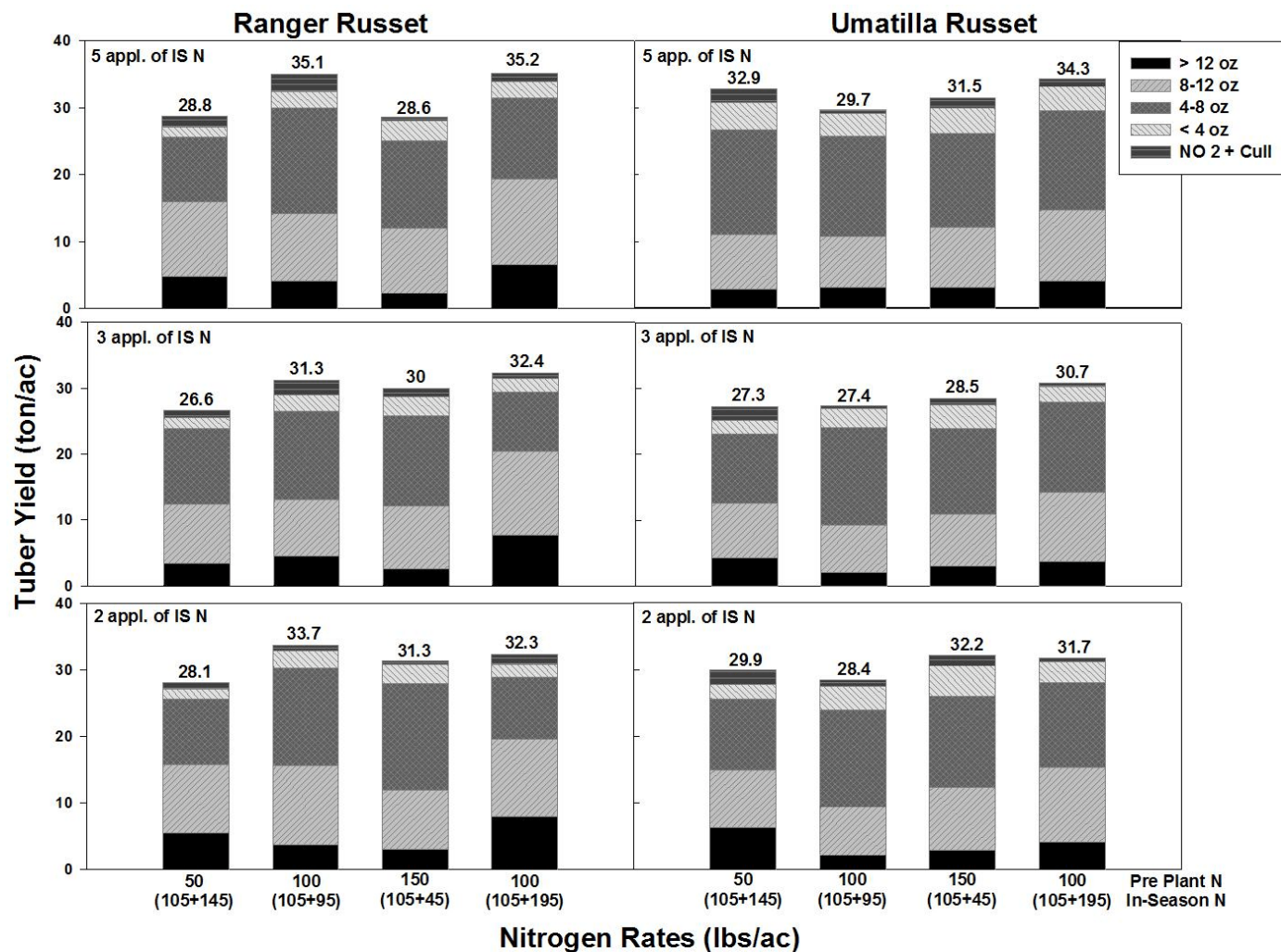


Fig. 1 (Alva, PP + IS_N)

Fig. 1 Effects of different rates of pre-plant N (including soil residual N, which was 50 lbs/acre at planting), and rates/frequencies of in-season N on total tuber yields as well as yields of different size grade tubers of 'Ranger Russet' and 'Umatilla Russet' cultivars. Year 2001 experiment results.

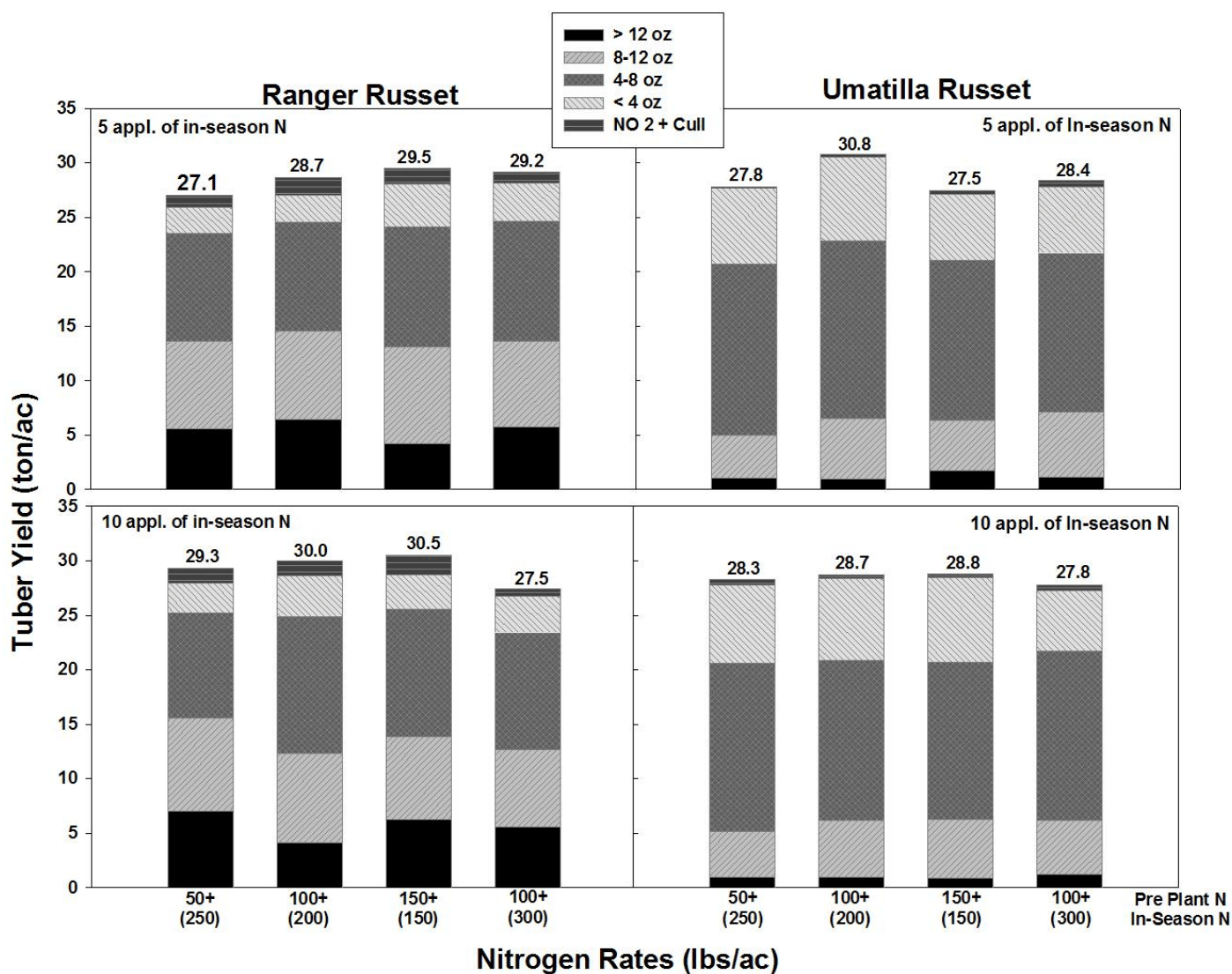


Fig. 2 (Alva, PP + IS_N)

Fig. 2 Effects of different rates of pre-plant N (including soil residual N, which was below detectable level), and rates/frequencies of in-season N on total tuber yields as well as yields of different size grade tubers of 'Ranger Russet' and 'Umatilla Russet' cultivars. Year 2002 experiment results.

2005 Commercial Seed Lot Trial Information

Mark J. Pavék, Washington State University

Commercial potato seed samples are requested for the 2005 Washington Seed Lot Trial. Two to three hundred whole (single drop) seed is an acceptable sample size, or 50 lbs of 4 oz single drop seed. This seed should not be treated with insecticide or fungicide. Seed tubers need to be uniformly small (not larger than 4 oz) because no seed cutting is done and a cup-type planter is used. A sample randomly taken that represents the entire seed lot received is most desirable. Sampling the first (or last) 300 seed from the truck is not likely to provide a representative sample of the lot. Sample tags may be obtained by calling the Potato Commission at 509.765.8845.

Due to the retirements of Erik Sorensen and Gary Pelter, your assistance with collection and drop off of seed samples is needed. Seed samples may be taken to the WSU Othello Research Unit (509.488.3191), south on Booker Road from State Highway 26 about five miles east of Othello. Alternatively, sample pickup can be arranged by calling Mark Pavék (509-335-6861) or Ed Driskill (509-335-6859).

In the North Basin, two seed “drop-offs” have been established. One is at the Bob Holloway storage just north of Road 3 NW and east of Dodson Road; place samples in northern most storage nearest Dodson Rd in the west end door. The second is at CW Potato Services, south of I-90 about six miles east of Moses Lake (just east of the Moses Lake Simplot Soilbuilders). Samples need to be at these locations by 2:00 pm the day before each planting date to be included.

The remaining planned seed lot planting dates for 2005 are:

3 rd	April 19
4 th	May 3

This year’s virus reading of the seed lots will take place on June 7 and 21.

The 2005 Potato Field Day is scheduled for Friday June 24.