

Potato response to tillage and nitrogen management

A.K. Alva, H.P. Collins, and R.A. Boydston

United States Department of Agriculture -Agricultural Research Service, Vegetable and Forage Crops Research Unit, Prosser WA 99350, Email ashok.alva@ars.usda.gov

Abstract

Potato responses to different rates of pre-plant and in-season N management were evaluated under reduced and conventional tillage under center pivot irrigation. Tuber yield, tuber size distribution, and tuber specific gravity were largely similar across different tillage and N management practices. Potato was rotated with two years of sweet corn in this study. Frequency of in-season N application from 5 to 10 at a given N rate had no significant effects on tuber yield or quality. Reduced tillage offers savings in energy and labor costs, therefore, net return is expected to be greater under reduced tillage than that with conventional tillage despite similar yields and tuber quality under both treatments.

Key Words

Best management practice, fertigation, reduced tillage, nitrate leaching, tuber quality, pre-plant nitrogen, in-season nitrogen

Introduction

Total area under potato production in the U.S. Pacific Northwest (PNW, comprising Washington, Idaho, and Oregon) is 208,210 ha, with a total tuber production of 10.7 million tonnes; represents 55% of total U.S. production (National Potato Council 2006). Historically, 'Russet Burbank' has been the major cultivar in this region. A new cultivar, 'Ranger Russet' (large russet-skinned tubers that are well suited for baking and processing into french-fries), has gained increased adaptation, in part, due to its greater resistance to *Verticillium* wilt, *Fusarium* dry rot, leafroll necrosis, and potato X and Y viruses than 'Russet Burbank' (Pavek *et al.* 1992).

The objective of this research was to evaluate different pre-plant and in-season N management practices on 'Ranger Russet' tuber yield and quality under center pivot irrigation with conventional (CT) vs. reduced tillage (RT).

Methods

This study was conducted on Quincy fine sand in Benton County, WA, under center pivot irrigation (Alva *et al.* 2009). Treatments included: I. two tillage: CT vs. RT; II: Four N-management rates and frequency: (kg/ha; as shown in Figure 3), with four replications. Pre-plant N rates (as per treatments) were applied as urea before planting. Phosphorus and potassium rates were applied based on soil test values. In-season N was applied as urea ammonium nitrate (UAN) solution (32% N).

Results and Discussion

Tillage effects were not significant on total tuber yield and tuber specific gravity across three years, as well as different size grade tubers during two out of three years (Figures 1 and 2). Total yield in 2004 as well as yield of large size tubers were than those in the next 2 years. Total tuber yield was not significantly influenced by different N management practices with total N rates in the range of 224 to 336 kg/ha and frequency of in-season N application 5 to 10 (Figure 3). In 2004, tuber yield was lower with 56 kg/ha pre-plant N as compared to that with 112 kg/ha. In summary, results of three years study support that RT had no negative impact on the tuber yield and/or tuber size distribution. Effects of long-term management of RT and CT on soil physical and biological properties are being investigated.

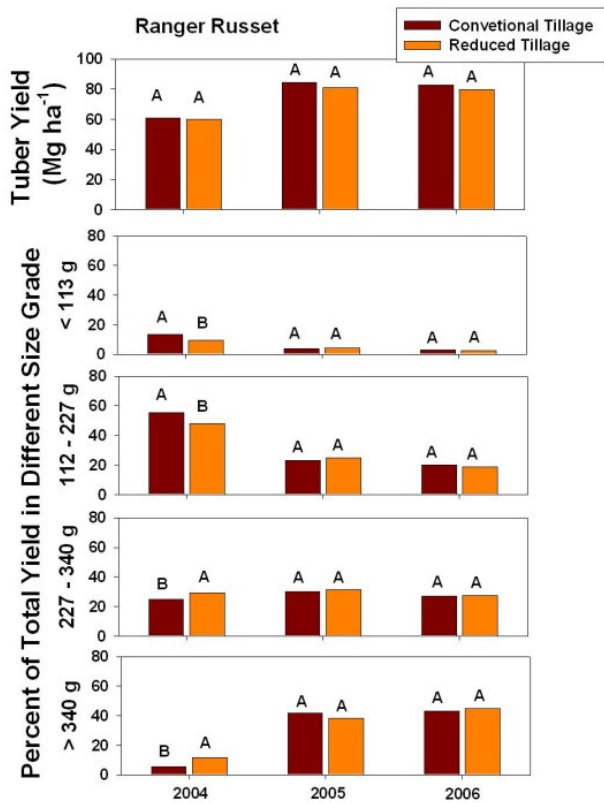


Figure 1. Total yield in size classes for 3 years for conventional and reduced tillage.

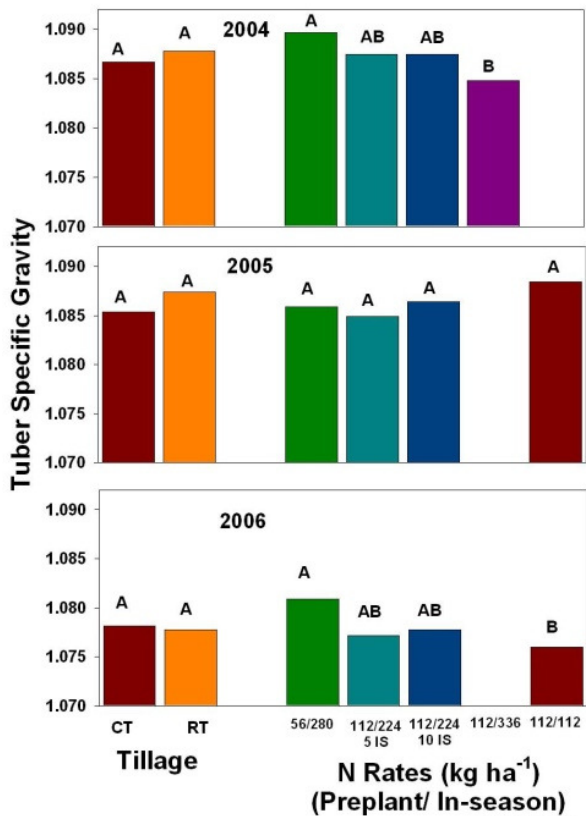


Figure 2. Tubers specific gravity over 3 years as affected by tillage and N rates.

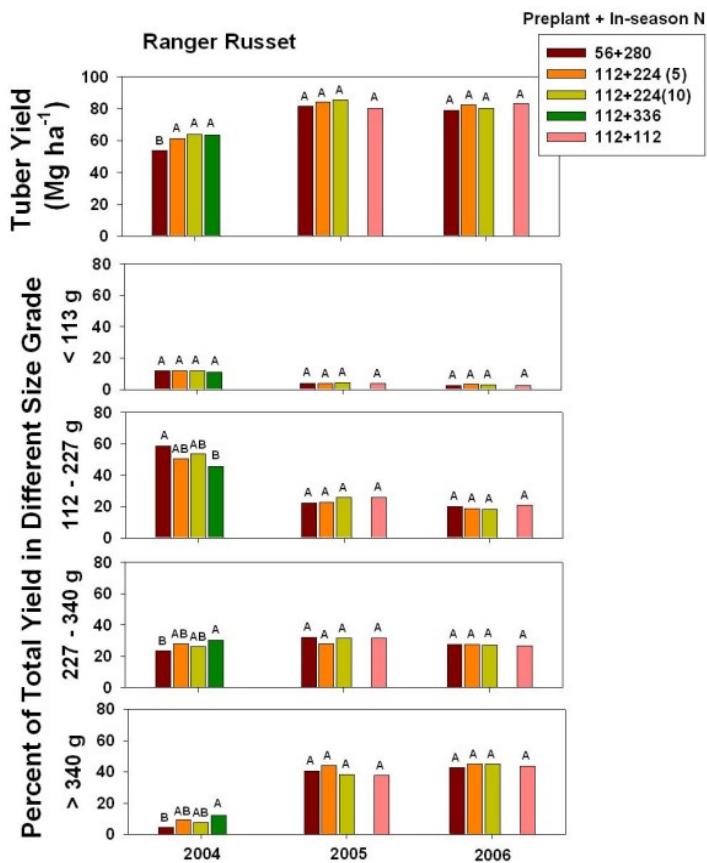


Figure 3. Percentage yield in size classes over 3 years in relation to N application method.

References

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