



## Canadian Agri-Science Cluster for Horticulture 2

### Progress Report April 2016

Activity 17, Potato 16

#### **Nitrogen for Improved Yield, Quality and Profitability of Potato**

##### **Lead Researcher**

Mario Tenuta, PhD, University of Manitoba

##### **Collaborators**

Michelle Konshuch, PhD, Alberta Agriculture and Rural Development

Darin Gibson, Gaia Consulting

#### **Activity Objectives**

This study examines the nitrogen fertilizer practices of timing, placement and form, to improve nitrogen use efficiency and economics of potato production. It will be done in two phases, with Phase 1 evaluating treatments encompassing a range of timing, placement and nitrogen source practices, and Phase 2, taking the most effective of the treatments for further testing and improving fertigation by providing N based on plant and/or soil N status. The objectives of this activity are:

- 1) Determine optimal timing, placement and source of N fertilizers for irrigated Russet Burbank potato
- 2) Evaluate the effectiveness of monitoring plant N status to adjust fertigation additions.

Phase 1) Apply fertilizer treatments providing a range of early, med to late N availabilities at two sites in Manitoba in each year 2013, 2014 and 2015, and one site in Alberta in 2014 and 2015. The objective is to determine BMP combination of timing, placement and source on irrigated potato production.

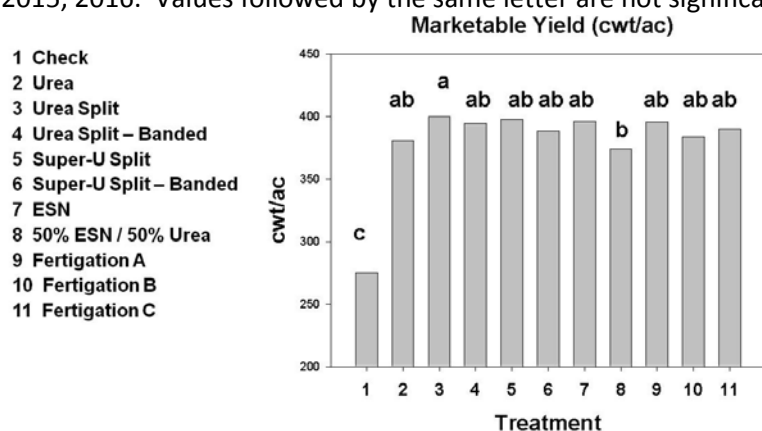
Two trials of 11 treatments (Table 1) in each of 2013, 2014 and 2015 were conducted in Manitoba.

**Table 1:** Nitrogen treatments as fraction of applied N at planting, hilling and fertigation to determine the effects of fertilization strategies on irrigated Russet Burbank in Manitoba.

Treatment	Fraction of applied N					Total		
	Broadcast @ Plant	Banded @ Plant	Hilling Split (side dress)	Fertigation				
				1	2		3	4
1 Untreated Check							0	
2 Urea (46-0-0) @ Plant Broadcast	100						100	
3 Urea Split (Broadcast at plant)	40		60				100	
4 Urea Split (Band at plant)		40	60				100	
5 Super-U split Broadcast	40		60				100	
6 Super-U split Band		40	60				100	
7 ESN (Coated Urea, 44-0-0)	100						100	
8 50% ESN / 50% Urea @ Plant Broadcast	100						100	
9 Fertigation A (28-0-0 diluted 1:10)	60			17	13	10	100	
10 Fertigation B (28-0-0 diluted 1:10)	40			20	17	13	100	
11 Fertigation C (28-0-0 diluted 1:10) (Broadcast @ plant 50 % ESN)	60			17	13	10	100	

Across the study so far, the treatments that most consistently provided top marketable yield were Urea split (treatment 3), SuperU Split (Treatment 5), ESN (Treatment 7), and Fert A (Treatment 9; Fig. 1).

**Figure 1:** Average marketable yield across Carman and Carberry sites with different N fertilizer treatments in 2014, 2015, 2016. Values followed by the same letter are not significantly different  $p < 0.05$  level.



### Alberta

The second year of the project in Alberta was 2015. The treatments (Table 2) are different than in Manitoba in response to local grower interests. Nevertheless, the objective is to apply fertilizer treatments providing a range of early, med to late N availabilities to determine BMP combination of timing, placement and source on irrigated potato production like in Manitoba. The target N was intended to be approximately 80% of an agronomist recommended rate for Russet Burbank Production in southern Alberta, but was inadvertently applied at 100% as soil test N was not accounted for at the time of application in 2014 and also used in 2015. Results from 2014 and 2015 were similar with urea/ESN split and Fert A being the top producers (Table 2). Fertigation A had 90 lbs N.ac applied at planting and 60 lbs as later fertigation. Results are remarkably similar to Manitoba with split application and fertigation with more N at planting being top producers.

**Table 2:** Average yield (ton/ac; < 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz.) for irrigate Russet Burbank grown at Lethbridge, AB in 2015. Data followed by the same letter in a column are not significantly different  $p < 0.05$  level.

Treatment	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Marketable Yield
Untreated Check	7.2 a	5.5	3.9 c	0.8 d	10.2 c
Urea Pre-Plant Broadcast; 100%	6.0 ab	7.0	8.5 ab	3.1 a-d	18.5 ab
Urea Split (60:40)	3.5 b	4.8	8.5 ab	7.0 ab	20.2 ab
Urea/ESN Split (60:40)	3.9 b	5.5	10.2 ab	6.3 ab	21.9 a
ESN + Fertigation (60:40)	5.9 ab	6.4	7.1 abc	2.1 bcd	15.7 b
ESN Broadcast; 100%	6.1 ab	6.9	6.3 bc	1.8 cd	15.0 b
50% ESN / 50% Urea Broadcast	5.8 ab	6.3	6.5 bc	2.4 bcd	15.2 b
Fertigation A High Broadcast	3.7 b	4.3	10.6 a	7.4 a	22.3 a
Urea/ESN Split + Fertigation	5.4 ab	5.5	9.5 ab	5.1 a-d	20.1 ab
Fertigation C ESN:Urea	6.6 ab	6.9	7.9 ab	2.3 bcd	17.1 ab
NJB1 – urea:ESN (60:40) at hilling	3.6 b	4.9	6.9 abc	5.1 a-d	17.0 ab
NJB2 – urea:ESN (40:60) at hilling	4.6 ab	5.3	7.6 abc	3.5 a-d	16.4 b

### Extension Activities (presentations to growers, articles, poster presentations, etc.)

N Management Project Results. M. Tenuta. CMCDC Carberry Field Tour. July 23, 2015.

Two Summer Tours of Research Sites to Project Stakeholders. Participants Rigas Karamanos and John Kruse of KOCH Agronomic Services and Ray Dowbenko of Agrium Inc.

Nitrogen Source and Timing for Optimal Yield of Irrigated Processing Potato in Manitoba. K. Baron, W. Shaw, M. Tenuta and D. Gibson. Poster Presentation. Agronomy, Crop Science and Soil Science Society of America Annual Meeting. Minneapolis, MN. November 11, 2015

The N Management Study. M. Tenuta, W. Shaw and D. Gibson. MPHPEC Research Reporting Day. December 8, 2015.

The Canadian 4R Research Network. M. Tenuta. The Fertilizer Institute Annual Meeting. Orlando, Florida. February 09, 2016.

UofM Potato Projects Under the Growing Forward 2 Program. M. Tenuta. Keystone Potato Growers Spring Production Meeting. Portage La Prairie, MB. February 22, 2016.

Fertility Studies in the Soil Ecology Laboratory. M. Tenuta. Manitoba Soil Fertility Committee Meeting. Winnipeg, MB. March 17, 2016.

### Early Outcomes (if any) or Challenges

Very pleased with results so far with 6 site years in MB and 2 in AB. No serious challenges in past year.

### Key Message(s)

Results across the project indicate split application of granular urea fertilizers at planting and hilling, as well as fertigation in which most N is applied at planting are top producers. The extra resources used to fertigate are not apparent compared to the simpler split granular application. The trials in MB move to Phase 2 to see if in-season evaluation of N fertigation needs can provide increased yield or N fertilizer cost savings. Alberta has only two site years completed so far so we will continue with the same treatments there in 2016.

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