Fertilizer & Irrigation Studies in Drip Irrigated Fresh Market Onions & Furrow Irrigated Garlic & Processed Onions

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Growers are Switching to Drip Irrigation

- **Water Management is Different**
  frequency and amounts?
- **Fertilizer Management is Different**
  sources, amounts, placement?
- **GOALS are the same: GOOD CROP**
  Resource Efficiency
  Environmentally Friendly

HOW to Grow with Drip?

Fresh Market Onion

Drip Irrigation & Fertilizer Field Studies

UC WSREC, Fresno County - 2006 and 2007

Variety	**CHIEF**
Plant	**week of January 22**
Harvest	**week of August 25**
Irrigation	**Solid set sprinklers for emergence and herbicide** **Subsurface DRIP** **start May 1** (onions 4-6” tall) **stop July 25**
Soil	**Panoche Clay Loam**
Nitrogen in Soil	**Total N level before planting = 0.06%**

PRODUCTS TESTED in Drip Irrigation Studies

Products *(all are liquid)*	**Company**	**Comments**
NITROGEN sources		
UN 32		urea & ammonium nitrate (UAN)
CAN 17		calcium ammonium nitrate
CN 9		calcium nitrate
other CALCIUM sources		
CalMax Premium (9-0-0)	Western Farm Service	calcium + several micronutrients
CaTs	Tessenderlo Kerley Co.	Calcium thiosulfate (6% Ca, 10% S)
N-INHIBITORS (add to conventional N fertilizer and it delays N release)		
Agrotain	Agrotain Int'l	Controls volatilization of UAN
GP 39	Georgia Pacific	80% CAN 17 + 20% NFusion
GP 40	Georgia Pacific	60% CAN 17 + 40% NFusion
GP 33	Georgia Pacific	80% UN 32 + 20% NFusion
GP 07	Georgia Pacific	60% UN 32 + 40% NFusion
ENHANCERS		
Acadian (0.3- 0.0- 5.0)	Acadian Agritech	100% Seaweed concentrate
Horizon	Horizon Ag Products	liquid soluble humus plus (humic acids +)

Table 1: Effect of N Rate and Source on Onion Yield

N- source*	lbs/A	Yield Tons/A 2006		2007		Avg
	100	**52**	g			
	150	**62**	abcde	**58**	j	
UN 32	200	**62**	abcde	**70**	ab	**66**
	250	**65**	ab	**71**	ab	**68**
	300	**58**	cdef	**70**	ab	**64**
					avg	**66**
	150	**63**	abcd			
CAN-17	200	**59**	abcdef	**70**	ab	**65**
	250	**60**	abcdef	**68**	bcd	**64**
	300	**60**	abcdef	**70**	abc	**65**
					avg	**65**
	150			**63**	fghi	
CN-9	200			**68**	bcd	
	250			**70**	ab	

*** 7 weekly applications through drip after bulbing started (May 11 - June 22)**

Table 2: Comparison of Slow Release Fertilizers to UN 32 under Drip Irrigation

Onion Yield - Tons/Acre

		Conventional	Slow Release		
Total N	N in drip	UN 32*	GP 39**	GP 40**	Agrotain*
150	100	58 j	66 c-f	62 g-i	61 h-j
200	150	70 ab	67 b-d	63 e-i	62 g-i
250	200	71 ab	64 d-h	67 b-f	
	avg	66.3	65.7	64.2	61.5

* UN 32 and Agrotain - 7 weekly applications (May 11 - June 22)

** GP products – 3 weekly applications (May 11 - May 25)

GP 39 = 80% CAN 17 + 20% NFusion

GP 40 = 60% CAN 17 + 40% NFusion

Table 3: Effect of "Additives" on Onion Yield

	Additive*	Total N Lbs/A**	Onion Yield Tons/A	
Acadian – foliar* **	seaweed	200	**72.5**	a
CaTs (20 gal)	Calcium + sulfur	200	**70.4**	ab
CalMax Premium + AMS	calcium	200	**70.1**	ab
Check plot UN 32		200	**70.3**	ab
CaTs (40 gal)	Calcium + sulfur	200	**69.2**	ab
CalMax Premium	calcium	200	**67.5**	b
Horizon	humic acid plus	200	**66.9**	b
Acadian - drip	seaweed	200	**66.8**	b

*7 weekly applications after bulbing started (May 11 - June 22)

**All treatments received 200 lbs N/A as UN 32 (50 lbs preplant + 150 lbs through drip)

***Two foliar applications (May 18 & June 1)

Table 4: Effect of "Additives" on Onion Bulb Firmness

	Bulb Firmness (psi)		
	2006	**2007**	**Avg**
CalMax Premium	21.9	23.7	22.8
CN 9	--	23.2	--
Horizon	22.1	22.7	22.4
CaTs	22.0	23.1	22.5
UN 32	20.5	22.6	21.5
CAN 17	21.5	21.9	21.7
	NS	**NS**	**NS**

Table 5: Effect of N- Rate and N- Source on Yield

Furrow Irrigated
Processing Onions - 2000

Onion Yield - Tons/Acre

Total N*	N -Rate	Urea**	Slow Release***	Slow Release + Urea (50 lbs)
33	0	15.0		---
80	50	18.0	16.9	---
133	100	18.0	16.2	18.6
183	150	18.1	16.0	18.4
233	200	17.4	17.2	17.2
		NS	NS	NS

Soil not depleted of N

* Preplant: 33 lbs N applied to all treatments

** Urea: Sidedress - March 2000

***Slow release: Preplant - Dec 1999

Plant: Dec 10, 1999 Harvest: Aug 18, 2000

Note: Dehydrated onion - 20% solids Fresh onion - 8% solids

Table 6: Effect of N- Rate and N-Source on Yield Furrow Irrigated GARLIC* - 1997

Source	Total N Applied	Garlic Yield Tons/Acre	
Slow Release	230	5.0	a
Slow Release	180	4.9	ab
Slow Release	130	4.9	ab
Urea	270	4.6	abc
Urea	230	3.7	de
Urea + Foliar	270	4.0	cde
Urea + Foliar	200	4.4	abc
Urea + Foliar	80	3.5	e

* Virus susceptible seed used.

Table 7: Effect of N-Rate & N-Source on Yield
Furrow Irrigated GARLIC - 2000

Total N*	N-Rate	Urea**	Slow Release***	Slow Release + Urea (50 lbs)
83	50	9.7	11.1	---
133	100	10.4	10.2	10.8
183	150	10.6	10.3	11.4
233	200	10.7	---	11.0
		NS	NS	NS

Soil not depleted of N

* Preplant: 33 lbs N applied to all treatments

** Urea: Sidedress - Jan 13, 2000

***Slow release: Preplant - Oct 27, 1999

Plant: Oct 27, 1999 Harvest: Aug 18, 2000 (Virus free seed)

Table 8: Effect of Phosphate* on Onion Yield

P_2O_5	Onion Yield Tons/Acre		
	2006	2007	Avg
0	40.4	55.2	47.8
52	43.0	57.5	50.3
104	46.1	55.0	50.5
156	---	53.7	--
208	45.7	51.6	48.7
312	45.3	---	
416	44.4	---	
	NS	**NS**	**NS**

* All phosphate applied preplant

Soil P (Olsen) 8 ppm each year (field location was side by side)

Onions planted late January, harvested late August

Table 9: Effect of Applied Water on Yield and Quality

Drip Irrigated – Fresh Market Onions

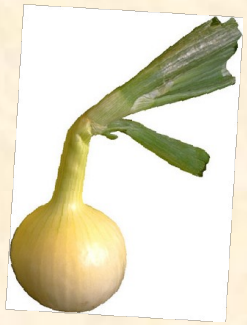
% ETc	Water applied thru drip (inches)	Yield T/A	Water applied thru drip (inches)	Yield T/A (Hi Pres)*	Yield T/A (Lo Pres)*	Brix %		Bulb Firmness psi	
	2006		2007			2006	2007	2006	2007
80	14	34.4 c				7.7	---	23.3	---
100	17	48.4 b	17	---	58.6 b	7.4	8.1	22.7	23.0
120	21	52.0 b	19	64.1 ab	68.1 a	7.5	8.3	22.6	24.6
140	25	58.6 a	21	65.0 ab	60.0 b	7.9	8.4	23.2	25.5
160	26	61.6 a	23	70.4 a	59.0 b	7.2	8.5	23.3	26.6
		LSD at .01%				NS	NS	NS	NS
		CV = 7%							

Pre-irrigation + sprinkler irrigation was 12” water applied prior to drip.

Drip irrigation was started when the plants were 3-4 inches tall.

* High Pressure – 10 psi Low Pressure – 3 psi

Applied water of the 100% treatment was determined from standard crop coefficients of onion and reference crop ET.



Conclusions about ONIONS under DRIP

1. **N** Rates: 150-200 lbs N/acre (growers fine tune)
2. **N** Source: Cheapest (CN9 – may improve firmness)
3. **P** Rates: No Yield increase
   Same Bulb Firmness
   (*expect yield response with low P in soils - 8 ppm)*
4. **A**dditives: May benefit quality
   May increase yield (not consistent)
5. **W**ater: ETc 140-160% (best yields, no drop in quality)

Conclusions on PROCESS ONIONS Furrow Irrigation

1. N Rates: 100-150 lbs N/acre

20 T/A process onion 20% Brix
50 T/A fresh onion 8% Brix
} about same tons of Brix

(70 T/A fresh onion under Drip needs more N)

2. Slow Release: Most potential in Furrow Irrigation

Drip Slow Release: 3 applications

Drip Conventional: 7 applications

3. Slow Release: Formulation costs

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Liquid = 5-10% more expensive than conventional fertilizer

Dry = more expensive than liquid

Thank You

Any questions?

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