Effects of Potassium Rates in Yield, Fruit Quality, Plant Biomass and Uptake on Mature-Green Tomatoes in Seepage Irrigation

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Potassium as a Key Nutrient in Tomato

- Tomato have relatively high K requirement compared with N and P.
- Potassium is the major component of fruit at approx. 250 mg/100 g of fruit, a very high concentration compared to P at 25-40 mg/100 g of fruit.
- 2.3 to 3.3 lb of K uptake/ton of tomato harvested (highest demand during fruit balking).

K Deficiency

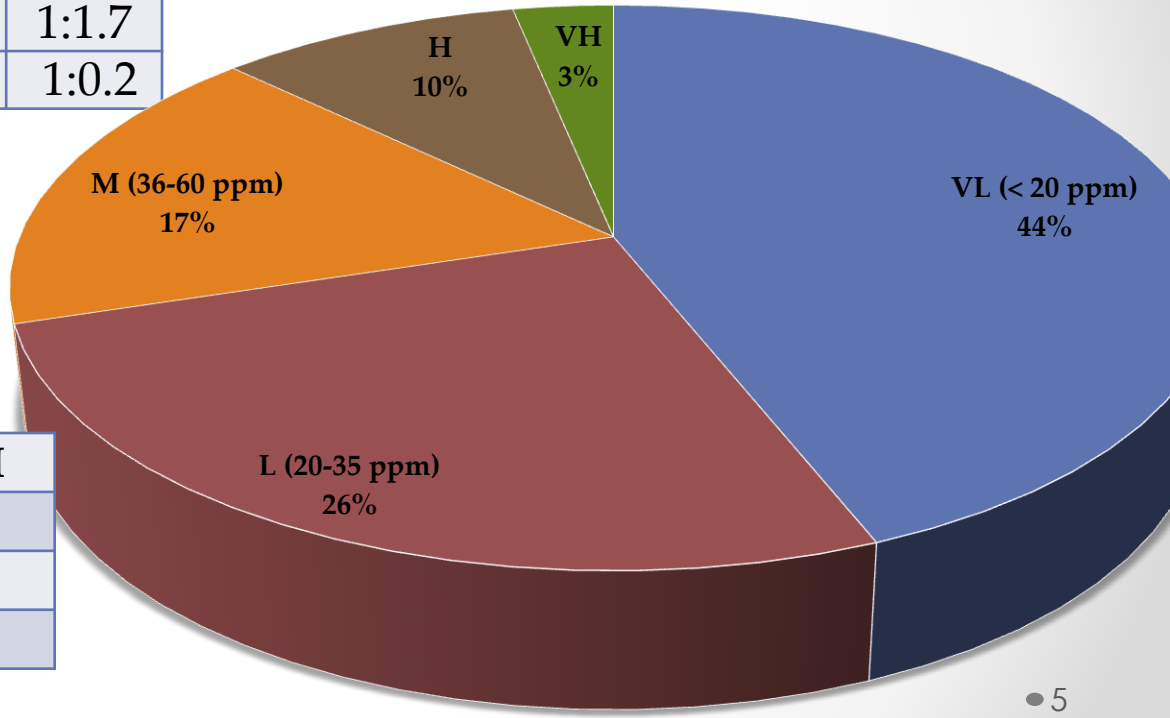
- Leaves to turn dark brown, yellowish to white necrotic dots develop near the leaf margins of the older leaves, which merge into brown necrotic areas around the leaf margins

Adequate K Nutrition

- Uneven and blotchy ripening
- Irregular shape and hollow fruit
- High level of internal white tissue
- Yellow shoulder
- Gray wall

Typical Manatee Farms (375 acres) Mehlich-1 K Interpretations for Vegetable Crops in FL

Average Fertilizer Application (lb/acre)		
	K_2O	N:K
Average	512 (418 – 606)	1:1.7
SD	94	1:0.2



VL	L	M	H	VH
----------K_2O----------				
	(lb/acre/crop season)			
225	150	100	0	0

Objectives

To evaluate the effect of K rate on tomato petiole sap and tissue content, plant biomass, K uptake, yield and fruit quality on spring tomatoes grown in seepage irrigation.

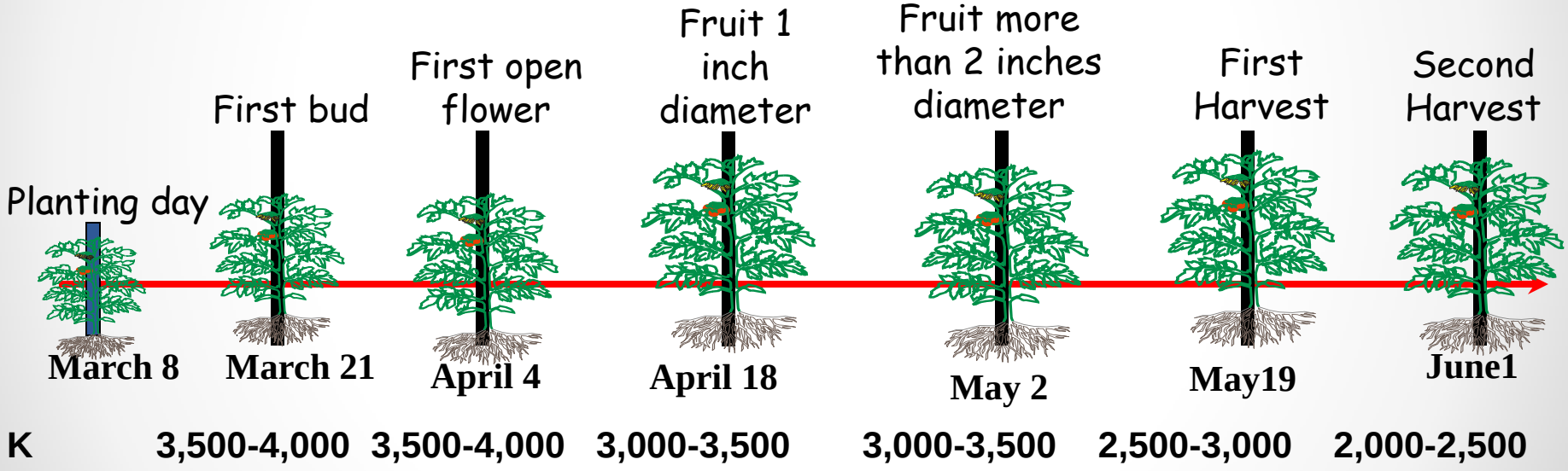
Fertilizer Rates (Very Low and Medium K)

Fertilizer Bottom mix	Fertilizer Hot mix	Fertilizer Total N Rate
(lb K_2O/acre)		
37	23	60
37	83	120
37	143	180
37	203	240
37	323	360
37	443	480
37	683	720
37	923	960

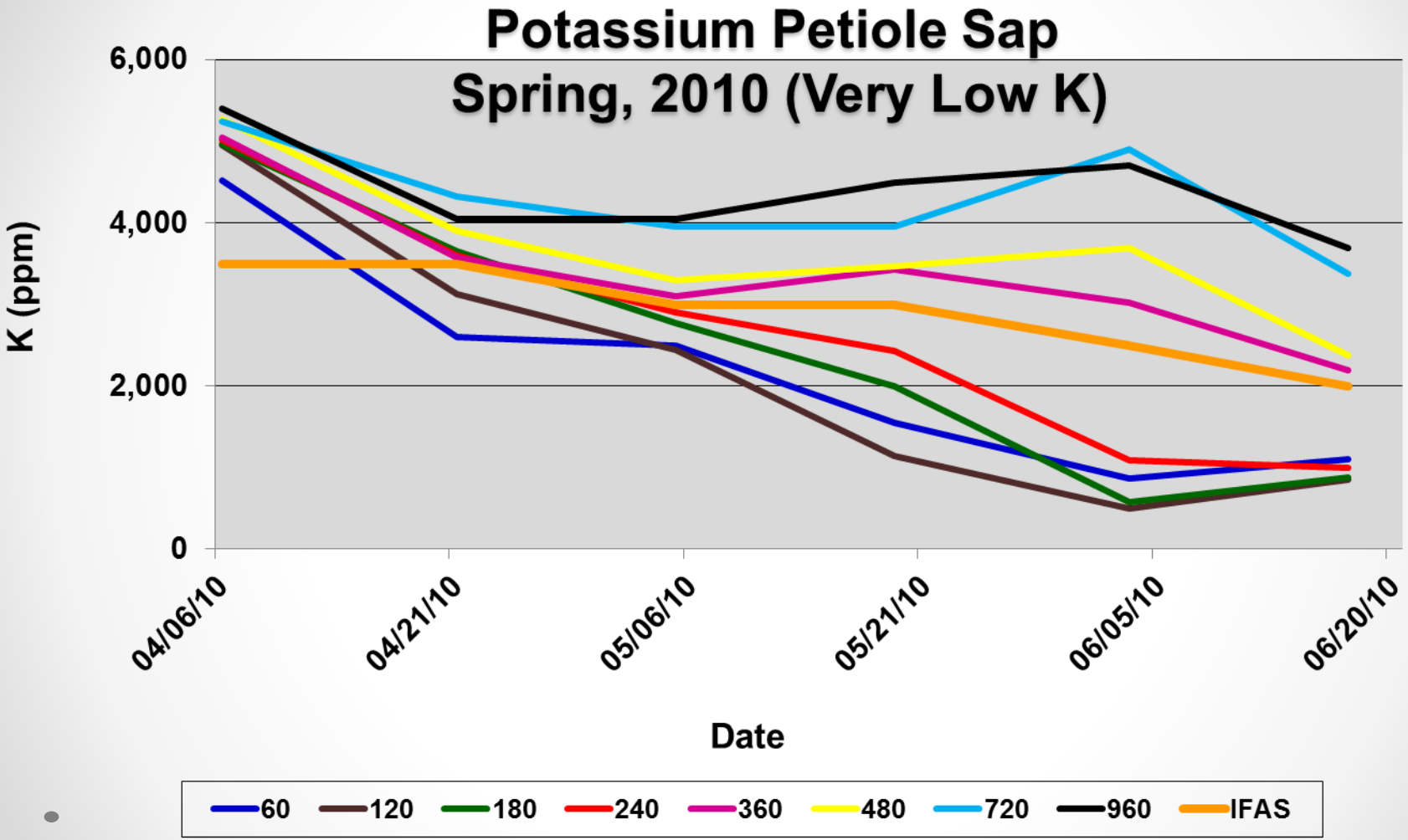
Summary of Cultural Practices

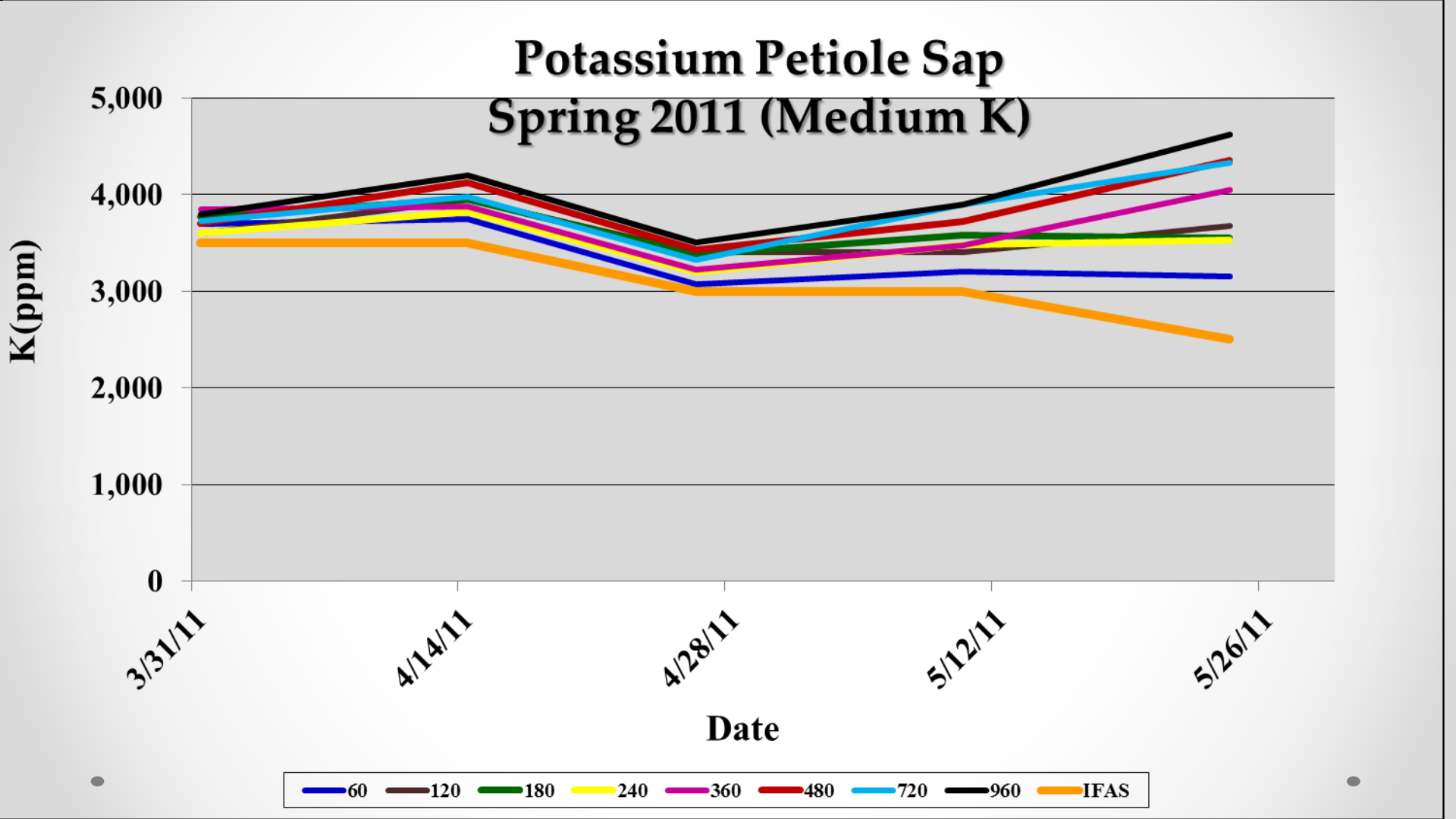
RCBD (Replications)	3 (Spring 2010)	4 (Spring 2011)
Plant spacing (inches)	24	24
Bed spacing (feet)	6	6
MeBr:Chl and Telone/Chl	50:50 @ 200lb/acre	40:60 @ 250lb/acre
Mulch	Black	Black
Planted length (feet)	3 beds of 30 (15 plants)	3 beds of 30 (15 plants)
Harvest length (feet)	34 (10 plants)	34 (10 plants)
Bed width (inches)	36	36
Transplant date	9 Mar.	8 Mar.
Harvest dates	1 and 8 June	19 May and 1 June

Tomato Phenology Palmetto, FL

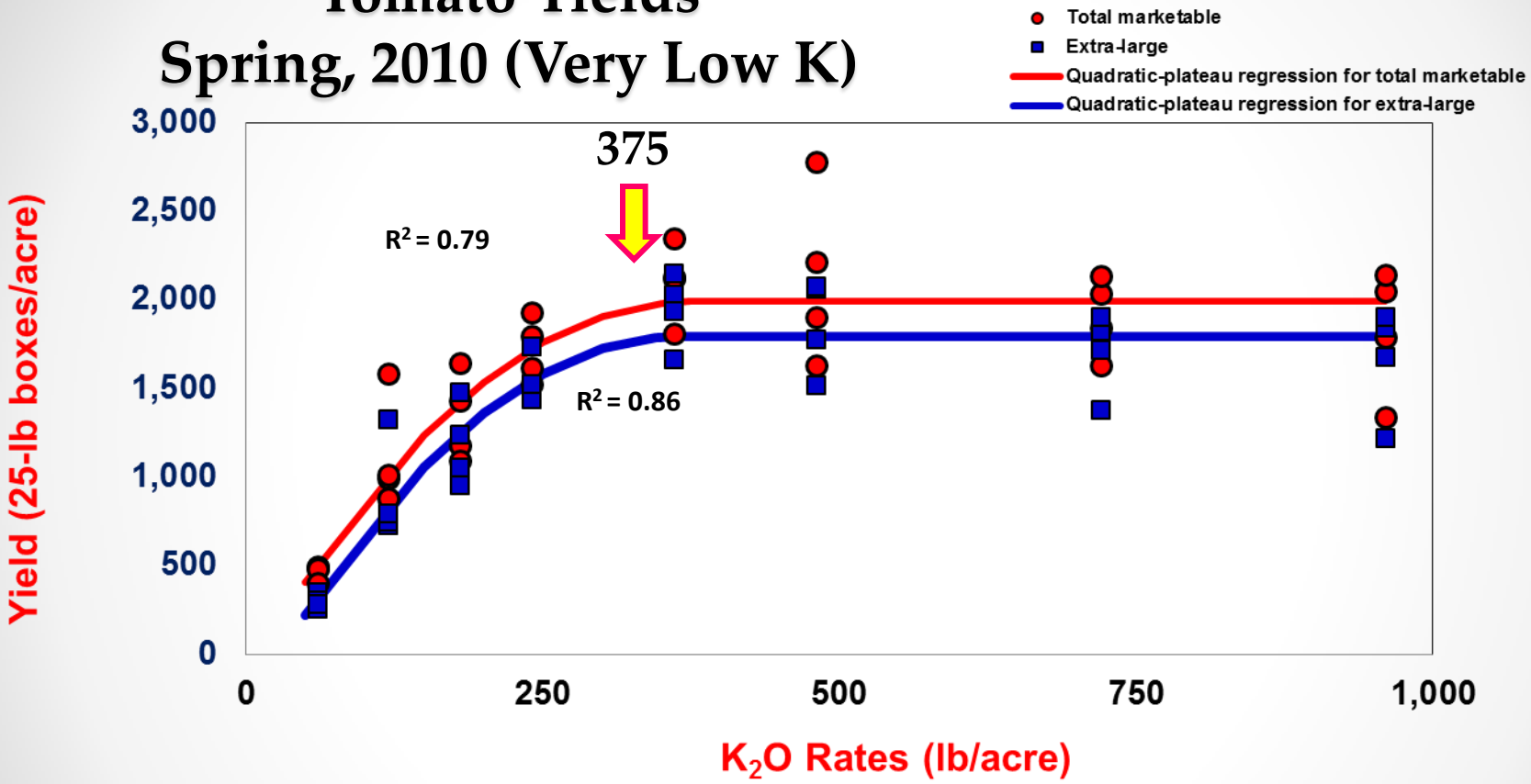


Results and Conclusions

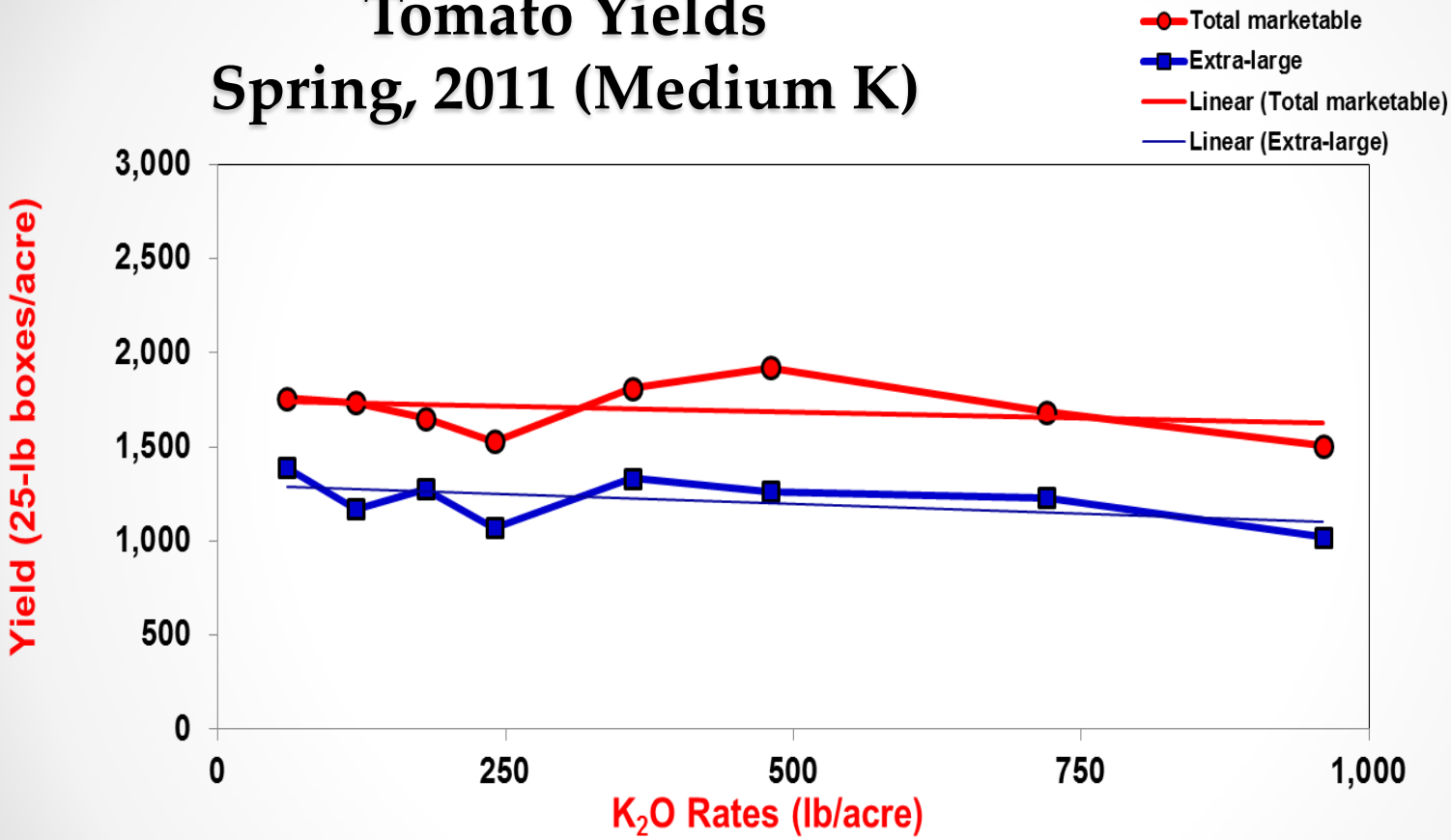

Potassium Petiole Sap
Spring, 2010 (Very Low K)
6,000
4,000
2,000
0
K (ppm)
04/06/10
04/21/10
05/06/10
05/21/10
06/05/10
06/20/10
Date
60
120
180
240
360
480
720
960
IFAS


Potassium Petiole Sap
Spring 2011 (Medium K)
5,000
4,000
3,000
2,000
1,000
0
K(ppm)
3/31/11
4/14/11
4/28/11
5/12/11
5/26/11
Date
60
120
180
240
360
480
720
960
IFAS

Tomato Yields
Spring, 2010 (Very Low K)



Tomato Yields
Spring, 2011 (Medium K)



Total Tomato Plant Biomass, Fruit, and K-Uptake (Very Low K)

Treatment K_2O (lb/acre)	Total plant biomass		--------Fruit--------		Plant biomass and fruit	
	Biomass	K-uptake	Biomass	K-uptake	Biomass	K-uptake
	----------(lb/acre)----------					
60	1,865.6	13.75	611.1	19.31	2,476.7	33.06
120	1,887.0	24.39	1,438.4	52.14	3,325.4	76.52
180	2,110.8	30.81	1,632.0	35.16	3,742.8	65.96
240	2,883.7	55.56	2,113.0	83.39	4,996.7	138.95
360	2,939.7	79.39	2,618.1	117.92	5,557.9	197.31
480	2,793.1	91.61	2,631.8	127.22	5,424.9	218.83
720	2,457.3	106.07	2,296.0	132.98	4,753.3	239.06
960	2,358.7	102.22	2,159.9	131.20	4,518.6	233.42
P. value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Regression	QP	-	QP	-	QP	-
Maximum K_2O	350.9	-	369.6	-	362.4	-

60

120

180

240

360

480

720

960

Soil Potassium Content at Second Harvest (Very Low K)

Treatment K_2O (lb/acre)	----------Soil K_2O (lb/acre)----------				
	Hot-band		Bed-center		Total
	----------Soil depth (inches)----------				
	0 – 4	4 - 8	0 – 4	4 – 8	
60	0.5	0.5	6.1	4.7	11.7
120	1.0	0.5	5.9	6.1	13.5
180	1.4	0.5	4.7	4.3	10.9
240	1.9	0.4	6.0	7.0	15.3
360	0.9	0.7	12.2	11.4	25.2
480	2.4	0.8	8.3	9.7	21.3
720	7.3	2.1	99.9	12.3	121.6
960	6.0	1.1	131.7	10.6	149.5
P. value	0.0001	0.02	0.0001	0.0001	0.0001
Regression	L	L	L	L	L

Higher K Use Efficiency (KUE) With Fertilizer Prices

Treatment	Total K – Uptake	Soil	Total Recovery
	K_2O (lb/acre)		(%)
60	39.4	11.7	85.2
120	91.8	13.5	87.8
180	79.2	10.9	50.0
240	166.7	15.3	75.9
360	236.8	25.2	72.8
480	262.6	21.3	59.1
720	286.9	121.6	56.7
960	280.1	149.5	44.7


50 lb/acre


100 lb/acre


150 lb/acre


200 lb/acre


300 lb/acre


400 lb/acre


600 lb/acre


800 lb/acre

Conclusions

- **Soils very low soil test K:**

Petiole sap K, plant biomass accumulation, tomato yields and maximum KUE the K rate should at 380 lb/acre.

- **Soils medium soil test K:**

No response to added K_2O rate, indicating that current UF/IFAS recommendation of 100 lb/acre will be sufficient for optimal tomato production.

Thanks, Thanks and Thanks
West Coast Tomato, Inc.
Griffin Fertilizer, Inc.
Howard Fertilizer, Inc.