CROPPING VIDAL BLANC IN KENTUCKY

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INTRODUCTION - VIDAL BLANC

- Economically important white wine grape cultivar in Kentucky
- Increasing acreage 100+
- Produces one of the most versatile white wines
- Well-suited to Kentucky climate and soils
- High cluster numbers and many fruitful secondary (non-count) shoots leads to overproduction and overcropping.

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IMPORTANT DEFINITIONS:

- Macroclimate – climate of a large region
  - Continental climate
    - Humid
    - Severe winter temperatures and warm summer temperatures
- Microclimate – environment within and around the canopy
- Vine balance - the balance between reproductive and vegetative growth.
- Vine size - the weight of dormant cane prunings in one season
- Crop level – clusters retained per vine
- Crop load - the ratio of crop yield to vine size

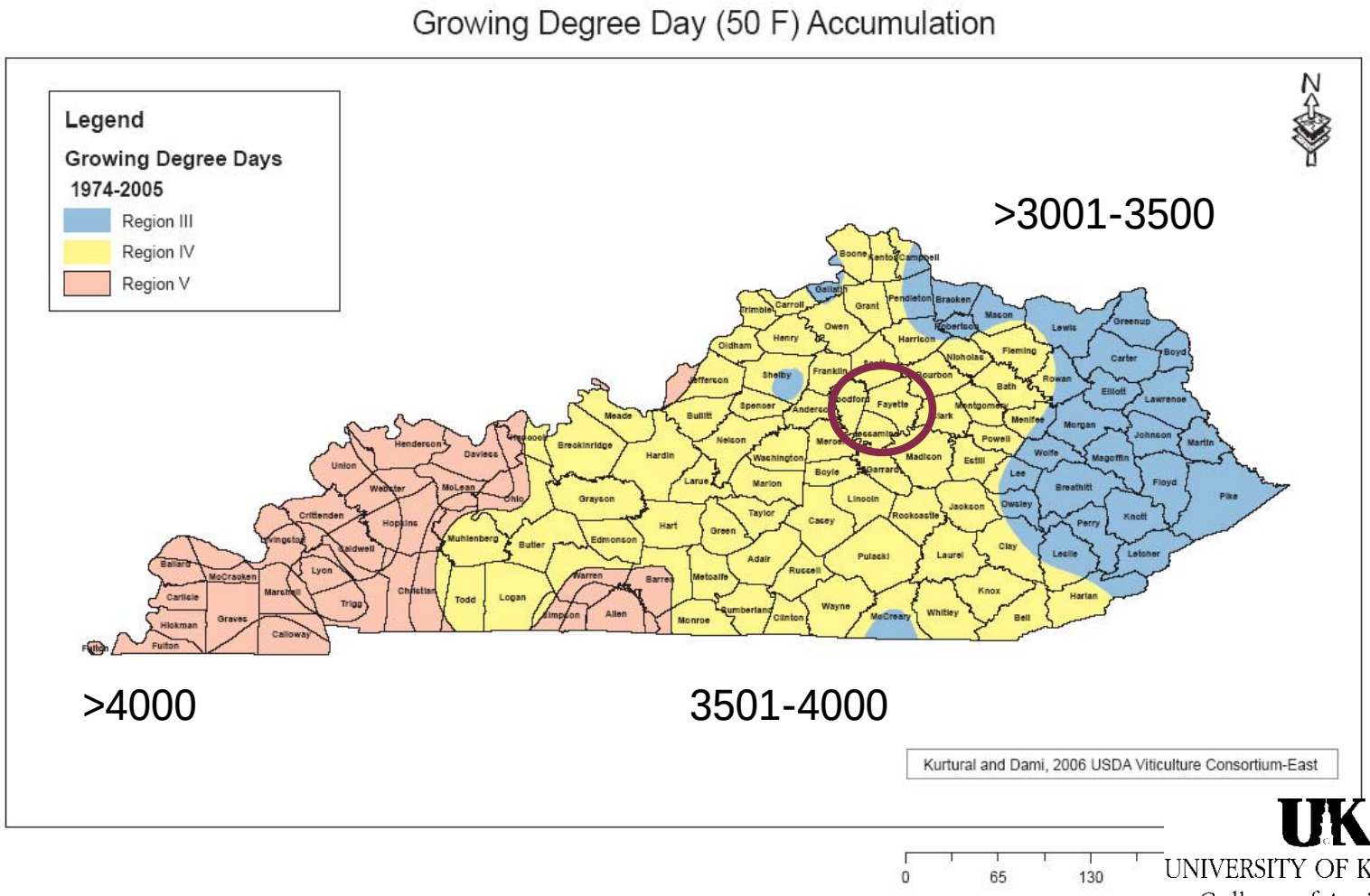
MACROCLIMATE OF RESEARCH AREA

- Growing degree day summation (GDD)
- Frost free days in Kentucky (>32ºF)
- Occurrence of -15ºF incidence

GROWING DEGREE DAYS

- The GDD summation between April 1 and October 31 has been used to predict the grapevine's ability to mature a high quality crop
- Regions I and II fall below 3000F GDD[1]
- Region III 3001F – 3500F
- Region IV between 3501F GDD to 4000F GDD
- Region V more than 4000F GDD
  - More clusters retained than vine capacity
  - Delayed harvest to reach desired fruit composition

MACROCLIMATE OF RESEARCH AREA



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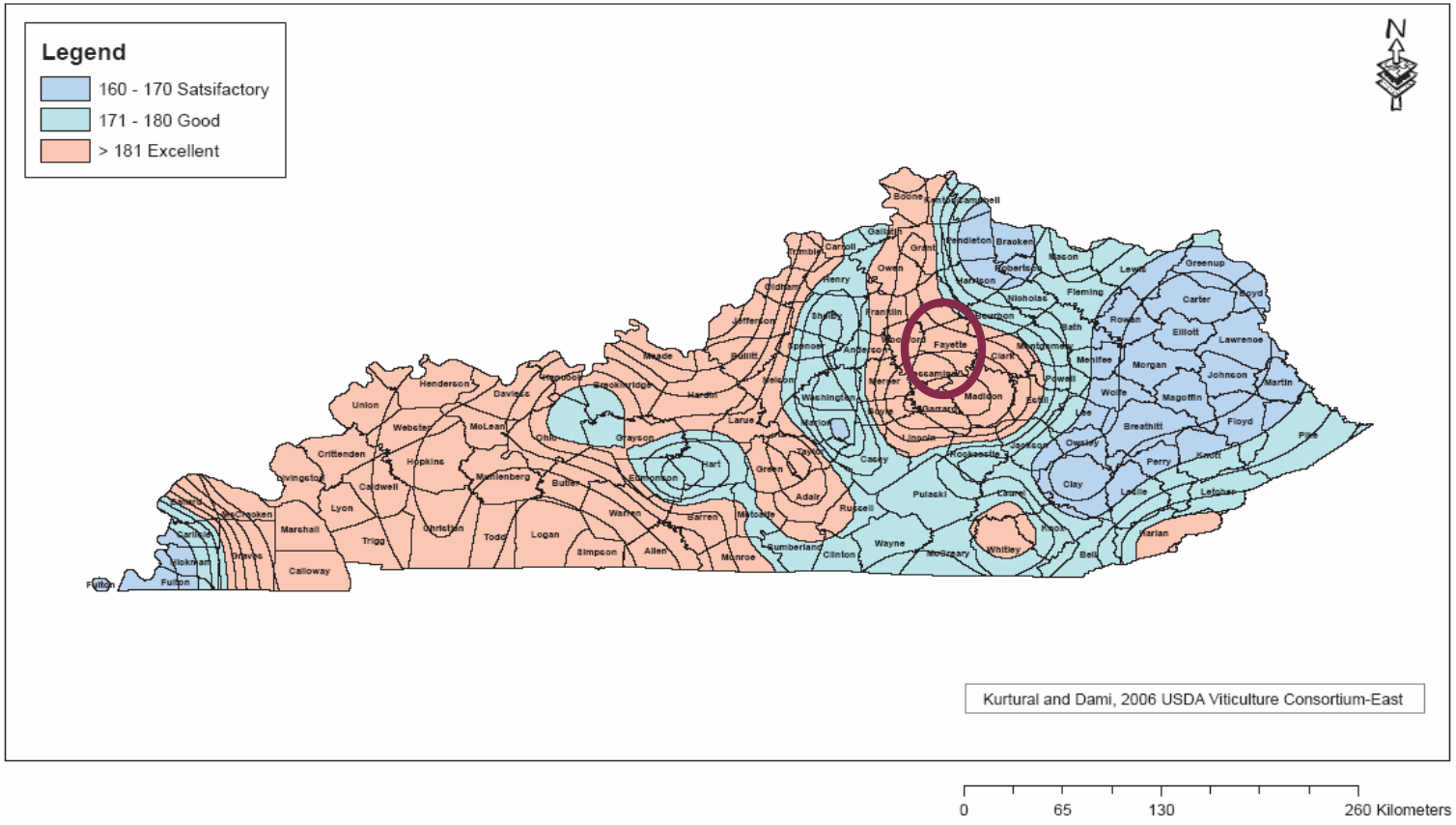
FROST FREE DAYS

- The length of the growing season
- Days between the last spring frost and the first killing fall frost
- Different requirements for different varieties to ripen crop and harden-off for winter
- General requirements:
  - 150 FFD (early ripening varieties)
  - 190 FFD (late ripening varieties)
- In 2007 230 FFD accumulated at the research site.

FROST FREE DAYS IN KENTUCKY

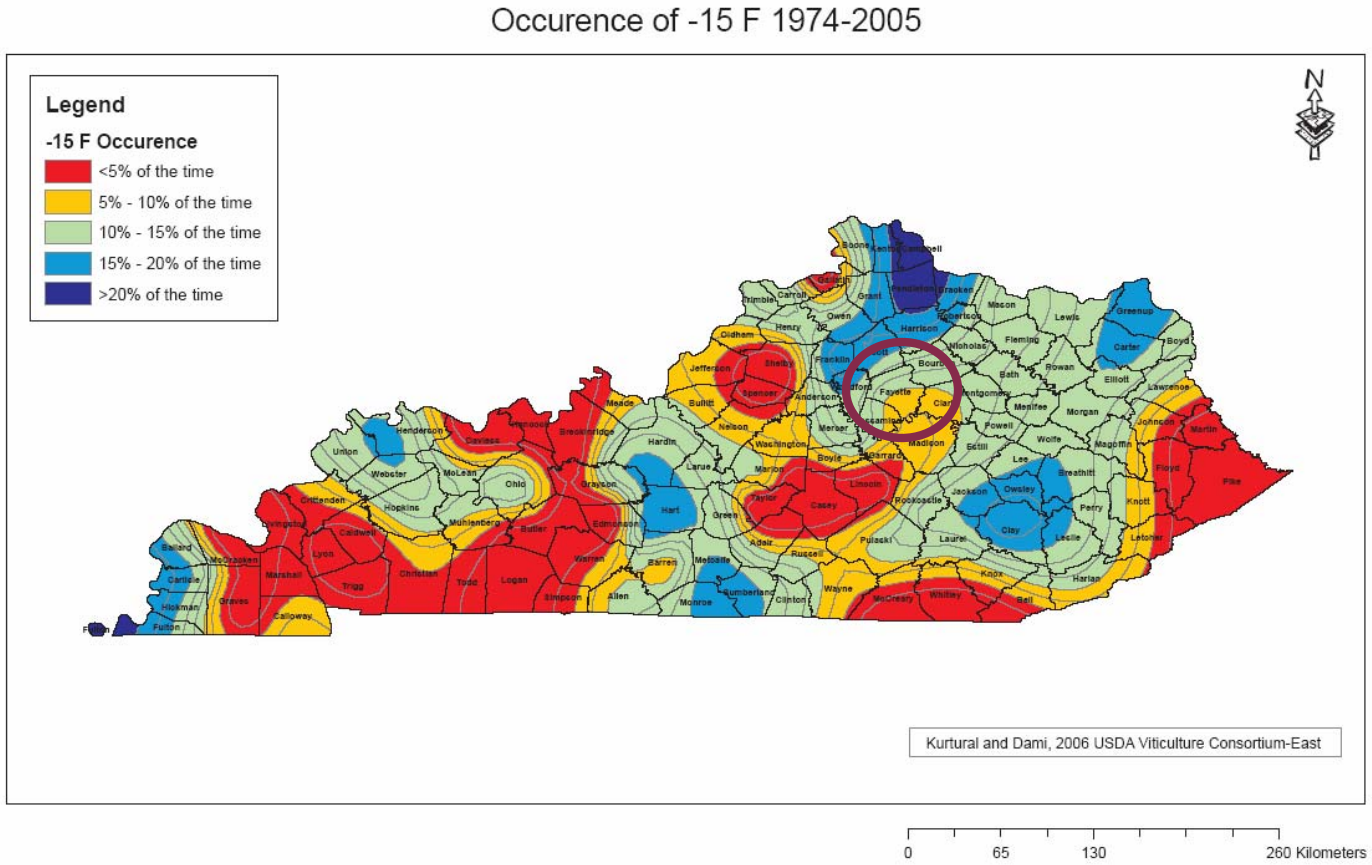
Frost Free Days 1974 - 2005



CRITICAL WINTER TEMPERATURES

- Critical winter temperatures limit where grapes can be grown commercially in Kentucky
- Winter thresholds
  - For European (*V.vinifera*) -8^{o} F
  - For French-American hybrids (*Vitis* spp.) -15^{o}F
  - For certain American (V. *aestivalis*, *labruscana*) -25^{o}F to -30^{o}F

MACROCLIMATE OF RESEARCH AREA



PROJECT OUTLINE

- Justification
- Objectives
- Materials and methods
- Results
- Discussion

JUSTIFICATION - WHY STUDY VIDAL BLANC?

- Cropping studies conducted in vinifera and some hybrid cultivars[2 5 6 7]
- Cropping study in Vidal blanc conducted in cooler climate (<1500 GDD)[4]
- No published research on cropping of Vidal blanc under long growing season

Hypothesis:

Under the long warm growing season typical of the lower Midwest, Vidal Blanc can ripen a commercial crop without adversely affecting yield, fruit composition and mid-winter cold hardiness.

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HYPOTHESIS

- Under the long warm growing season typical of the lower Midwest Vidal Blanc can ripen a commercial crop without adversely affecting yield, fruit composition and mid-winter cold hardiness.

OBJECTIVES:

- Evaluate the effect of balanced pruning and cluster thinning on:
  - Canopy microclimate
  - Yield components
  - Fruit composition
  - Winter hardiness
  - Wine quality

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MATERIALS AND METHODS

- Commercial vineyard in central Kentucky
- Own rooted ‘Vidal Blanc’ planted in 2001 @ 545 vines/acre
- North-South facing arrangement.
- Trained to 6 ft. single high wire bi-lateral cordon.

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VITICULTURE TREATMENTS

- Experimental design CRD, 4 replications
  - Treatments: (3 x 3)
- 3 balanced pruning treatments x 3 cluster thinning treatments

Balanced pruning treatments

- 20 +10 (20 nodes retained for each 454g)
- 30 +10
- 40+10

Cluster thinning treatments

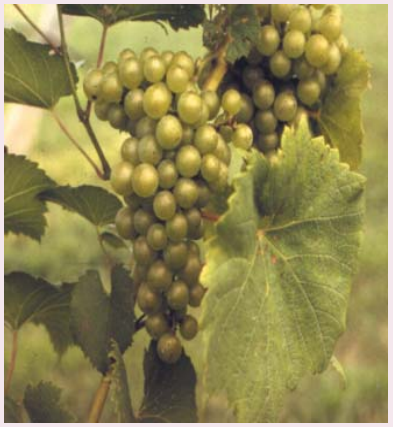
- 1 cluster per shoot
- 2 clusters per shoot
- 2+ clusters per shoot (no thinning)

EICHORN - LORENZ PHENOLOGICAL STAGES :

Bud Burst (05)

Bloom (25)

3-5mm (29)



Veraison (35)

Harvest (38)

Periderm Browning (41)

Killing Frost (43)

PHENOLOGICAL PROGRESSION OF VIDAL BLANC AT THE RESEARCH SITE:

	E-L Stage	2006	2007	GDD 2006	GDD 2007
Bud Break	05	April 18	May 1	8	177
Bloom	25	May 16	May 28	272	637
Cluster Thinning (3-5mm)	29-31	June 14	June 11	764	968
Veraison	35	August 6	August 9	2175	2516
Harvest	38	Sept. 11	August 23	3022	2944
Periderm Browning	41	Sept. 26	August 30	3234	3161
Killing Frost	43	November 11	November 23	3507	4329

GDD provided by UK Ag. Weather Center http://wwwagwx.ca.uky.edu/

RESULTS:

EFFECT OF PRUNING AND CLUSTER THINNING ON CANOPY MICROCLIMATE OF VIDAL BLANC IN 2006 AND 2007

Table 1.	Leaf area/vine (ft)	Dist. Between shoots (in.)	LLN	Leaf area/vine (ft)	Dist. Between shoots (in)	LLN
		2006			2007	
Pruning Formula						
20+10	268.02	1.4a	5.168	133.47	2.4a	3.964
30+10	250.80	1.3b	6.148	172.22	2.0b	4.527
40+10	241.11	1.3ab	5.685	188.36	1.6c	5.297
P<	0.8228	0.0444	0.3084	0.0948	<.0001	0.2229
Cluster Thinning						
1 cl/shoot	268.02	1.3	5.546	162.53	1.9	4.026
2 cl/shoot	275.55	1.3	5.699	175.45	1.9	5.340
2+ cl/shoot	257.26	1.3	5.757	157.15	2.1	4.423
P<	0.9341	0.9473	0.9412	0.7487	0.1009	0.2343

RESULTS:

EFFECT OF PRUNING AND CLUSTER THINNING ON YIELD COMPONENTS OF VIDAL BLANC IN 2006 AND 2007

Table 2.	Clusters harvested per vine	Yield per vine (lb/vine)	Cluster weight (g)	Clusters harvested per vine	Yield per vine (lb/vine)	Cluster weight (g)
		2006			2007	
Pruning Formula						
20+10	90	25.6	129.18	73b	24.53b	154.46a
30+10	99	25.7	125.40	82b	25.03b	142.39ab
40+10	88	23.7	123.64	99a	29.50a	137.13b
P<	0.4872	0.8433	0.9159	0.0003	0.0538	0.0990
Cluster Thinning						
1 cl/shoot	62b	16.9b	127.56	48c	16.54c	156.62a
2 cl/shoot	104a	26.9a	117.75	96b	28.45b	136.64b
2+ cl/shoot	111a	31.1a	132.90	110a	34.01a	140.73ab
P<	<0.001	0.0035	0.5301	<0.0001	<0.0001	0.0425

RESULTS:

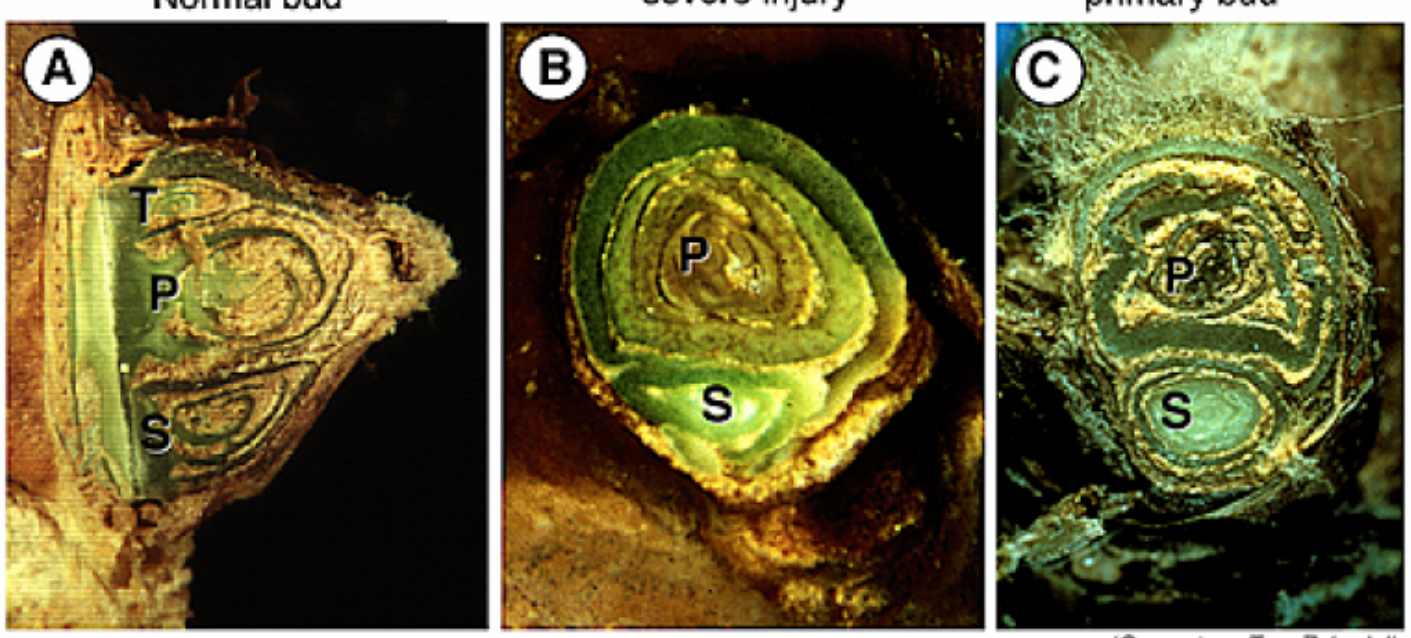
EFFECT OF PRUNING AND CLUSTER THINNING ON YIELD COMPONENTS OF VIDAL BLANC IN 2006 AND 2007

Table 3.	TSS	Juice pH	TA (g/L)	TSS	Juice pH	TA (g/L)
		2006			2007	
Pruning Formula						
20+10	16.58	3.36	4.71	18.98	3.35	7.5
30+10	17.01	3.39	4.74	19.01	3.35	7.2
40+10	15.88	3.29	4.62	18.58	3.32	7.6
P<	0.1768	0.0622	0.0624	0.4217	0.4990	0.2635
Cluster Thinning						
1 cl/shoot	16.50	3.35	4.68	18.93	3.35	7.3b
2 cl/shoot	16.73	3.35	4.69	18.78	3.31	7.9a
2+ cl/shoot	16.15	3.36	4.68	18.93	3.36	7.0b
P<	0.6342	0.9976	0.9964	0.9029	0.1917	0.0043

EFFECT OF PRUNING AND CLUSTER THINNING ON PRUNING WEIGHTS AND CROPLOAD OF VIDAL BLANC GRAPEVINES IN 2006.

Table 4.	Mature weight (g)	Die-back weight (g)	Vine size (lb) per foot of row	Crop Load
Pruning Formula				
20+10	584	497	.3029	11.76
30+10	528	504	.2891	12.96
40+10	570	549	.3136	10.07
P<	0.7305	0.6603	0.6823	0.4815
Cluster Thinning				
1 cl/shoot	581ab	540	.3141ab	7.69b
2 cl/shoot	642a	535	.3297a	10.86b
2+ cl/shoot	460b	475	.2618b	16.25a
P<	0.0302	0.4946	0.0297	0.0045

BUD KILL DUE TO WINTER INJURY



(C, courtesy Tom Zabadal)

SIMULATED FREEZE TESTS

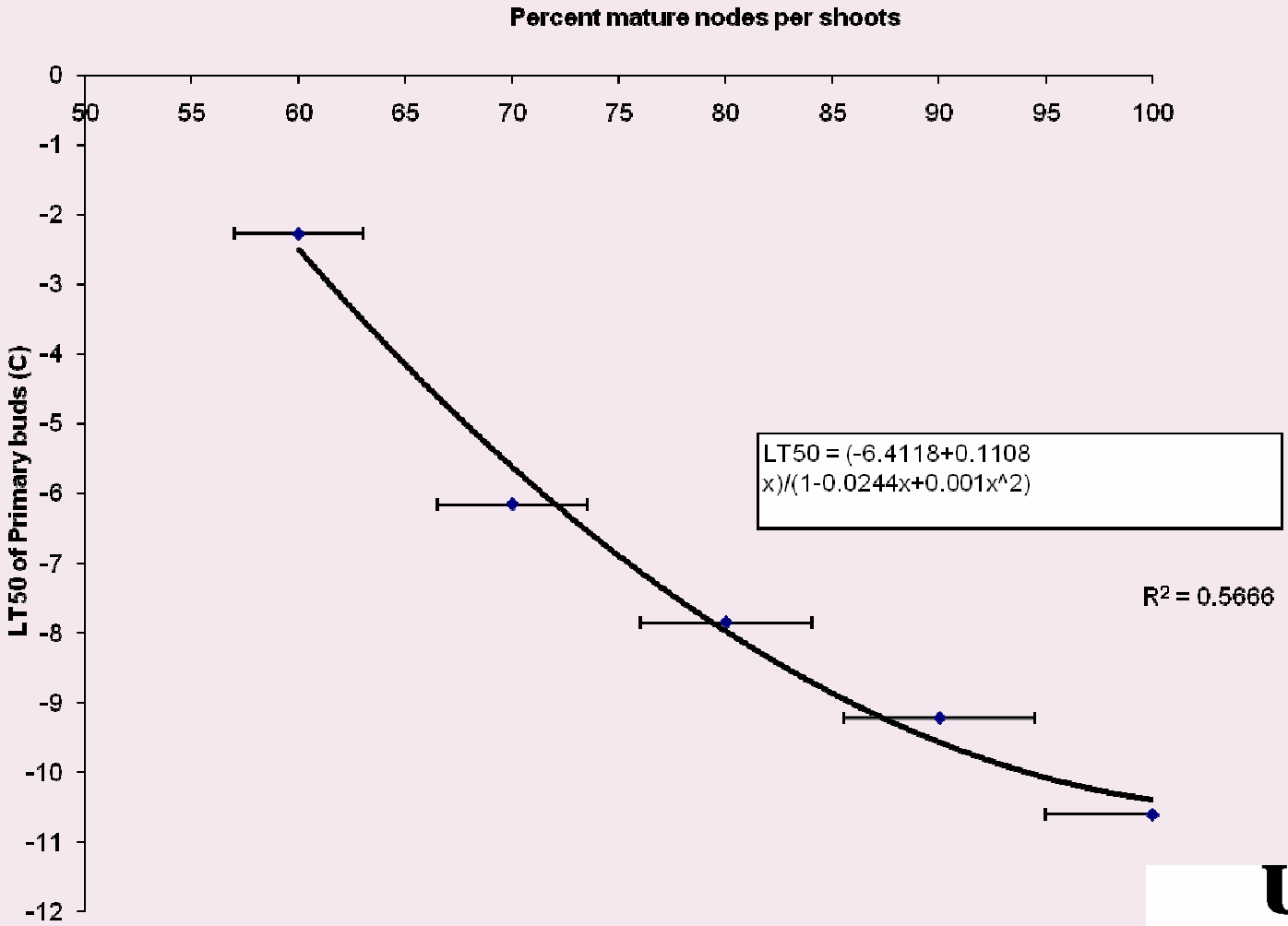
- Dormant canes harvested and cut into 3 node sections (27 nodes total)
- Three replications from each treatment group
- Freeze tests of temperatures ranging from 32ºF – to -40ºF.

EFFECT OF PRUNING AND CLUSTER THINNING ON MID-WINTER PRIMARY BUD COLD HARDINESS

Table 5.	LT_{50} °F	Percent of mature nodes per shoot
Pruning Formula		
20+10	6.98	66.73
30+10	9.21	63.24
40+10	11.79	59.00
P<	0.4553	0.4600
Cluster Thinning		
1 cl/shoot	7.52	63.54
2 cl/shoot	6.60	63.76
2+ cl/shoot	13.87	61.62
P<	0.0939	0.9328
Pruning × Thinning	0.6325	0.5812

* Lethal Temperature 50 (LT_{50}) is the lethal temperature required to kill 50% of the primary buds on the vine.

EFFECT OF WOOD MATURATION OF COLD HARDINESS OF VIDAL BLANC IN 2006



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DISCUSSION

- Balanced pruning had little effect on yield components and fruit composition measured
- The major effect was on shoot density and number of shoots exposed per acre
- Cluster thinning has significant effect on Vidal Blanc:
  - Decreased crop weight, crop load, titratable acidity, but increased vine size, cluster weight, and mid-winter cold hardiness

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DISCUSSION

- Crop load imposed has a profound effect on sustainability of Vidal blanc in Kentucky
  - As crop load decreased, cluster weight increased $R^2 = 0.3217$
  - As crop load decreased pruning weight increased $R^2=0.3487$

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SUMMARY

- Optimum crop load: 8-12
  - Cluster number - 62
  - Yield (T/A) – 4.6
  - TSS – 19
  - pH – 3.35
  - TA – 7.3 g/L
  - Achieved by: 20+10 pruning formula with 1 cluster per shoot

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