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AUSTRALASIA

SESSION SIX

Session Six
Postharvest quality, outturn

New Zealand and Australia Avocado Grower's Conference'05
20-22 September 2005
Tauranga, New Zealand

Improving avocado fruit quality through tree nutrition

Present knowledge
Future challenge

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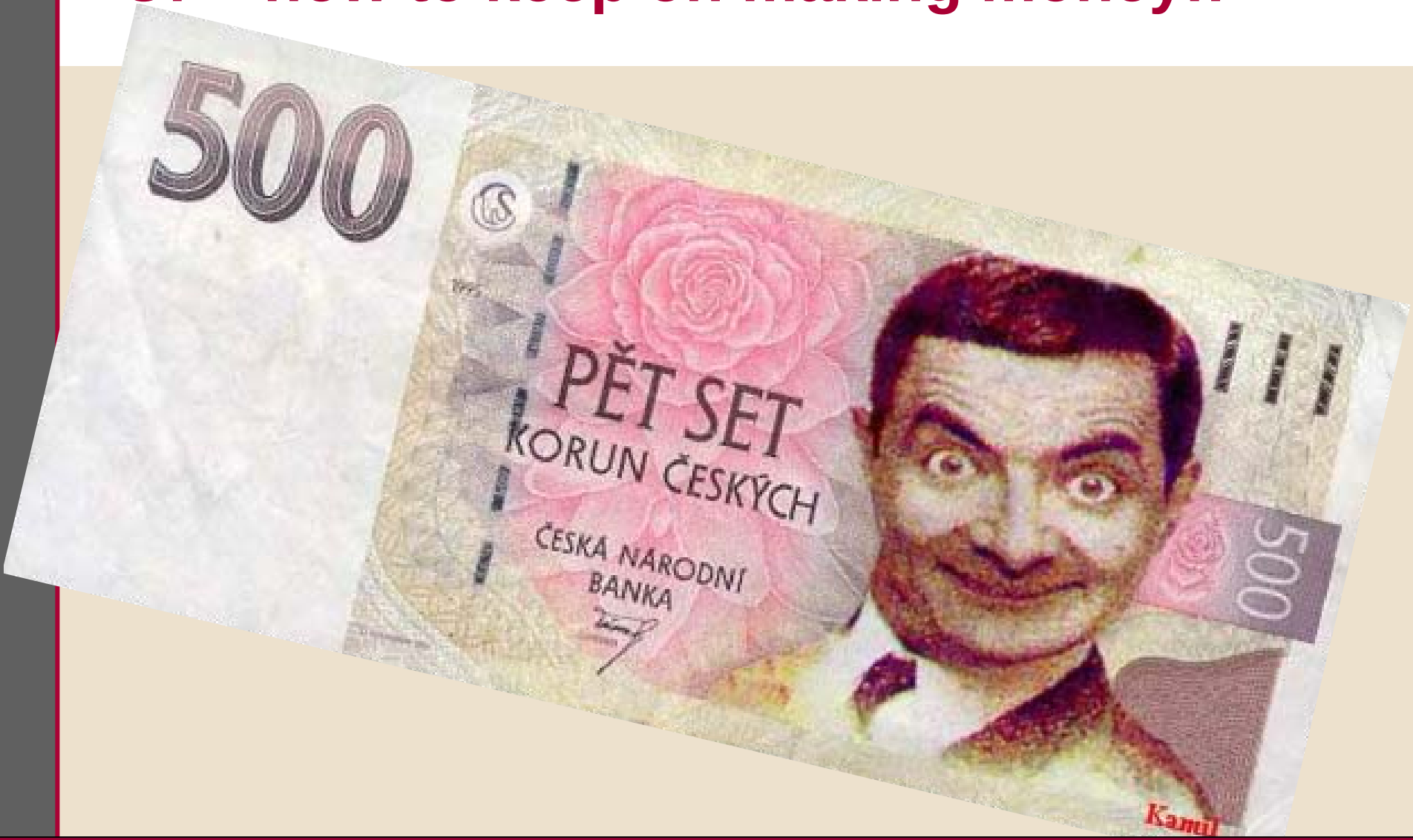
Department of Primary Industries and Fisheries

Department of Natural Resources

Or – how to keep on making money!!



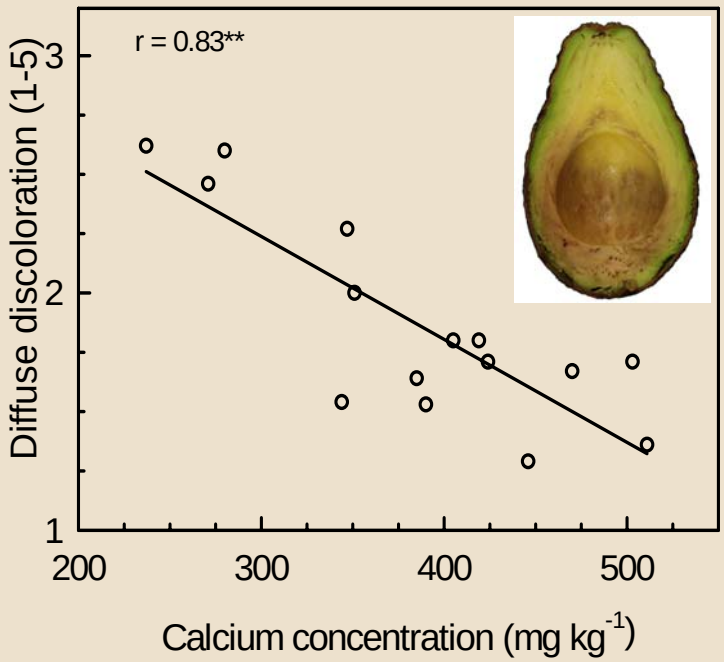
Hypothesis, and the “Holy Grail”

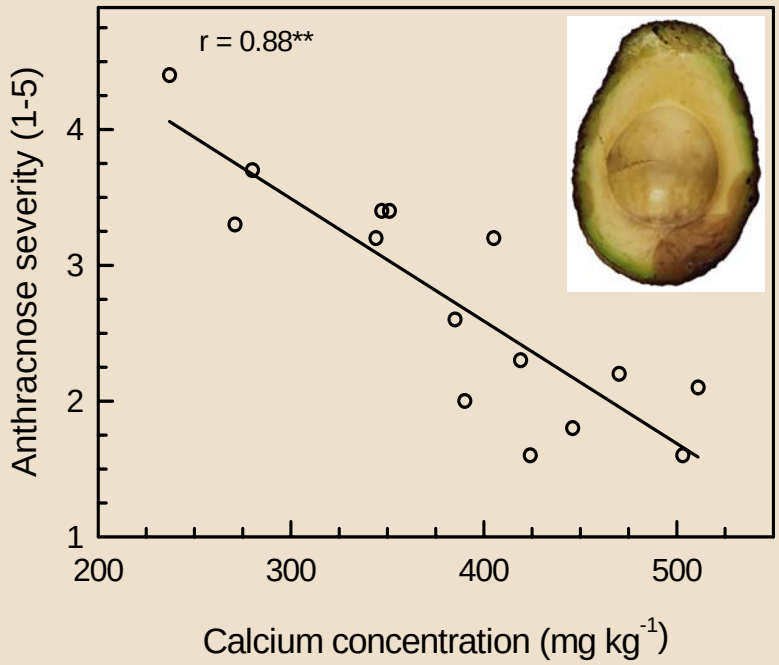
“Few postharvest disorders of fruit *(including diseases*) are completely independent of pre-harvest factors” (van Rooyen and Bower 2003)

- Aim:
  - increase fruit robustness at harvest to withstand postharvest stresses
  - develop a prediction system to reduce disorders and get consistent outturn

So far!

Long history of Ca and quality in fruits





Individual, adjacent trees

Hofman, Vuthapanich, Whiley, Klieber, Simmons 2001

Other minerals

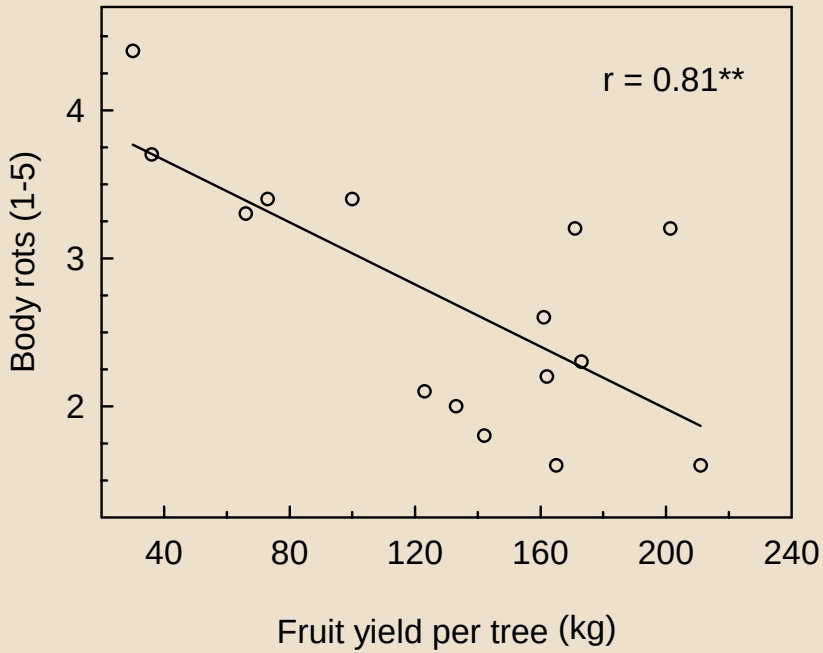
- Mg and K can also be related to fruit quality
  - More fruit Mg, better quality
  - Less fruit K, better quality
- Relationships not as strong as with Ca
- Most likely through interaction with Ca

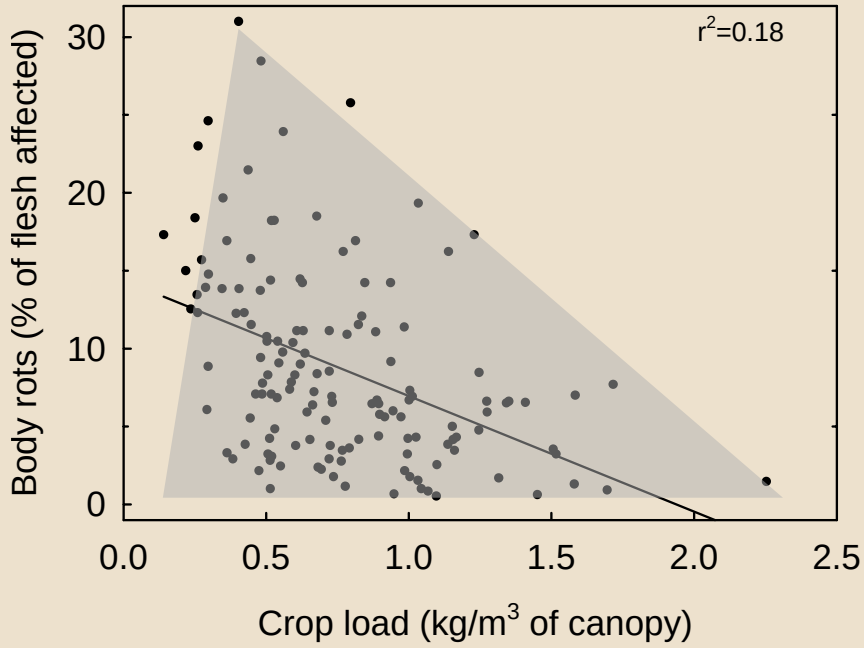
Nitrogen

- Comparing fruit from high/low N sites
  - N strongly related to quality
    (van Rooyen and Bower 2003; Kruger et al 2004)
- Recommendations for fruit N in fruit
  - <1.7% in Dec, and <1% during Feb
    (Kruger et al 2004)
- Increased N applications
  - indications of increased rots
    (Willingham et al 2003)

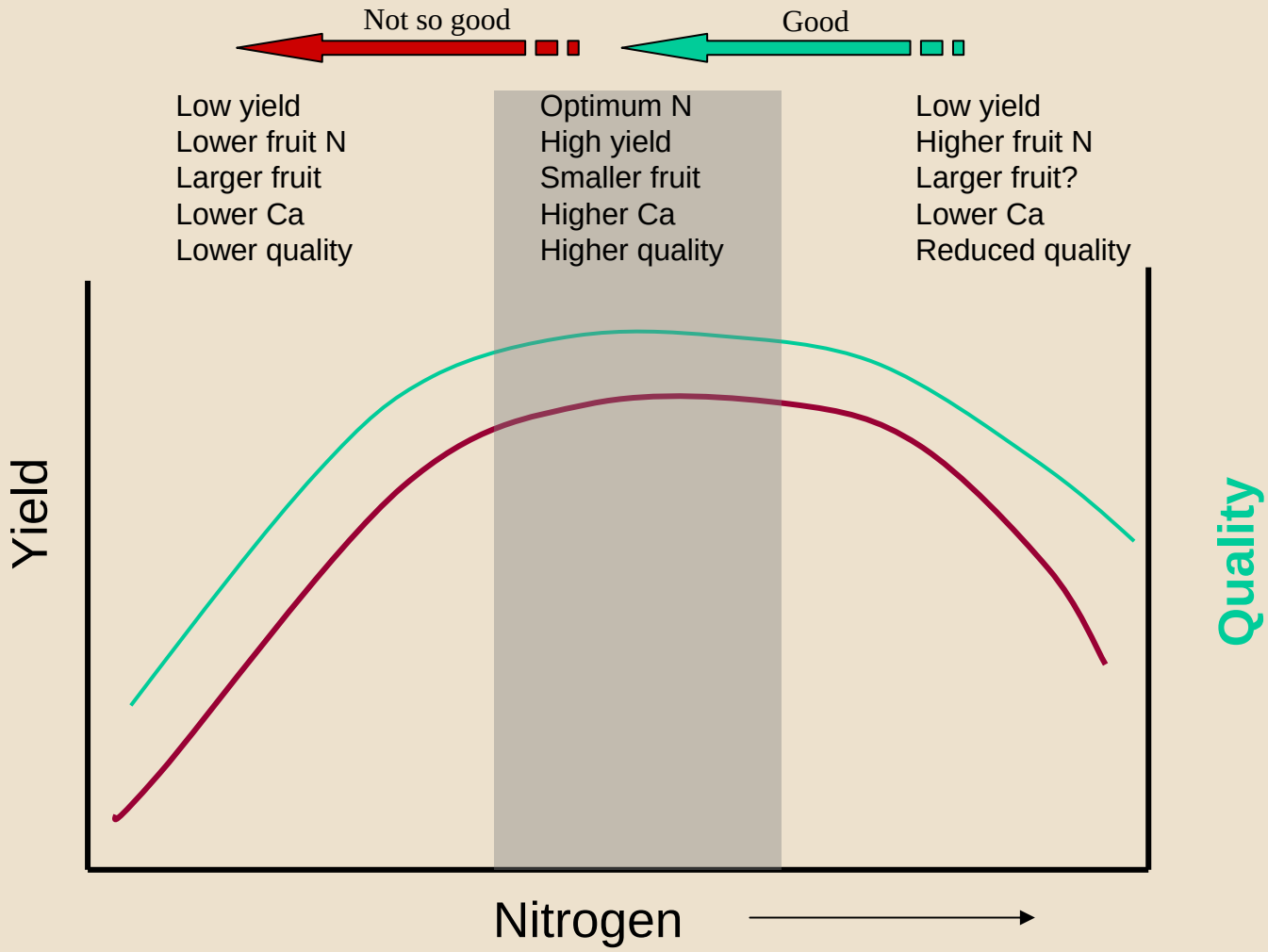
Crop load

On-year good quality
Off-year reduced quality





The nitrogen/crop load dilemma?



So!!

- When excess soil N common:
  - benefit in reducing fruit N
- When excess soil N not common (Australia?):
  - Negative effect of less N on fruit quality (through crop load)?
- What then?
  - Increase crop load
    - Genetics
    - Reduce plant stress (N, water etc)
  - Continue to focus on Ca

Challenges with Ca

- Correlations between fruit Ca and quality are common (using surveys), but

- Challenging to manipulate fruit Ca and quality by fertiliser and other practices

Now that's a challenge!

Ca effect on plant minerals

Treatment	Ca concentration			
	Early December			May
	Sap (mg/L)	Leaf (g/Kg)	Fruitlet flesh (g/Kg)	Fruit flesh (mg/Kg)
Control	14.2 [a]	14.3	1.56	374
6-MG	**20.4** [b]	14.2	**1.66**	396
12-MG	**18.3** [ab]	15.2	1.59	391
12-G	12.7 [a]	14.3	1.47	410
P value			0.11	0.47

Ca effect in fruit quality

Treatment	Ripening Time (days)	Flesh volume affected (%)	
		Body rots	Stem end rots
Control	12.2 a	9.3 a	4.3 a
6-MG	**12.6 b**	**12.0 b**	**6.2 b**
12-MG	12.3 a	10.1 a	5.5 b
12-G	12.4 a	10.6 ab	6.0 b

No effect on flesh disorders

Ca/K interactions (seedlings)

Soil treatment	Xylem sap (mg/L)		Leaf (g/Kg)	
	Ca	K	Ca	K
Control	26 b	135 a	12.8 b	8.2 a
2 x Ca	26 b	158 a	13.7 b	8.0 a
4 x K	**14** a	231 b	**7.2** a	19.4 b

Other considerations: Rootstock

Cultivar	Xylem sap (mg/L)		Leaf (g/Kg)	
	Ca	K	Ca	K
Reed	22	185 b	10.8 ab	13.4 c
Smerdon	25	177 b	12.6 c	12.0 bc
Toro Canyon	22	193 b	9.5 a	11.9 b
Velvick	19	**144 a**	12.1 bc	**10.2 a**

Rootstock effects

Cultivar	Non-suberised root (g/Kg)		Leaf (g/Kg)	
	Ca	K	Ca	K
Duke 7	2.22	9.69 a	3.84	5.56 b
Fuerte	1.71	10.18 a	3.76	5.82 bc
Hass	1.54	9.98 a	3.81	6.10 c
Velvick	1.84	**13.66** b	**4.37**	**4.72** a
P value	**0.093**	0.001	**0.093**	0.001

Conclusions

- Nitrogen
  - Related to quality
  - Fruit concentration targets for acceptable quality
  - Data on interaction with crop load?
  - Not sure of relevance when excess N is uncommon
- Crop load
  - Aim to maximise crop load
  - Minimise stress by nutrition, water, genetics
- Ca/Mg/K
  - Current treatments having less impact on fruit Ca compared with survey results
  - Consider other factors
    - Genetics
    - Potassium
    - Other soil interactions
    - Crop load etc

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