

Optimising concentrate spray applications on avocados

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Avocados as spray targets

- Irregular tree sizes and spacing
- Canopy per hectare highly variable
- Many options for driving patterns
- Difficulty in communicating application rates
 - both those required and those used
- Need to understand variability in order to optimise spray application efficacy and efficiency
- Three year MAF Sustainable Farming Fund project
 - ***to determine the most effective technology for pesticide application based on reduced water rates using superspreader adjuvants***



1. Grower survey & Deposit benchmarking

- Three distinct tree sizes on NZ orchards
- Usually treat with single sided sprayers, dilute to runoff
- 'Nominal' spray volumes 1000-3000 L/ha
- Limited concentrate spraying, by air
- 4 commercial sprayers x 3 tree sizes
- Constant rate of copper per 100 L
- Measured deposits



Understanding variability

Application rates and deposits

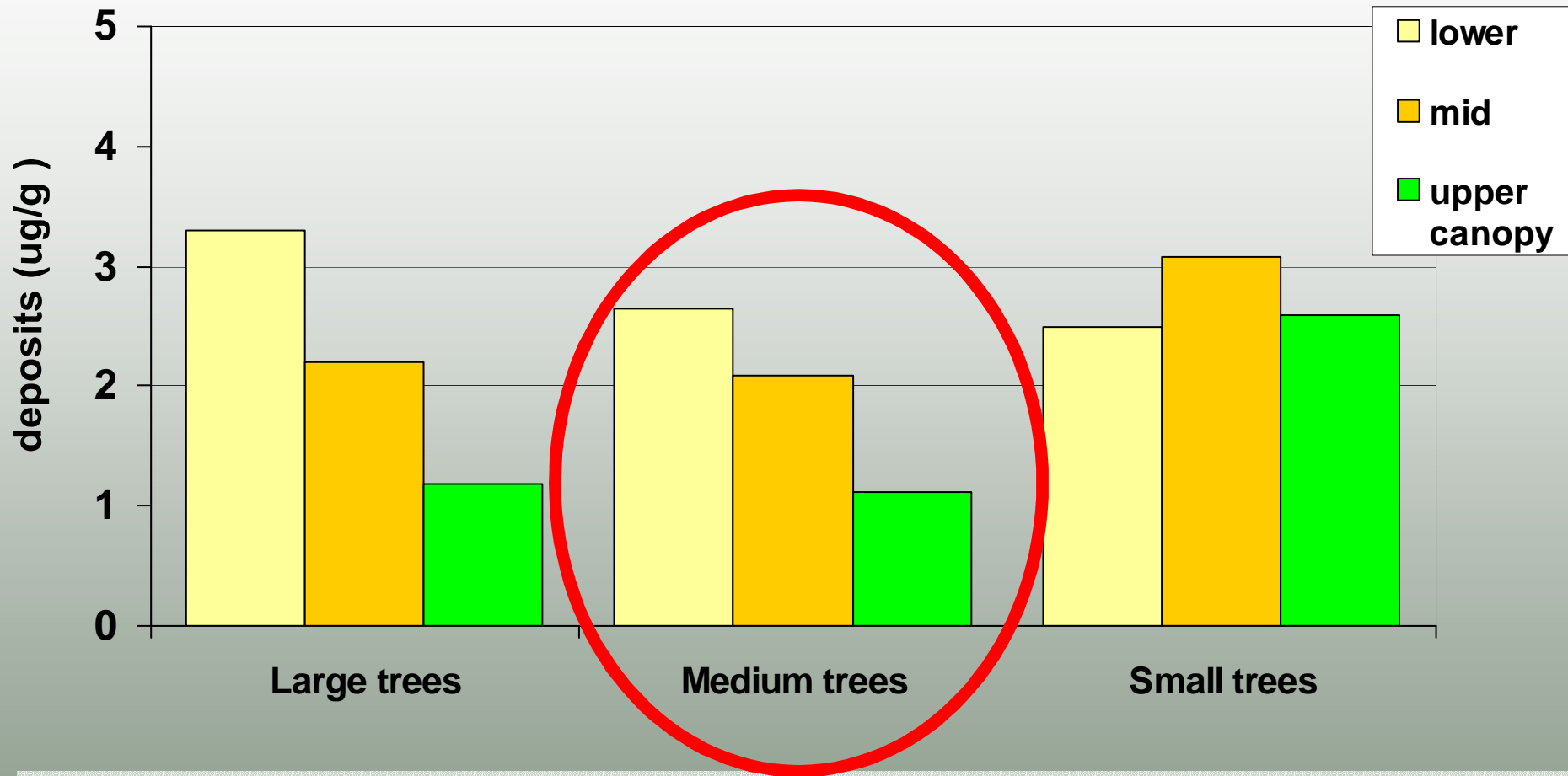
Copper deposits on fruit in different sized trees

Tree size					
Large >10m		Medium 5-7m		Small <4m	
Volume	Deposit	Volume	Deposit	Volume	Deposit
L/ha	µg/g	L/ha	µg/g	L/ha	µg/g
5000	2.2	2700	2.0	2100	2.7

Highest volumes consistently provided lowest deposits!!

Understanding variability

Fruit deposit variation within trees



- In med-large trees, upper canopy deposits only 40% of lower canopy
- Inner canopy deposits typically only 50% of outer exposed canopy

Understanding variability

2. Variation in surface wettability of targets

	mature leaves		young leaves		fruit		flowers
	upper	lower	upper	lower	old	young	
Sept	easy	difficult	moderate	moderate	difficult	moderate	moderate
Nov	easy	very difficult	moderate	very difficult	difficult	moderate	very difficult
Jan	moderate	very difficult	moderate	very difficult	difficult	moderate	moderate
March	moderate	very difficult	moderate	very difficult	difficult	moderate	moderate
July	moderate	very difficult	moderate	moderate	difficult	moderate	moderate

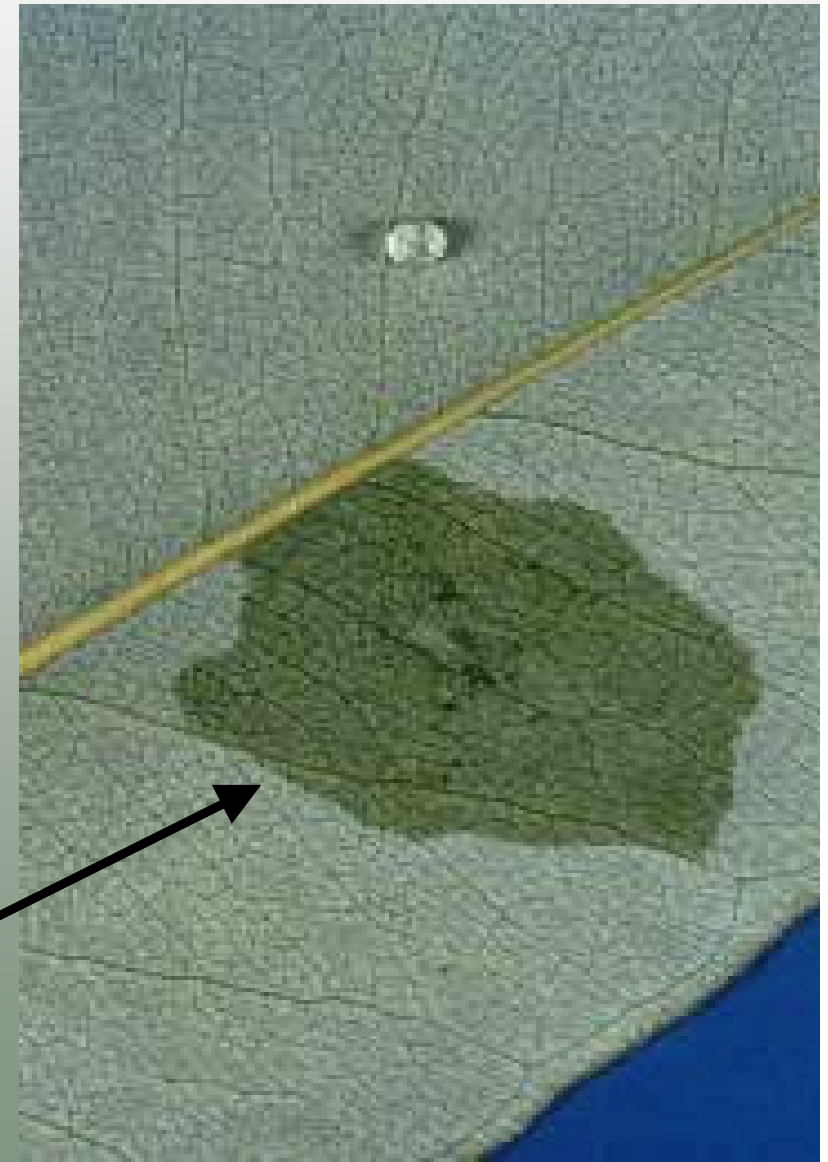
Colour code for surface wettability	easy	moderate	difficult	very difficult
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Adjuvants
beneficial



Spray adjuvants

- High surface tension = poor droplet adhesion/retention and poor surface coverage
- Adjuvants that lower surface tension = improved retention of spray droplets and good coverage of plant surfaces: e.g. organosilicone superspreaders



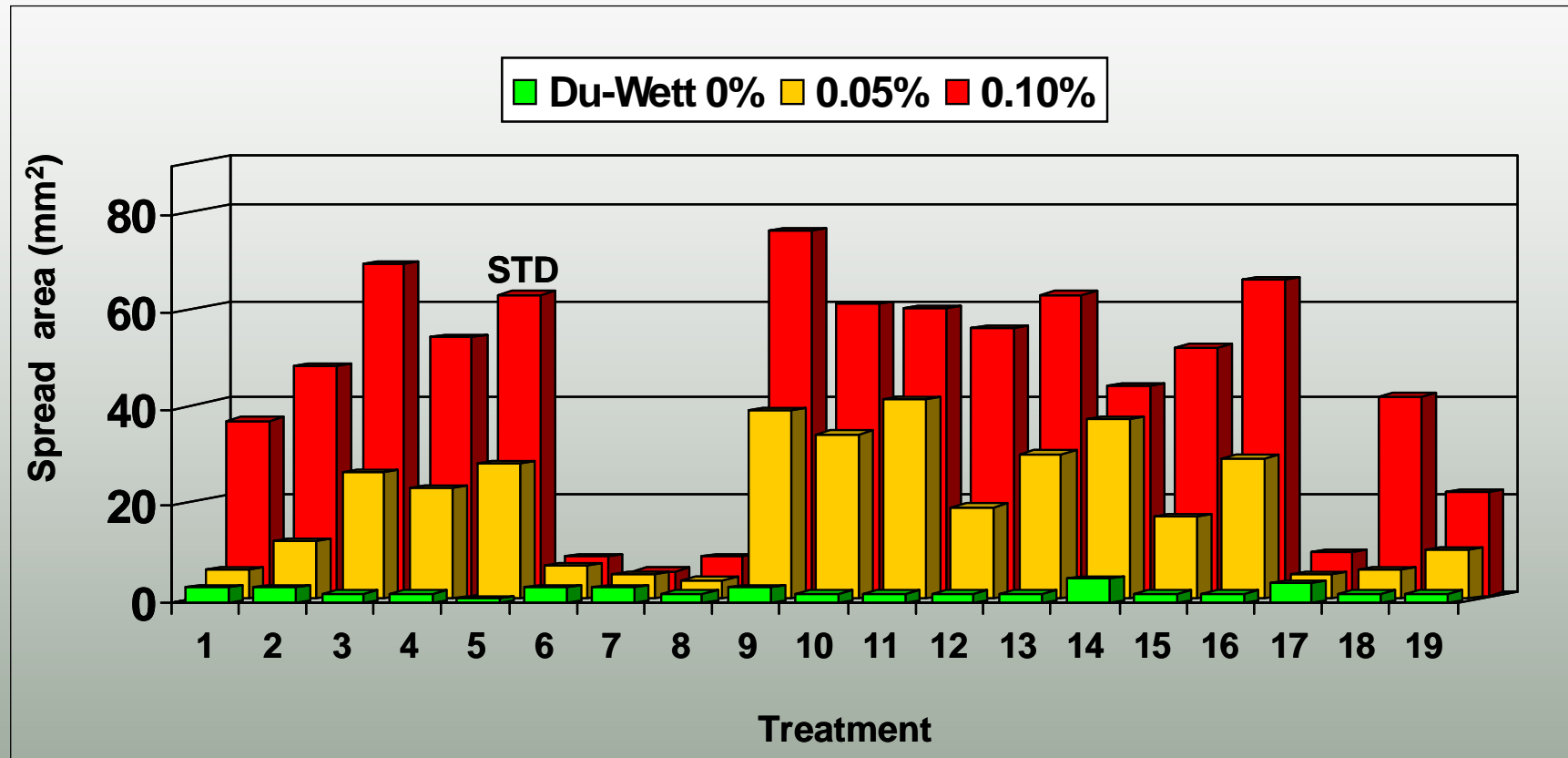
Leaf undersides very difficult to wet



Organosilicone blend superspreader (Du-Wett®) improves spray coverage, makes water go further

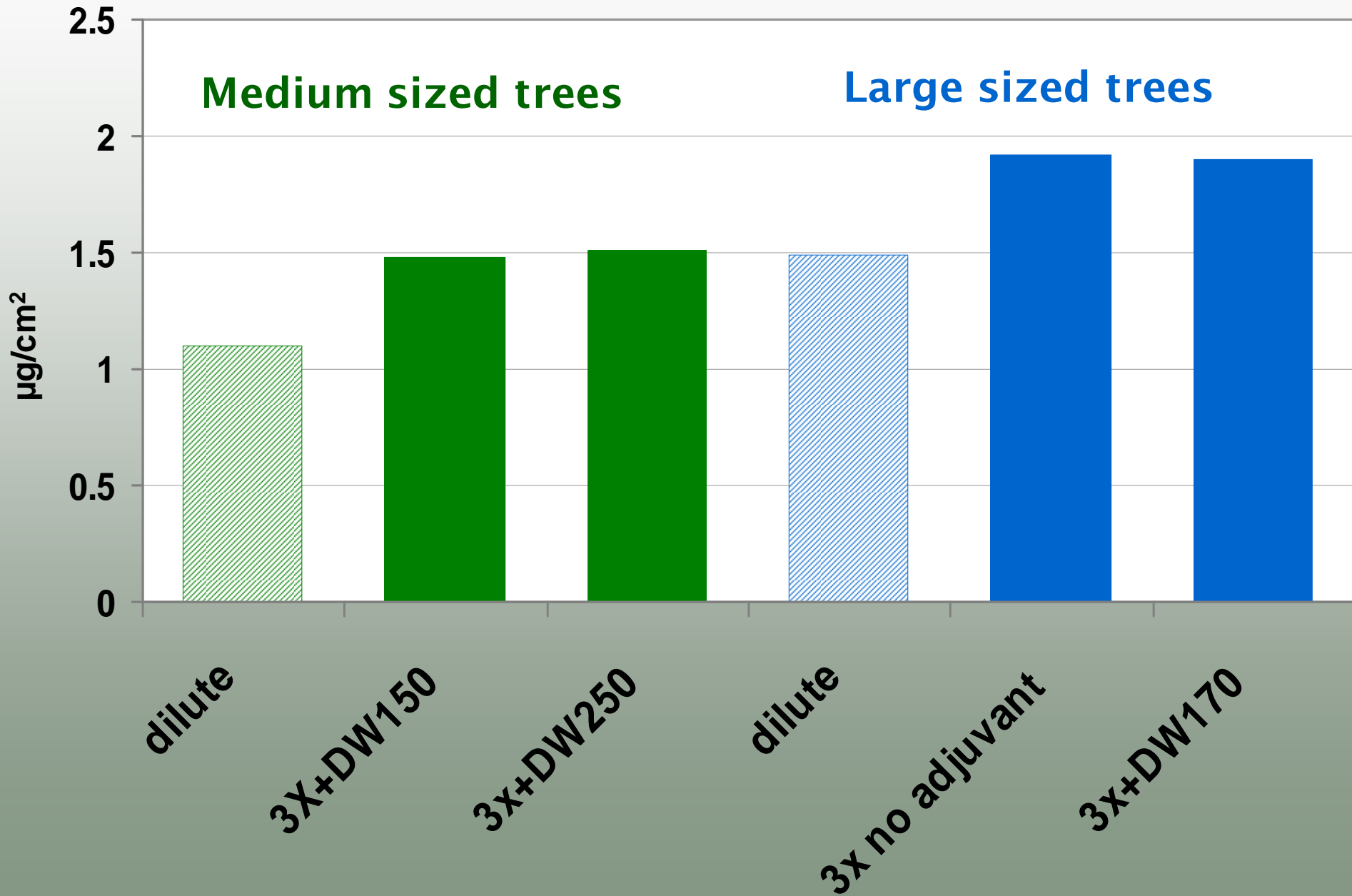
- ❖ **Not** for use in high volume sprays as get **loss** via excessive runoff
- ❖ For avocados, 3- 5X concentrate sprays were likely the best

Pesticide formulations affect Du-Wett spreading on avocado upper leaf surface

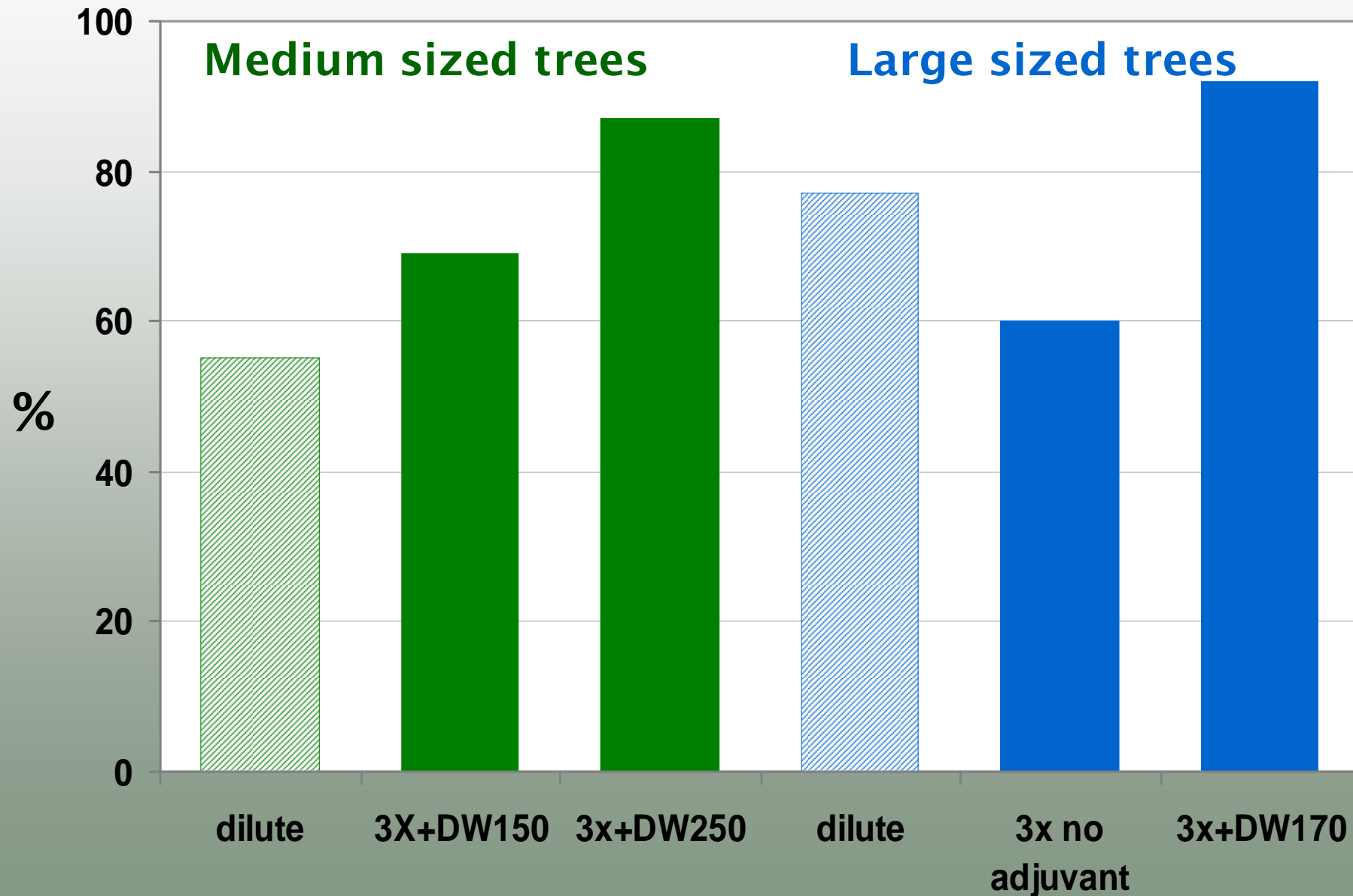


- ❖ Ability of adjuvants to superspread affected by in-can pesticide formulation
- ❖ DOSE RATE CHARTS prescribe Du-Wett adjuvant use for all agchems approved for use on NZ avocados

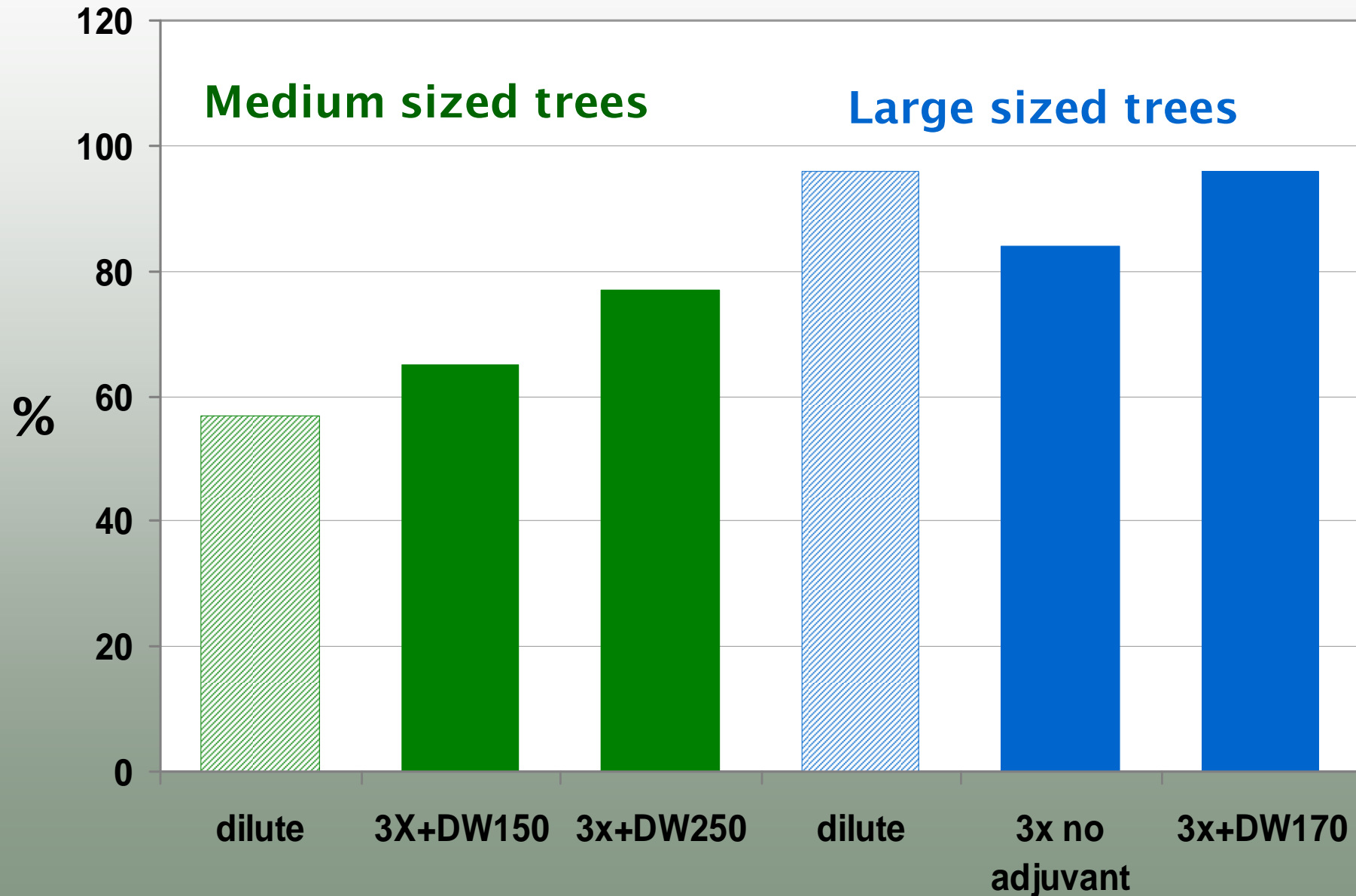
3. Comparison of dilute vs concentrate sprays ± adjuvants: average leaf deposits



Deposits on inner as a proportion of outer canopy zones



Deposits on upper canopy as a proportion of mid canopy deposits



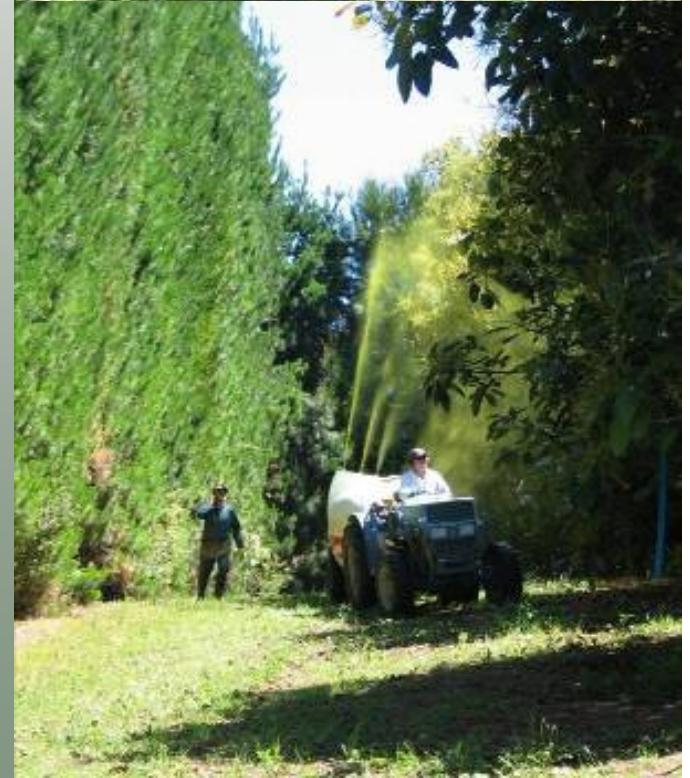
Orchard field trials summary

- Deposits from concentrate sprays significantly higher than dilute
- 3X concentration of sprays provided highest and most even deposits in all tree sizes
- Addition of Du-Wett adjuvant improved deposits from concentrate sprays and spray distribution on trees



4. Commercial orchard trials

- Comparison of 3x concentrate + DW sprays *versus* growers' conventional dilute programmes;
 - all **sprayers** calibrated,
 - **concentrate volumes** prescribed,
 - **adjuvant use rate prescriptions** provided for all sprays
- Different sized trees, paired blocks, 2 orchards, at least 1 full year, no aerial sprays
- Pest & disease monitoring – orchard & packhouse
- Residue analyses at harvest



Commercial orchard trials

Northland: AvoGreen monitoring of large trees (>18 years)

Data is mean of all monitor periods

Spray programme	LR Larvae on % fruit	LR Larvae on % leaves	Mite eggs on % leaves	SSM on % leaves	Thrips on % fruit
Control dilute	0	5	23	21	0
3x Concentrate + adjuvant	0	4	19	19	0

Commercial orchard trials

BOP: AvoGreen monitoring of large trees (>15 years)

Data is mean of all monitor periods

Spray programme	LR Larvae on % fruit	LR Larvae on % leaves	Mite eggs on % leaves	SSM on % leaves	Thrips on % fruit
Control dilute	0.5	1.5	0.4	1.3	0.25
3x Concentrate + adjuvant	0.1	0.25	0	0.6	0.25

Commercial orchard trials

Packhouse Packout Reports

Orchard programme	Sample size (kg)	% in Grade analysis		
		Export	Local	Reject/oil
Northland Large trees				
Control dilute	2412	81	17	2
Concentrate+adjuvant	2130	75	23	2
BOP Large trees				
Control	3080	70	27	2.8
Concentrate+adjuvant	2290	87	12	1.6
BOP Small trees				
Control	833	72	27	0.8
Concentrate+adjuvant	830	91	9	0.9

Commercial orchard trials

Residue analyses

Orchard programme	Residues (mg/kg)					
	chlorpyrifos-ethyl			pirimiphos-methyl		
	Sept	Oct	Jan	Sept	Oct	Jan
Northland Large trees						
Control dilute	0	-	-	0.026	-	-
Concentrate+adjuvant	0.016	-	-	0.042	-	-
BOP Large trees						
Control	-	0.24	-	-	0.014	-
Concentrate+adjuvant	-	0.30	0.19	-	0.040	0.014
BOP Small trees						
Control	-	-	0	-	-	0
Concentrate+adjuvant	-	-	0.034	-	-	0

Chlorpyrifos: MRL = 0.5 ppm Pirimiphos: MRL = 0.1 ppm

Tailoring Pesticide Application to Avocado Canopies

- ❖ Best Practice technology for applying concentrate sprays has been developed
 - ❖ Requires identification of appropriate volumes (dilute & concentrate) to treat avocado canopies
 - ❖ Requires calibration of sprayers to accurately deliver 3x concentrate sprays
 - ❖ Requires use of specialist super-spreader adjuvants and Du-Wett® Dose Rate Tables for all products applied
- ❖ Will save growers time & money, and improve fruit quality & returns**



AVOCADO

Spray Volume Quick Reference Guide

TABLES for dilute and 3x concentrate sprays

1. Find spray volume required per 100 m of row for your tree height & canopy density
2. Find sprayer output volume (L/min) per 100 m of row at your travel speed (re-nozzle sprayer for concentrate sprays)
3. Find spray volumes/ha at your row spacing, using output volume (L/100 m travelled)
4. Make up your tank mix of agrichemical products and count total kg or litres of products/ha; for **CONCENTRATE** sprays use adjuvant at rates/ha stated on Du-Wett® chart



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