Evaluating the effectiveness of low volume spray application using air assisted knapsack sprayers in wine vineyards

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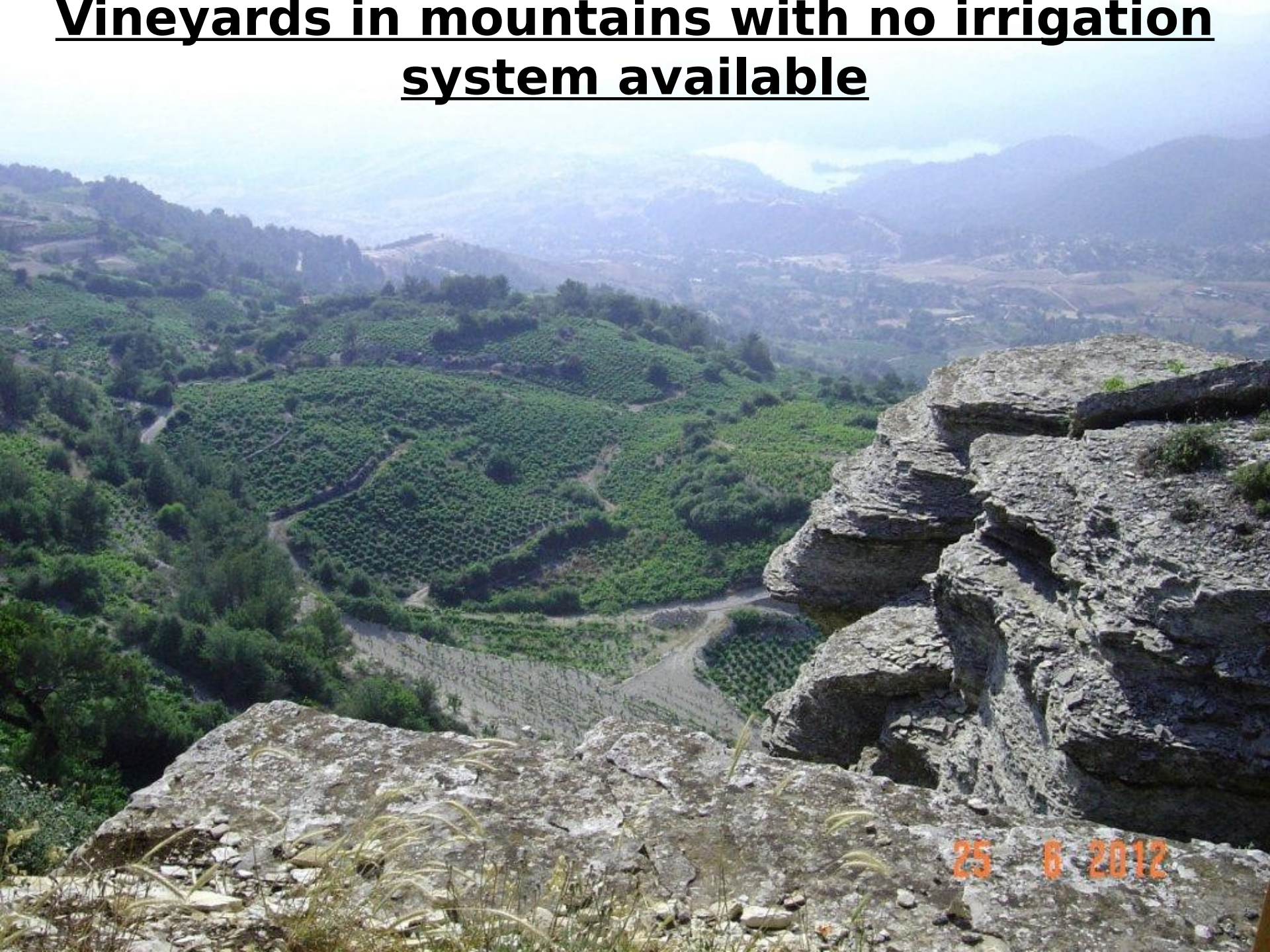
Σκόπια
Μπάρι
ΑΛΒΑΝΙΑ
Ποτέντσα
Αυλώνας
Κορυτσά
Θεσσαλονίκη
Κωνσταντινούπολη
Σαμψούντα
Μπούρσα
Άγκυρα
Balikesir
ΕΛΛΑΔΑ
ΤΟΥΡΚΙΑ
Καταντζάρο
Ιζμίρ
Αφιόν Καραχισάρ
Πάτρα
Αθήνα
Ρέτζιο Ντι Καλάμπρια
Καλλιθέα
Aydin
Ικόνιο
Νίγδη
Kahramanmaraş
Κατάνια
Άδανα
Γκαζιαντέπ
Αντάλια
Χαλέπι
Hatay
Λευκωσία
Χομς
ΣΥ
ΛΊΒΑΝΟΣ
Ανατολική
Μεσόγειος Θάλασσα
Βηρυτός
Δαμασκός
Misrata
Βεγγάζη
Ίρμπιντ
Αμμάν
Surt
Αλεξάνδρεια
Πορτ Σάιντ
Ιερουσαλήμ
Ατζντεμπίε
Al Mahallah al Kubra
Μανσούρα
ΙΟΡΔΑΝΙΑ
Qattara Depression
Κάιρο
El-Suweis (Suez)
Φαγιούμ

Viticulture in Cyprus

Is characterized by:

- Small plots (average size 0,6 ha) ≈ 7000 ha.
- Plots in mountains
- No irrigation system (8
- Lack of water (drough
- Dust formulation pesticides were ban from the market

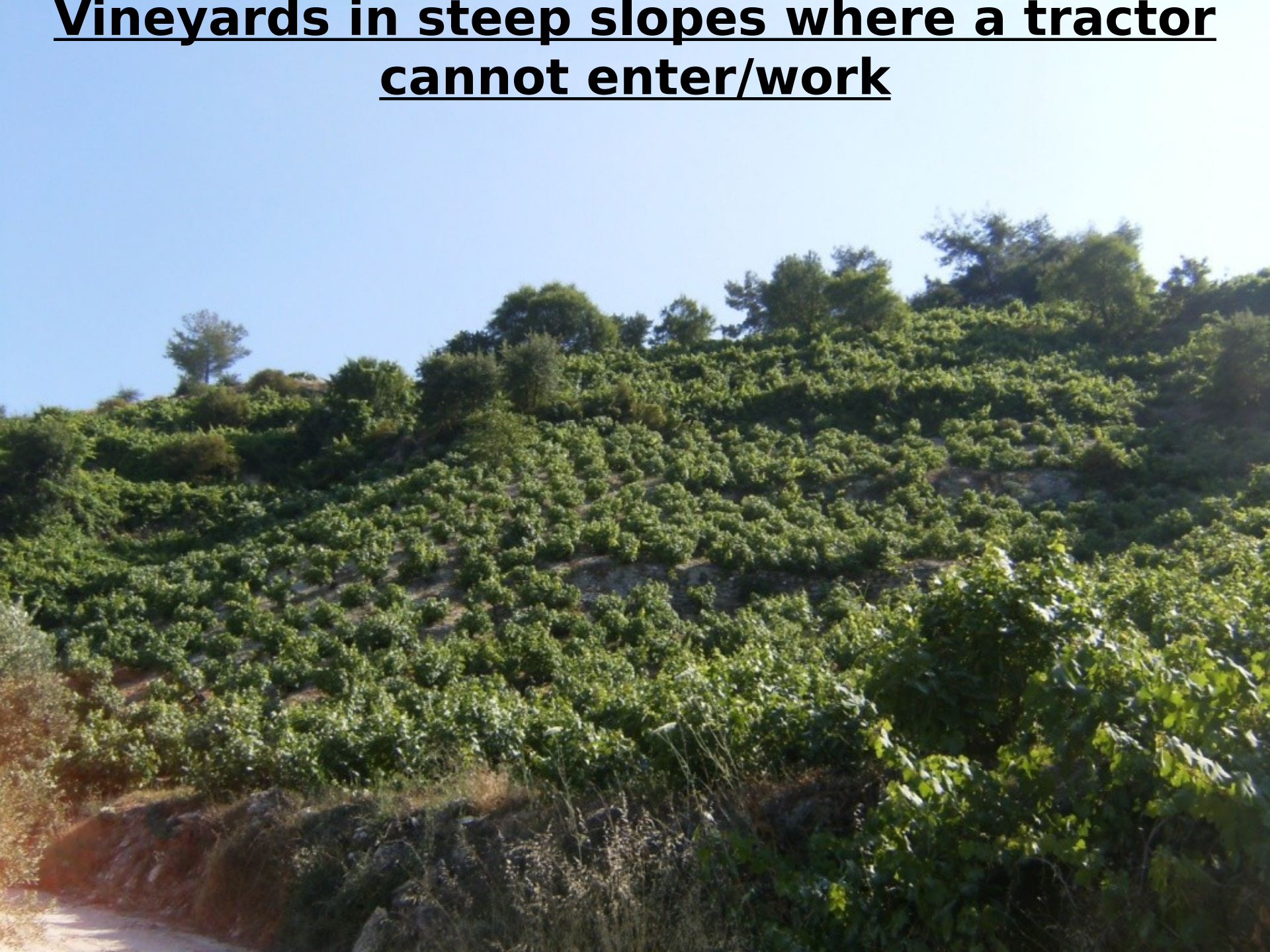
Vineyards in mountains with no irrigation system available



Spray gun (hoses, high volumes)

Need assistance…!

Vineyards in steep slopes where a tractor cannot enter/work



Vineyards in steep slopes where a tractor cannot enter/work

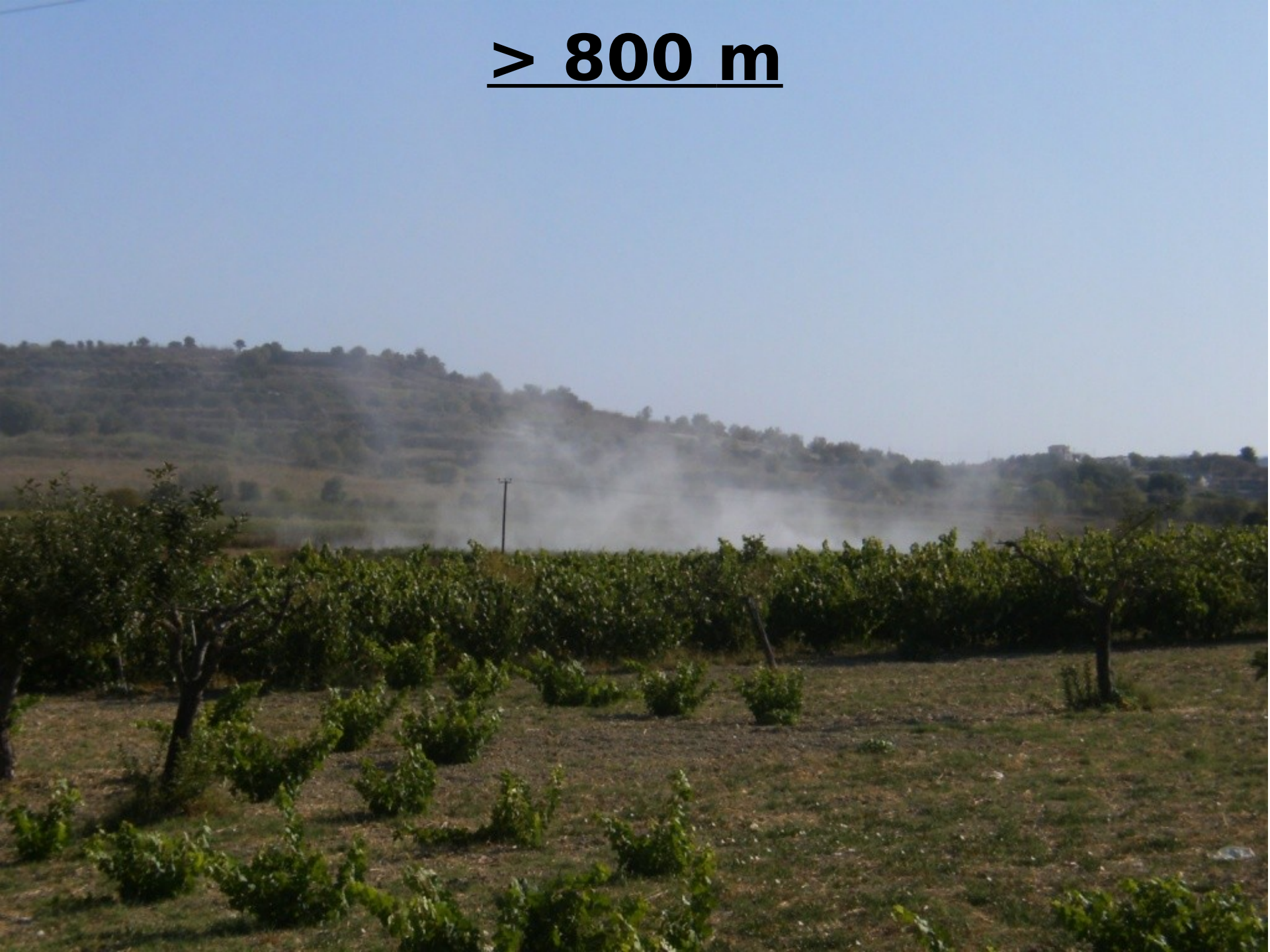
European Directives & Regulations

- **2009/1107/EC** (concerning the placing of plant protection products on the market)
- **2009/127/EU** (machinery for pesticide application)
- **2009/128/EU** (Sustainable Use of Pesticides)

Common practice (dusting sulphur)

Small particles of the dust formulations…

…could be carried by the wind up to 3 km


> 800 m

Air assisted motorized knapsack duster

Air assisted motorized knapsack duster

Alternative: Air assisted low volume knapsack sprayers

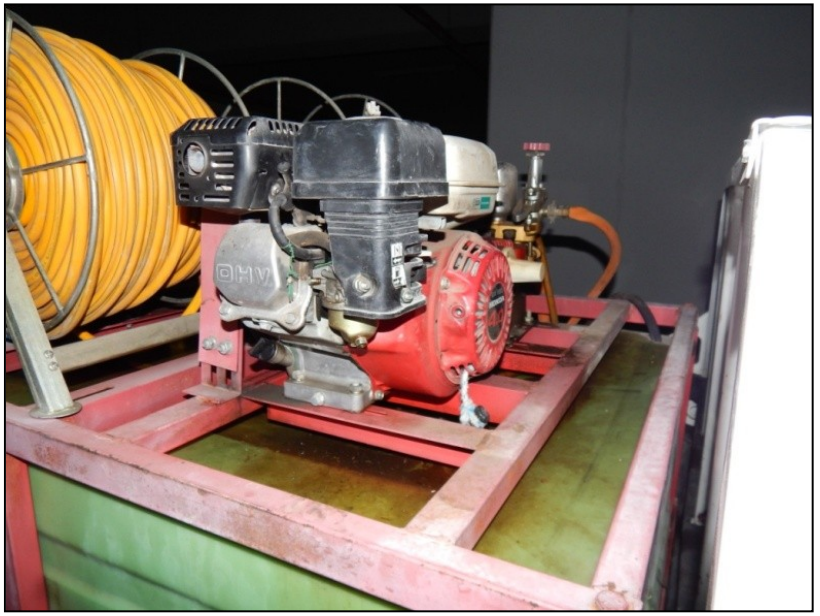
Study aim

- Evaluate the effectiveness of common, low volume and high volume sprayers in vineyards

Common Sprayer (CS)

Low Volume Sprayer (LVS)

High Volume Sprayer (HVS)

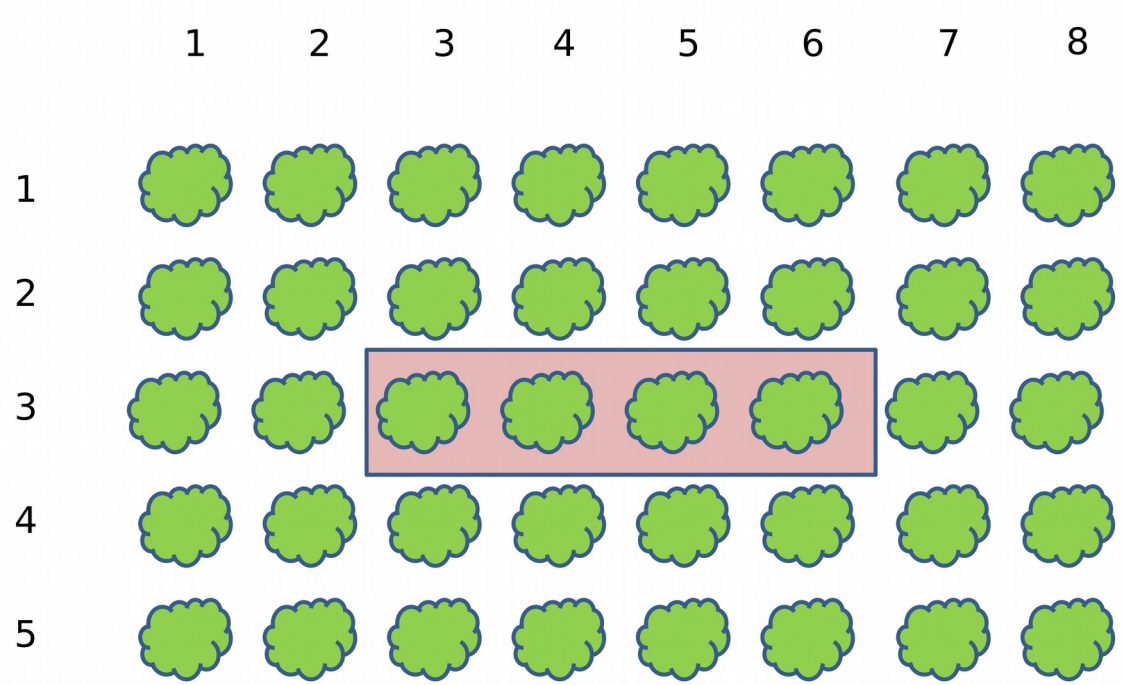


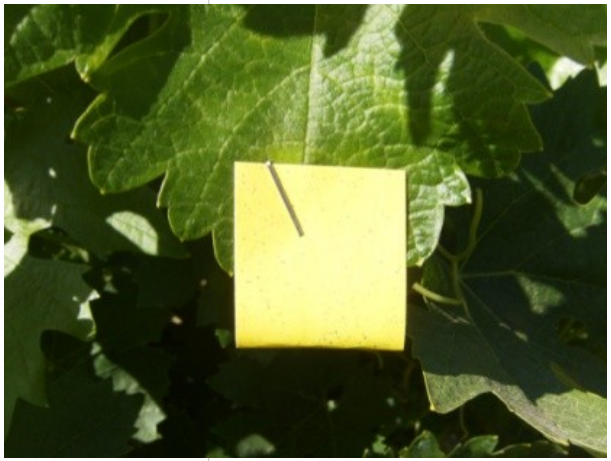
Field Trial

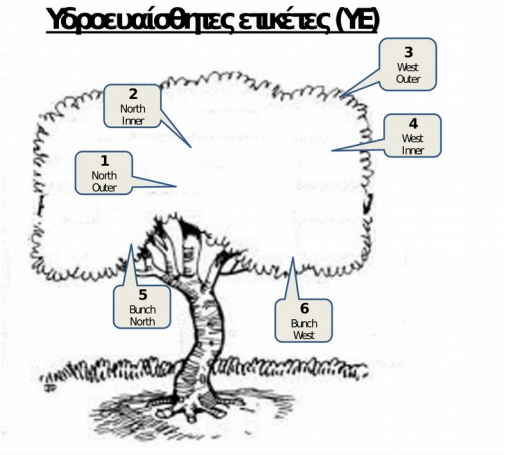
C= Control
CS = Common Sprayer
LVS = Low Volume Sprayer
HVS = High Volume Sprayer

C	LVS	CS	HVS
LVS	CS	HVS	C
CS	HVS	C	LVS
HVS	C	LVS	CS

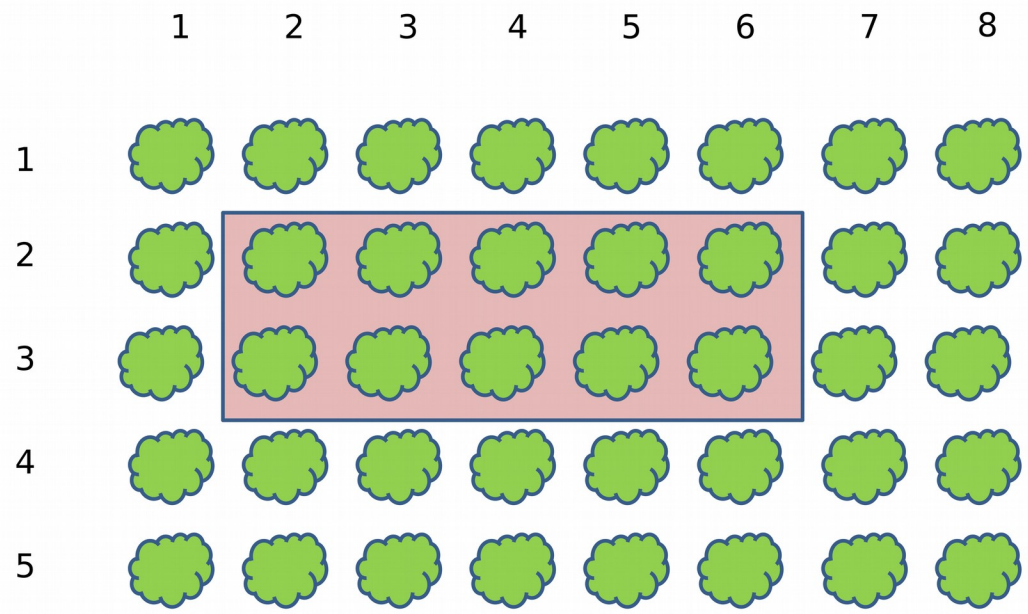
Evaluation of coverage with Water Sensitive Papers







Evaluation of effectiveness against grape berry moth (*Lobesia botrana*) and downy mildew (*Plasmopara viticola*)



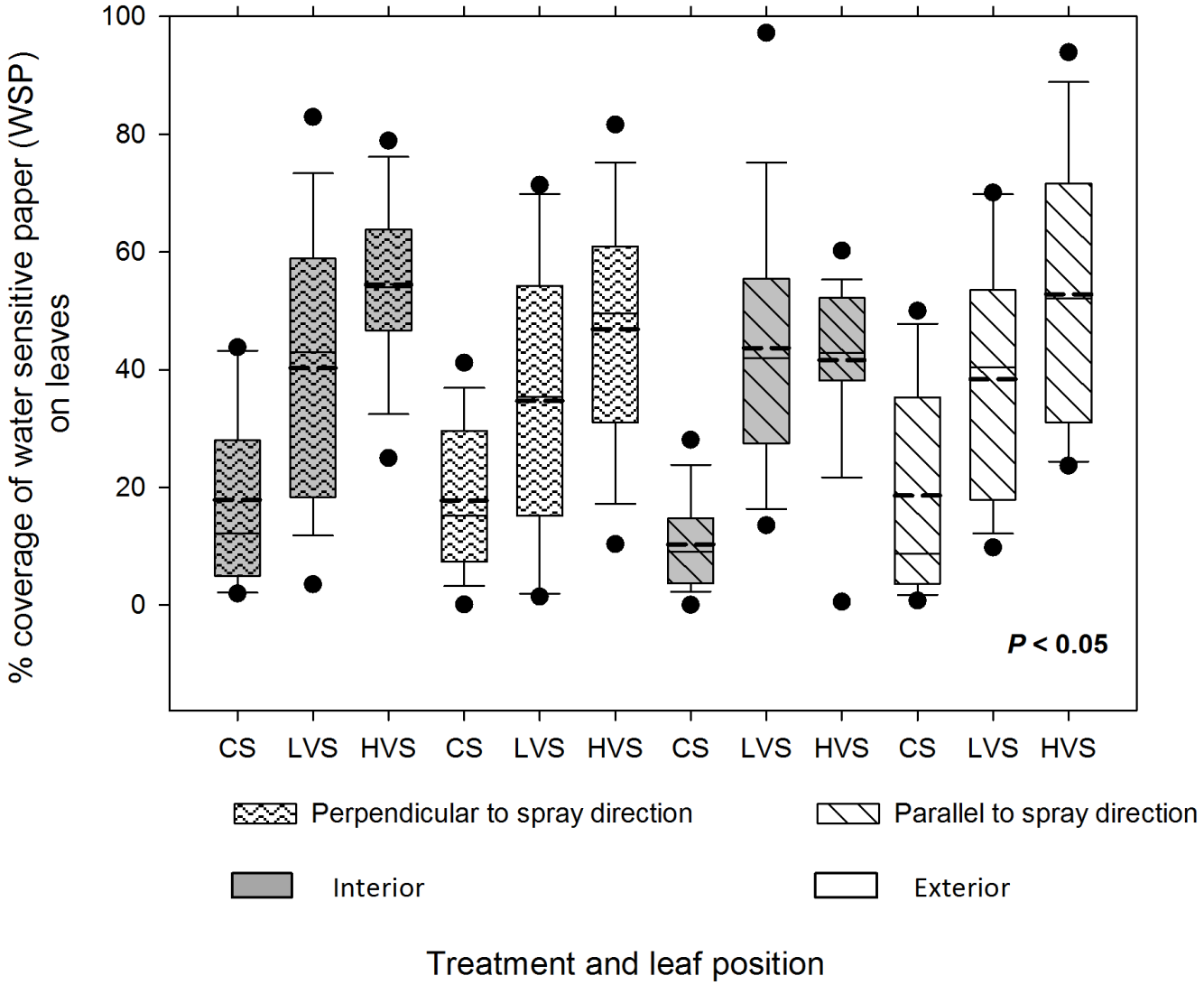
Grape Berry moth

- 3 bunches / vine

Downy Mildew

- 10 leaves / vine

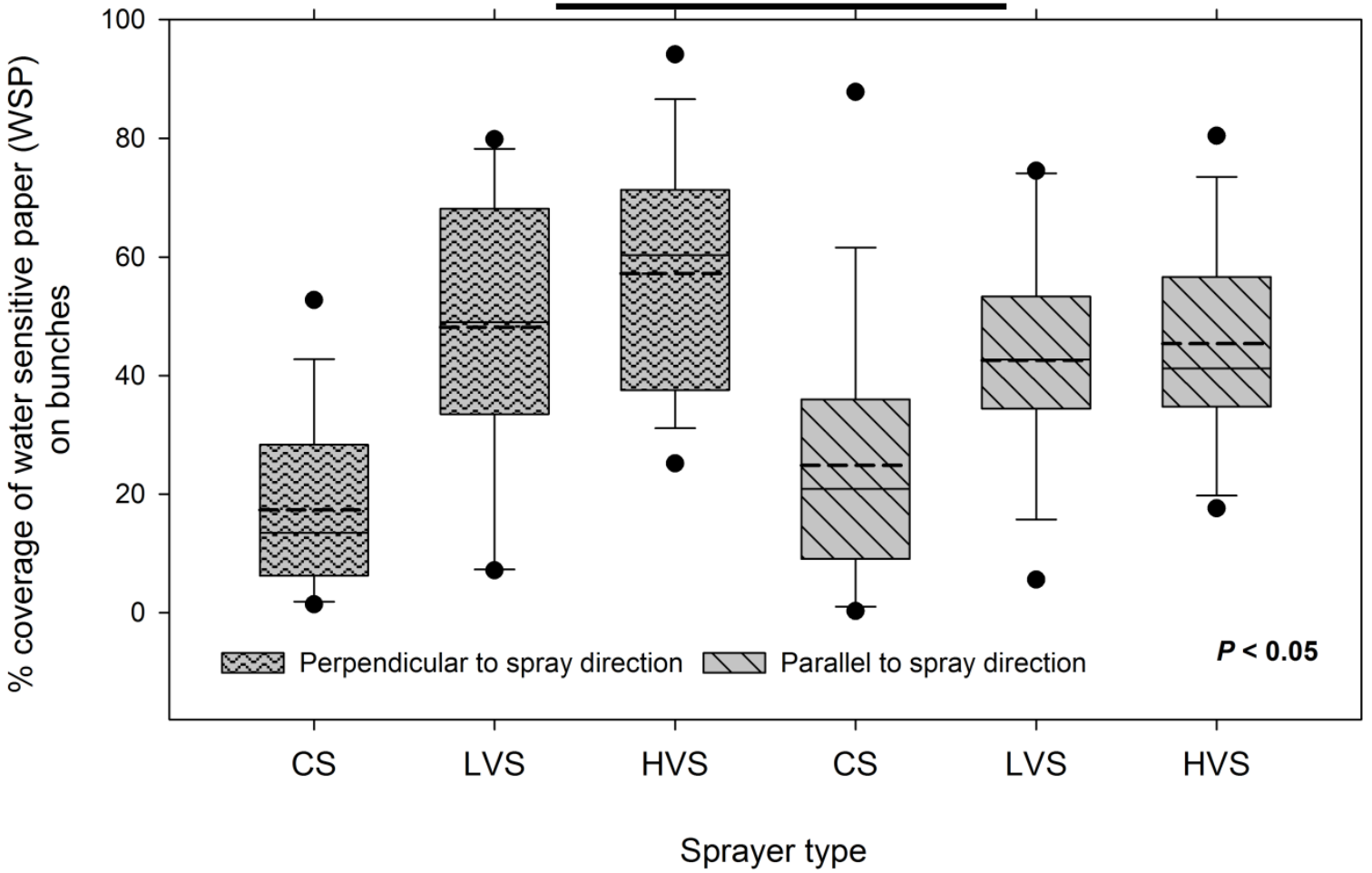
% coverage of WSP on leaves



Coverage
≈ 20% CS
≈ 34% LVS
≈ 41% HVS

•Sprayers ($F = 55.8$, $df = 3, 57$, $P < 0.001$), Orientation ($F = 1.7$, $df = 1, 135$, $P = 0.20$), Leaf position ($F = 0.06$, $df = 1, 135$, $P = 0.98$)

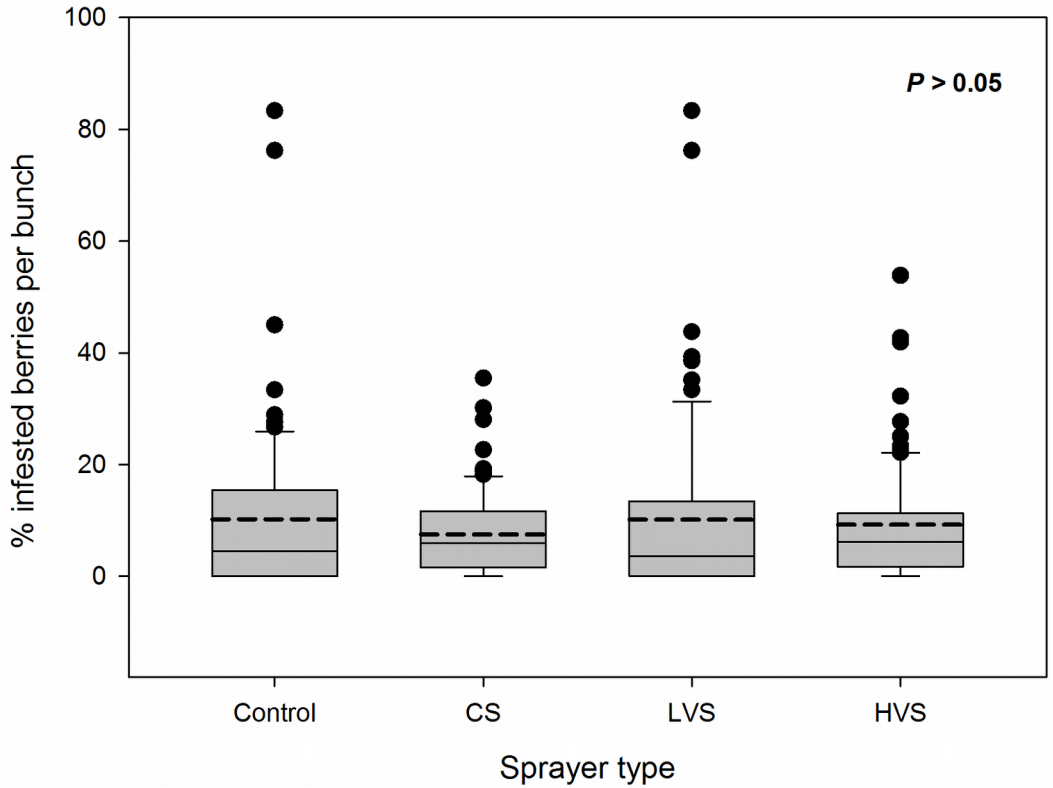
% coverage of WSP on bunches



% Mean Coverage
≈ 25% CS
≈ 42% LVS
≈ 45% HVS

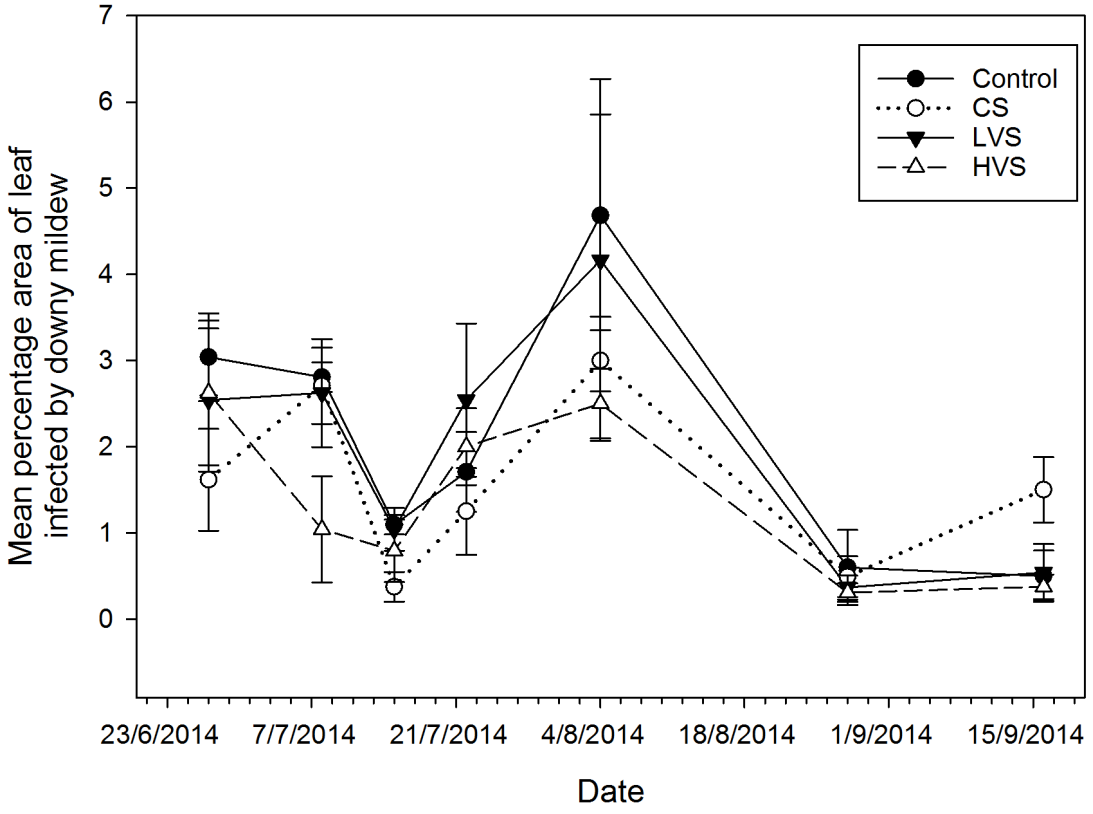
Significant differences between the sprayers ($F = 16.9$, $df = 2, 42$, $P < 0.001$) and orientation ($F = 13.69$, $df = 1, 45$, $P < 0.001$), with a significant interaction between sprayer and orientation ($F = 39.03$, $df = 2, 45$, $P < 0.001$)

% infested berries per bunch



- No significant differences in berry infestation ($F = 0.74$, $df = 3, 142$, $P = 0.50$). Mean infestation remained at around 10% .
- The effectiveness of spray applications depends among other factors on spray coverage, the pesticide active ingredients used, the presence of resistance in the target pest, and the timing of pesticide applications

Mean percentage area of leaf infected by downy mildew

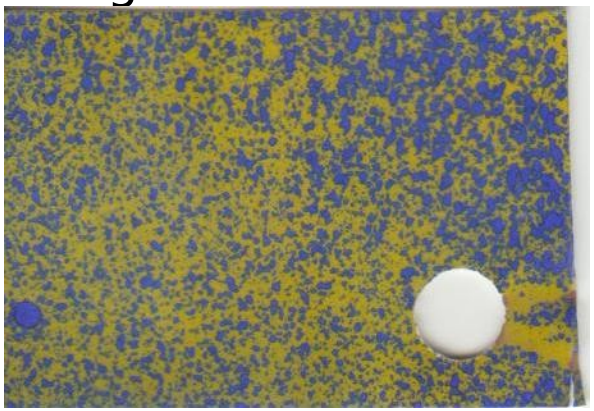


Significant differences in leaf infection by downy mildew between treatments ($F = 5.6$, $df = 3, 189$, $P = 0.001$). There was also a significant effect of application time ($F = 273.7$, $df = 6, 3140$, $P < 0.001$), and a significant interaction between treatment and time ($F = 20.4$, $df = 18, 3140$, $P < 0.001$).

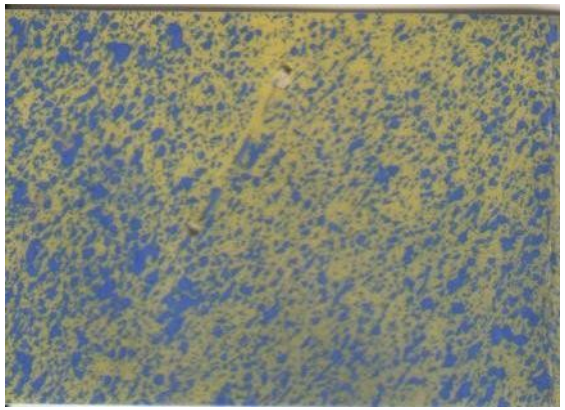
Conclusions

LVS can achieve coverage of the spray material similar to that of HVS.

Higher coverage with HVS rather than LVS was expected because of the higher volume of spray liquid applied with each sprayer, at 1400 L per hectare for HVS and 150 L for LVS. However, the difference in coverage between the two sprayers was not proportional to the difference in the amount of spray liquid used. For instance, overall mean coverage by HVS was around 50% for both leaves and bunches, while for LVS it ranged between ca. 40% for leaves and 45% for bunches.



HVS



LVS

Conclusions

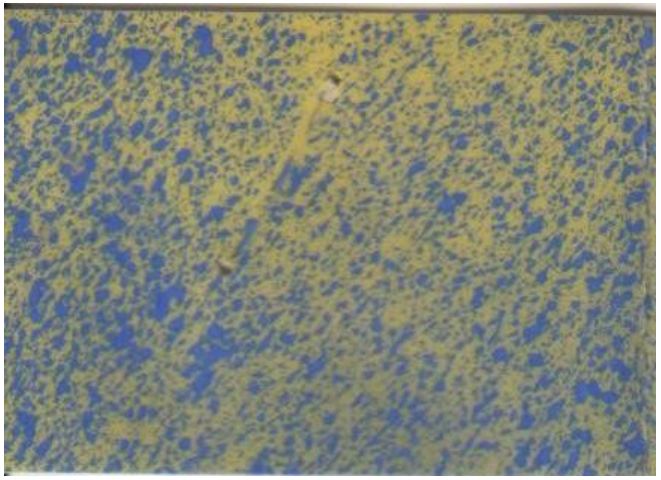
LVS are more environmentally friendly compared to HVS.

- ✓ HVS application resulted in substantial runoff. The excessive runoff of the spraying material from the outer leaves of the vine often misleads the farmers who consider that they fully and effectively sprayed their vines.
- ✓ However, a relatively small amount of spraying liquid penetrates the foliage and reaches the grape bunches of the sprawl system. A high runoff of spraying liquid is not desirable, since there is a waste of spraying material and therefore economic loss for the producer and also soil pollution and subsequently of the groundwater through leaching.

Conclusions

LVS are more environmentally friendly compared to HVS.

No runoff was observed with the LVS, because most of the spraying liquid ended up on target. The presence of air at the LVS seems to play a significant role to the dispersion and penetration of the liquid into the foliage



Conclusions

Adequate spray coverage can be achieved with volumes as low as 150 L/ha

Determination of the pesticide dose based on the stage of plant growth and the surface of the leaf area (Barani et al., 2008; Gil et al., 2006) can lead to reduction of the quantity of pesticides applied and therefore the production cost without a corresponding compromise in the effectiveness of sprays.

Future work: Evaluate the coverage [illegible]d sprayers in indigenous grape varieties

Thank You