EFFECTS OF NATURAL BIOSTIMULANT *Ecklonia maxima* SEAWEED PRODUCT ON REDUCTION OF POST-HARVEST BERRY DROP IN TABLE GRAPES cv. THOMPSON SEEDLESS.

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Abstract

Trials with the seaweed product Kelpak® were conducted on Thompson seedless table grapes over two seasons in Campusano, Metropolitan Region of Chile. In the first year Kelpak® was applied as four sprays at 4,5 L/ha with an electrostatic sprayer (70 litres of water per hectare) starting at 2-3 mm berry size and repeated three times at 4-5 mm, 6-8 mm and 8-10 mm berry size stages. The results showed a significant reduction in post-harvest berry drop (4,2% to 2,3%) due to a significant increase of the internal berry brush length. Another treatment with three Kelpak® sprays starting at 4 mm berry size did not have a significant effect on the reduction of berry drop. Based on the results of the 2010-2011 season, a further trial was conducted in the same place the following season, but with Kelpak® applied only once at 2-3 mm berry size at 4,5 L/ha, with a similar statistically significant reduction of berry drop.

Background and Aim

Post-harvest berry drop is a serious problem in many table grape producing areas, with Thompson seedless one of the most sensitive varieties. This problem reduces marketability of table grapes that in turn significantly decreases grower returns. Many products are tested to reduce post-harvest berry drop (loose berries in the packed box) without consistent improvement or negative collateral effects (Navarro *et al*., 2001; Retamales *et al*., 1995). Application of 4-CPA significantly reduced berry drop but delayed ripening (Ben-Tal, Y. 1990). The aim was to test Kelpak® as a natural biostimulant (Crouch *et al*., 1991) to reduce the post-harvest berry drop in Thompson seedless, the most important planted variety in Chile.

Experimental Procedure

Trials were conducted in 2010-2011 and 2011-2012 in Campusano, Metropolitan Region of Chile on Thompson seedless table grapes. The product Kelpak®, a natural seaweed biostimulant product extracted from the seaweed species *Ecklonia maxima*, was evaluated as a tool to reduce post-harvest berry drop. Control was the standard farming practice with four GA_3 applications, using 20 ppm @ 2-3 mm, 30 ppm @ 4, 6 and 8 mm, plus a CPPU spray at 2 g/ha applied together with GA_3 at 6 mm berry size stages. The *Ascophyllum nodosum* seaweed product Goëmar Calibra® at 3 L/ha was also applied at 6 mm berry size as a separate application in the control. Kelpak® treatment 1 was three sprays of 7 L/ha at 4, 6 and 8 mm berry sizes, and treatment 2 was four sprays of 4,5 L/ha at 2-3 mm, 4, 6 and 8 mm berry size stages. All Kelpak® sprays were done as a tank mix with GA_3 and CPPU at the same rates as the control. In the 2011-2012 season trial two controls were tested, control 1 with GA_3 20 ppm @ 2-3 mm, 30 ppm @ 4 mm, 40 ppm @ 6 and 8 mm berry size stages. Control 2 was the same as control 1, but with Goëmar Calibra® at 3 L/ha at 6 and 12 mm berry size stages. The two Kelpak® treatments were one spray of 4,5 L/ha at 2-3 mm and three sprays of 7 L/ha at 2-3 mm, 4 and 8 mm berry size stages. All treatments were done with an electrostatic sprayer (ESS) with 70 litres of water per hectare. The blocks in which the trials were conducted had a history of high post-harvest berry drop. The trial layout was a complete randomised block design with four replicates of eight vines each, with the middle six vines used for measurements. Number of shot berries per bunch, berry size, berry weight, berry colour and berry firmness (FirmTech®) were recorded at harvest. Post-harvest berry drop was recorded as percentage by weight of loose berries per box, after packing bunches into export boxes (8,2 kg USA standard).

Results and Discussion

In the first year the Kelpak® 4 x 4,5 L/ha treatment showed a significant reduction of post-harvest berry drop at 2,3% vs 4,2% of the control. The Kelpak® 3 x 7 L/ha showed a similar trend with 3,4% berry drop, not statistically different from the control **(Table 1)**. The increase of internal brush (vascular bundles) length had a high correlation with the berry drop, with Kelpak® 4 x 4,5 L/ha recording 1,2 mm longer than that of the control. Kelpak® 3 x 7 L/ha had no effect on brush length. The tendency to less berry drop was probably caused by an increase in rachis and pedicel flexibility from this treatment. The results suggested that the first early spray at 2-3 mm berry size was the most effective Kelpak® application to reduce the berry drop. Due to the results of the first year, it was decided to have controls with and without the *Ascophyllum nodosum* seaweed product Calibra®, and a treatment with only one Kelpak® spray (4,5 L/ha) at 2-3 mm berry size stage in the second season 2011-2012. Kelpak® 4,5 L/ha at 2-3 mm berry size showed a similar reduction of berry drop to Kelpak® 3 x 7 L/ha with the first spray starting at 2-3 mm berry size **(Table 2)**. Calibra® showed a tendency to increase the berry drop above the control and was statistically significantly higher than the Kelpak® treatments.

Conclusion

The results show that Kelpak® application at the early stage of 2-3 mm berry size can be an effective tool to reduce the incidence of post-harvest berry drop in certain table grape varieties without any negative collateral effects such as reduction of bunch quality, harvest delay or other post-harvest conditions.

Electrostatic spray at 6-7 mm berry size

Table 1. Effect of seaweed product on post-harvest berry drop and brush length, season 1 (2010-11)

Treatment	Berry Drop (%)	Brush Length (mm)
Control (GA_3+CPPU+Calibra®)	4,2 a	12,7 b
Kelpak® 3 x 7 L/ha*	3,4 ab	12,7 b
Kelpak® 4 x 4,5 L/ha*	2,3 b	13,9 a

*With GA_3+CPPU as per control
Values with same letters do not differ significantly at the 95% confidence level

Bunch at 6-7 mm
(thinned to 160 berries at 5 mm size)

Bunch at harvest
(thinned to 110 berries at 9 mm size)

Table 2. Effect of seaweed product on post-harvest berry drop, season 2 (2011-12)

Treatment	Berry Drop (%)
Control - SGP	6,0 bc
Control - SGP	6,8 c
Kelpak® 1 x 4,5 L/ha	3,5 a
Kelpak® 3 x 7 L/ha	3,8 ab

Values with same letters do not differ significantly at the 95% confidence level

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