

Research Report

Innovative Packaging Technologies to Enhance the Quality of Fresh Cut Flowers

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Summary

This is the first research report we have submitted to the Joseph H. Hill Memorial Foundation, INC. We have been conducting studies on controlling *Botrytis* blight in cut roses that were pre-treated with STS. We have made sachets that have thyme oil (TO) encapsulated by β -cyclodextrin (CD). The encapsulated TO:CD was placed in sachets made of TyvekTM. We tried two different ratios of TO:CD and found that the lower ratio TO:CD did not control gray mold in cut roses even when the quantity placed in the TyvekTM was increased four fold (Table 1). When the ratio of TO:CD was increased to 14:86 there was also no measurable decrease in *Botrytis cinerea* disease incidence in cut roses that were incubated with TO:CD sachets for 7 d compared to flowers that were not treated (Table 2). However, when the number of TO:CD sachets was increased from one to two the number of lesions and size of lesions decreased in the roses treated with TO:CD compared to the ones not treated (Table 2). Next, we plan to test the effects of three TO:CD sachets on *Botrytis* blight in cut roses along with the addition of EthylBlocTM sachets to roses that have not been pre-treated with STS or 1-MCP. The results suggest that *Botrytis* control is possible but we have not determined the optimum concentration of TO to encapsulate in CD or the number of TO:CD sachets to provide per package.

Results

Experiment 1

4 cm x 4cm TyvekTM sachets were filled with different amounts of thyme oil (TO): β -cyclodextrin (CD) prepared from a ratio of 08:92 TO:CD and heat sealed. Alternatively, 3 cm x 4cm TyvekTM sachets were filled with different amounts of CD (control) and heat sealed. Two sachets were adhered to MAP sleeves (PEAK^{fresh}USA) and four to six rose flowers were placed into the sleeves. The flowers had previously been placed into a commercial hydration solution (Chrysal Clear Professional 1, Chrysal International B.V., Narden, Netherlands) and 0.2mM STS. One petal of each rose was inoculated with 5 μ L of *Botrytis cinerea* conidial spore suspension (2500 spores). The stems of the sleeved roses were placed in 2L flasks containing commercial processing solution (Chrysal Clear Professional 1, Chrysal International B.V., Narden, Netherlands) and held at 5 °C for 3 days. The flowers were then removed from the sleeves transferred to 25 °C and the stems were cut and placed in commercial vase solution (Chrysal Clear Professional 1, Chrysal International B.V., Narden, Netherlands). Each treatment had two replicates. The results are shown in Table 1.

Table 1. Effects of increasing amounts of TO:CD sachets on Botrytis Blight in cut roses stored at 25 °C for 7 days.

Treatment	Disease Incidence (%)	Lesion #	Lesion size (cm)
0.12 g TO:CD	100	Whole flower affected	Whole flower affected
0.12 g CD	100	Whole flower affected	Whole flower affected
0.25 g TO:CD	74	Whole flower affected	Whole flower affected
0.25 g CD	94	Whole flower affected	Whole flower affected
0.5 g TO:CD	59	Whole flower affected	Whole flower affected
0.5 g CD	72	Whole flower affected	Whole flower affected

Experiment 2

4 cm x 4cm Tyvek™ sachets were filled with 0.5 g TO:CD prepared from a ratio of 14:86 TO:CD and heat sealed. Alternatively, 4cm x 4cm Tyvek™ sachets were filled with 0.5 g of CD (control) and heat sealed. One or two sachets were adhered to the MAP sleeves (PEAKfreshUSA) and four to six rose flowers were placed into the sleeves. The flowers had previously been placed into a commercial hydration solution (Chrysal Clear Professional 2, Chrysal International B.V., Narden, Netherlands) and 0.2mM STS. One petal of each rose was inoculated with 5 µL of *Botrytis cinerea* conidial spore suspension (2500 spores). The stems of the sleeved roses were placed in 2L flasks containing commercial processing solution (Chrysal Clear Professional 1, Chrysal International B.V., Narden, Netherlands) and held at 5 °C for 3 days. The flowers were then removed from the sleeves and transferred to 25 °C and the stems were cut and placed in commercial vase solution (Chrysal Clear Professional 3, Chrysal International B.V., Narden, Netherlands). Each treatment had two replicates. The results are shown in Table 2.

Table 2. Effects of 14:86 ratio of TO:CD on Botrytis Blight in cut roses stored at 25 °C for 7 days.

Treatment	# Sachet/Sleeve	Disease Incidence (%)	Lesion #	Lesion Size (cm)
0.5 g TO:CD	1	83	Whole flower affected	Whole flower affected
0.5 g CD	1	67	Whole flower affected	Whole flower affected
0.5 g TO:CD	2	29	6	1.17
0.5 g CD	2	29	22	1.735