EthylBloc™ application and afternoon harvest improve postharvest quality of ethylene-sensitive unrooted cuttings.

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Introduction

For many growers, successful young plant production relies on the ability to receive high-quality unrooted cuttings (URC) from offshore production facilities. Postharvest leaf abscission and premature leaf senescence (yellowing) during shipment are major concerns with many crops.

Fig. 1
Example of leaf abscission in unrooted cuttings of *Lantana camara*

Two factors in particular impact postharvest quality of unrooted cuttings: ethylene and carbohydrate status.

Ethylene is a primary reason for URC leaf abscission and yellowing. Production of this gaseous plant hormone is triggered when cuttings are harvested. In addition, shipping of offshore cuttings to North America or Europe for 72 to 96 hours under darkness, temperature extremes and vibration amplifies ethylene production. As a result, ethylene builds up in shipping bags and containers during transport. Ethylene-induced damage can be swift and extensive with ethylene-sensitive cultivars.

Carbohydrate status influences ethylene's impact on URCs. The primary source of plant energy, carbohydrates also help regulate the action of plant hormones such as ethylene. During the respiration process, carbohydrates (sugars and starch) are consumed and energy is released to maintain the metabolic activities of plants. The higher the carbohydrate status of cuttings, the greater their resistance to ethylene action.

When ethylene gas and lower carbohydrate status threaten postharvest cutting quality, severe leaf abscission and/or premature leaf senescence jeopardize propagation success.

Objective

Research summarized in this update was designed to gain understanding regarding the impact of ethylene on URC postharvest quality and to develop strategies to improve URC postharvest quality. The primary focus was the impact of EthylBloc™ ethylene-action inhibitor (active ingredient 1-methylcyclopropene) on unrooted cuttings during shipment, in conjunction with URC harvest timed to maximize URC carbohydrate status.

Materials & Methods

A variety of ethylene-sensitive unrooted cuttings were studied, including highly sensitive plants such as Lantana and Portulaca, which are well known for drastic leaf abscission in response to ethylene exposure. Cuttings were harvested from stock plants grown in North America and packed in sealed Ziploc bags, either with or without EthylBloc™ Sachets. They were then subjected to conditions simulating long-distance shipping for three days. It is noted that the sealed bags allowed only minimal escape of gases, thereby accentuating the effects.

Results

EthylBloc™ is an ethylene-action inhibitor that works naturally with plants to block ethylene receptors. As such, application of EthylBloc™ protects cuttings from both internal and external ethylene, inhibiting leaf abscission and premature senescence.

Across the cuttings studied in the research summarized here, EthylBloc™ treatment controlled leaf abscission and/or yellowing in the following ethylene-sensitive unrooted cuttings:

+ Agastache (leaf abscission)
+ Croton (leaf abscission)
+ Euphorbia Hybrid (leaf abscission)
+ Geranium (leaf yellowing)
+ Hibiscus (leaf abscission)
+ Lantana (leaf abscission)
+ Mandevilla/Dipladenia (leaf abscission)
+ Poinsettia (leaf abscission)
+ Portulaca (leaf abscission)
+ Thunbergia (leaf abscission)

Note: In Geraniums, EthylBloc™ delays leaf yellowing during the first week of propagation. However, in certain Geranium cultivars the leaf yellowing may reappear.

The following are some examples of EthylBloc™ inhibiting leaf abscission. Fig. 2 and Fig. 3 show the impact of EthylBloc™ on Portulaca and Lantana cuttings, where controls exhibited almost 100% leaf abscission while EthylBloc™-treated cuttings showed no leaf abscission.

Fig. 2 Portulaca Cv. Red – Untreated controls (left) exhibited close to 100% leaf abscission. EthylBloc™-treated cuttings (right) showed no leaf abscission after simulated long-distance shipping.

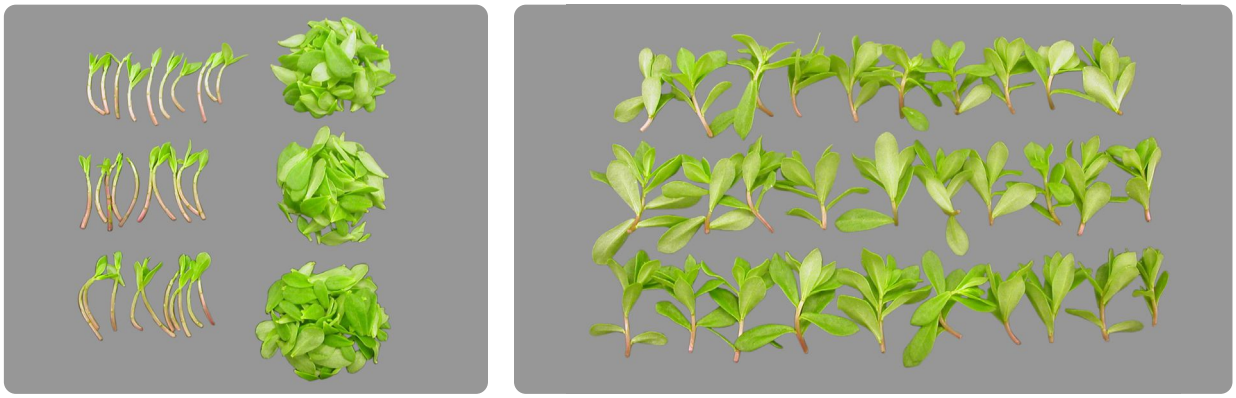

Fig. 3 Lantana Cv. Red – Untreated controls (left) experienced 100% leaf abscission after simulated long-distance shipping. No leaf abscission occurred in cuttings treated with EthylBloc™ (right).

Time of Harvest

Even in ethylene-sensitive cultivars, cuttings are less sensitive to ethylene action when carbohydrate status is higher. Carbohydrate levels are highest in plants later in the day. As a result, scheduling URC harvests for afternoon or end-of-the-day hours can help ensure higher URC carbohydrate levels, which in turn helps limit the negative potential of ethylene on sensitive crops.

However, for most producers, harvesting all URC crops toward the end of the day is not practical. In addition, while end-of-the-day harvesting will improve cutting quality, it will not fully inhibit ethylene damage. As a result, the best course of action to improve URC postharvest quality is to:

1. Treat all ethylene-sensitive URC crops with EthylBloc™ Sachets.
2. Harvest extremely sensitive URC cultivars late in the day and treat with EthylBloc™.

Conclusions

Treating with EthylBloc™ ethylene-action inhibitor and scheduling URC harvests for late in the day, when cutting carbohydrate status is highest, are both viable and valuable strategies for improving postharvest quality of unrooted cuttings.

EthylBloc™ Sachet application significantly improves the postharvest quality of ethylene-sensitive unrooted cuttings. In many cases, leaf abscission that borders on 100% for ethylene-sensitive cultivars can be reduced to minimal or no leaf abscission with EthylBloc™ treatment. While this research focused on a few ethylene-sensitive crops, any cutting cultivars that display leaf abscission or yellowing could benefit from EthylBloc™ treatment to inhibit ethylene-induced damage.

For best results, it is noted that EthylBloc™ treatment should be applied as soon as possible after cuttings are harvested. In addition, although the active ingredient in EthylBloc™ (1-methylcyclopropene gas) irreversibly blocks ethylene receptors and inhibits ethylene action, vegetative cuttings keep generating new ethylene receptors. Therefore, it is important to reapply EthylBloc™ if the cuttings are repackaged or if the storage is prolonged.

As a final note, even after applying EthylBloc™ treatment, it is imperative to continue to follow best practices to manage the temperature and moisture content of the cuttings. Otherwise, the quality of the cuttings can quickly deteriorate in spite of treatment and harvest timing.

References

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