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The Effect of 1-Methylcyclopropene on Postharvest life of Sessile Joyweed (*Alternanthera sessilis*)

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Abstract

Sessile Joyweed (*Alternanthera sessilis*) which is commonly known as *Mukunuvenna* in Sri Lanka, is the most widely produced and most popular of nine leafy vegetables cultivated and sold on a commercial scale in Sri Lanka. This is primarily consumed locally, while only a small quantity is exported. However, the shelf life of *Mukunuvenna* is as low about 3-4 days due to leaf yellowing and wilting. Consumers prefer green and turgid leafy vegetables and thus the loss is considerably high after wilting and yellowing. Ethylene is a critical problem in leaf senescence. Minute concentrations such as 1 μ L/L ethylene can affect leaf yellowing significantly. Thus, an ethylene blocker, 1-Methylcyclopropene (1-MCP), which is now commonly being used in the fruit industry, can be considered as an effective solution for extending the postharvest life of *A. sessilis*. It is not toxic and environmentally friendly thus safe with edible produce. The present study was done, with the objective of investigating effects of 1-MCP on postharvest life and sensory qualities. Two experiments were conducted for several dosages (concentration \times time) to investigate the shelf-life performances and processed *A. sessilis* samples were used to check sensory qualities such as taste, smell, texture and colour.

Samples treated with 1-MCP showed high levels of chlorophyll, lower yellowing and higher overall quality. Postharvest life of treated samples increased by 1 full-day (25% increase) under the room temperature. 1-MCP, 5 ppm for 8 hour duration showed promising results. However, the obtained results did not show a specific treatment combination as the best treatment and 1-MCP did not alter the sensory qualities of the processed product.

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1. Introduction

Sessile joyweed (*Alteranthera sessilis*) or *Mukunuwenna* (Sri Lankan common name) is the most widely produced and most popular of nine leafy vegetables cultivated and sold on a commercial scale in Sri Lanka (De Alwis et al., 2006). This perennial herb, which belongs to family Amaranthaceae is a green leafy vegetable with high level of vitamins, minerals and fiber. Due to its taste, medicinal properties and low cost, *Alteranthera sessilis* is consumed by Sri Lankans, several times a week (Wahundeniya, 2008), generating an annual potential net income of Rs. 151,200 per acre. This is primarily consumed locally, while only a small quantity is exported.

The monthly retail and wholesale prices are relatively stable, but the shelf life of *Mukunuwenna* is as low about 3-4 days due to leaf yellowing and wilting. Consumers prefer green and turgid leafy vegetables and thus the loss is considerably high. On the contrary, it is estimated that the postharvest loss of leafy vegetables is, 5% and it is relatively low compared to other perishables (Wahundeniya, 2008). But unaccounted loss at the household level is much higher due to loss of visual quality.

Ethylene is a critical problem in leaf senescence. Even 1 μ L/L ethylene can affect leaf yellowing significantly. Thus an ethylene blocker, 1-MCP treatment can be considered as an effective solution for extending the postharvest life of *A. sessilis*. Renowned counterfeit argument against 1-MCP is that, it being expensive; 1-MCP is not worth used for low economic value commodities. However, at present, the price of 1-MCP has noticeably reduced; moreover ultra-low quantities are needed as the treatments need minute concentrations. Most importantly, it is environmentally friendly and non-toxic thus safe with edible produce.

1-MCP is used as an ethylene blocker for numerous fruits to prevent ripening. In addition, it is often used to delay flower senescence as many literature suggests. Nonetheless, a very few studies have been conducted to analyze the effect of 1-MCP on green leafy vegetables. Unlike fruits which need ethylene for ripening, the main ethylene activity in the leafy vegetables is enhancing senescence. Thus the aim of this study is to investigate the effect of 1-MCP on postharvest life and sensory qualities of *A. sessilis*.

2. Methodology

The research was conducted in a laboratory at the Department of Crop Science, Faculty of Agriculture, University of Peradeniya in Sri Lanka. The experiments were carried out from the end of August to October 2014 during which the average temperature was 29 \pm 2 °C.

A. sessilis bunches were collected from a local producer at the point of harvest and they were treated inside 20 L each, air tight chambers. Three replicates per treatment combination of 100 g bunches were used. Two experiments were conducted for several dosages. Each was a completely randomized design. In the experiment one, 0, 0.5, 1 and 5 ppm were checked with 4 hour and 8 hour durations. In the second, 0, 7.5 and 10 ppm were checked with the same two time durations. In both experiments, 0 ppm or untreated samples were taken as control treatments. Ethylene scrubbing was not implemented as the experiment was carried out simulating normal storage and retail conditions of leafy vegetables. Similarly cooked *A. sessilis* samples were used to check sensory qualities such as, taste, smell, texture and colour.

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