

Effects of Treatments on the Postharvest Senescence of Green Leaves
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Introduction

In tests to develop satisfactory and practical applications of chemical senescence control for green leafy vegetables after harvest, several questions emerged. One involved tissue age and another the effects of prior nitrogen nutrition.

While many tests were made using several kinds of plants, data drawn from a complicated factorial experiment with broccoli leaves are perhaps most expressive.

Methods

Plants of Waltham 29 broccoli were grown in pots in the greenhouse. Four weeks prior to leaf harvest, ammonium nitrate at the rate of 1 gram per 7 inch pot was applied in solution to supplement a low and near exhausted reserve in the growth medium. Plants without added nitrogen were maintained for comparison.

At harvest there were visible differences in color of lower leaves with checks being less green and showing advanced abscission of those leaves. Age differences were established by selecting recently formed upper leaves and mature (still green) lower leaves to provide young and old experimental tissues.

A tight control over age was attained by numbering leaves downward from the apex and choosing leaves 5 and 6 for young and 11 and 12 for old. Chemical senescence control treatment was made by dipping one of each pair of leaves in a solution of 10 ppm of N⁶ benzyladenine (N⁶BA) with a wetting agent. Checks were provided by dipping the other member of the pair in tap water also with a wetting agent. After drying, leaves were inserted into perforated plastic bags and placed in storage.

On a weekly schedule leaves were examined for color and other evidences of life and senescence. Subjective ratings were made by eye and recorded on a 9 to 1 scale of intensity. Objective, but nondestructive measurements of green color were obtained from a color reflectance meter attached to a colorimeter. Data was obtained over a 6-week period.

Results

While only a small portion of the results can be presented in this report, Table 1 summarizes the effects of several factors on one characteristic - subjective green color remaining at 2-week intervals.

Table 1. Green color ratings* of detached broccoli leaves at 12.8°C.

Weeks	with nitrogen		without N		with N		without N	
	N ⁶ BA	Ck						
0	9.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0
2	8.2	6.0	6.0	2.8	9.0	9.0	8.5	7.8
4	6.8	2.8	4.8	2.0	9.0	4.8	8.0	4.0
6	4.5	1.0	4.0	1.0	7.5	4.2	7.2	3.3

* Ratings are on a 9 to 1 subjective scale. 9=healthy dark green, 7=medium green, 5=light green, 3=mostly yellow and 1=dead and brown.

It is not proper to express these results in terms of practical utility. However, it appears obvious that young leaves, those dipped in N⁶BA and those receiving preharvest nitrogen, retain green color and have a longer shelf life than their counterpart checks. In giving consideration also to other facets of the experiment not reported here, the apparent order of importance for factor influence on senescence was: storage duration > leaf age > storage temperature > N⁶BA > nitrogen nutrition and > plant age. Statistically, each had a highly significant effect. In addition, there were 11 two-way interactions and a single three-way interaction, all highly significant.

This study was part of the basic research supporting technological studies to improve and extend market life and food value of fresh fruits and vegetables grown in and shipped from Arizona.