

**AMERICAN BEAUTY POST HARVEST
HANDLING TECHNIQUES FOR
MAXIMUM SHELF-LIFE**

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AMERICAN BEAUTY POST HARVEST HANDLING TECHNIQUES FOR MAXIMUM SHELF-LIFE

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Location:	Welsh College of Horticulture Northop and ADAS Chichester
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SUMMARY

White American Beauty blooms grown at Welsh College of Horticulture were selected and treated on site. After transport to Chichester by road they were observed for shelf life effects.

Harvesting at an early stage of maturity gave the best results delaying leaf yellowing. However the bloom shape is more horizontal and less rounded. Over-mature blooms developed brown basal petals the earliest. Pre-treatment chemicals improved water uptake but gave no delay in leaf yellowing. In one case where the pre-treatment was continued for 48 hours the degree of leaf yellowing was unacceptable.

Marketing dry or wet had a noticeable influence on the appearance of the product on arrival. Dry stored and marketed flowers arrived looking and feeling limp but quickly revived and had the best resistance to leaf yellowing of any treatment. Marketing in water (aqua-packs) produced the best quality blooms on arrival but their subsequent vase life was no better than the control.

The best overall combination would be marketing at an early stage of maturity and using wet/dry or dry packing. Some care and possibly market testing would be needed if this were to be adopted.

INTRODUCTION

The variety American Beauty has a special niche market over the Christmas period. However due to its large head volume and extensive leaf area it often has a poor shelf life reputation involving yellowing leaves and petal shatter. Two

trials were designed to evaluate a range of harvesting stages, storage, packing and chemical treatments.

Blooms of American Beauty, Select Strain were grown at Welsh College, Northop, as part of the experimental programme. Treatments were applied at the Welsh College and then the blooms were transported by road to ADAS, Chichester, West Sussex, for observations.

TECHNICAL TARGETS OF THE WORK

- a. To compare various maturity harvesting stages for ease of handling and shelf life.
- b. To compare three pre-treatment chemicals with water during storage prior to marketing.
- c. To examine if dry or wet packing has an influence of the vase life and to look at aqua-packaging.

TREATMENTS

TRIAL 1. Blooms were harvested on 28 November and treatments applied immediately. Transport to Chichester was on 30 November and blooms were observed until 20 December.

(A) Stage of harvest

- (1) Blooms cut at an early stage of maturity with central petals not fully closed over and the base of bloom mostly horizontal.
- (2) Blooms cut at normal mature stage with central petals closed in.
- (3) Blooms cut at late maturity stage with all central petals fully expanded and base of bloom fully rounded.

(B) Storage conditions

- (1) Ambient 10°C average.
- (2) Cold storage 5°C.

(C) Handling and Pre-treatment Chemicals

- (1) Stored and marketed dry
- (2) Stored in water 24 hrs, marketed dry.
- (3) Stored in Chrysal RVB 24 hrs, marketed dry.
- (4) Stored in Bactoflor 24 hrs, marketed dry.
- (5) Stored and marketed in water (Aqua pack).
- (6) Stored and marketed in Chrysal RVB (Aqua pack).

Fifteen selected combinations of the above were chosen as follows:-

A1 B1 C2; A1 B1 C3; A1 B1 C4;
A2 B1 C2; A2 B1 C3; A2 B1 C4;
A2 B2 C2; A2 B2 C3; A2 B2 C4;
A2 B1 C5; A2 B1 C6; A2 B1 C1;
A3 B1 C2; A3 B1 C3; A3 B1 C4;

TRIAL II

Following the early results of Trial I the second set of treatments was chosen. Blooms were harvested on 19 December and 22 December and transported to Chichester on 21 and 24 December respectively. Observations were made until 13 January 1993.

TREATMENTS

(A) Stage of harvest

- (1) Blooms cut at an early stage of maturity with central petals not fully closed over and the base of the bloom mostly horizontal.
- (2) Blooms cut at normal mature stages with central petals closed in.

(C) Pre-treatment chemicals for first 24 hours.

- (1) Stored dry,
- (2) Stored in water,
- (3) Stored in Bactoflor,
- (4) Stored in Florissant 400,
- (5) Stored in water + 3% sugar,
- (6) Stored in Bactoflor + 3% sugar,
- (7) Stored in Florissant 400 + 3% sugar,

(D) Handling methods

- (1) Marketed dry,
- (2) Aqua pack marketing was used for treatment C (2) to (7) inclusive. This ensured that stems were in the various chemicals for 48 hours total including the storage and marketing phases.

Fifteen selected combinations of the above were chosen:-

A1 C2 D1; A1 C3 D1; A1 C4 D1;
A2 C2 D1; A2 C3 D1; A2 C4 D1;
A2 C1 D1; A2 C5 D1; A2 C6 D1;
A2 C7 D1; A2 C2 D2; A2 C3 D2;
A2 C5 D2; A2 C6 D2; A2 C7 D2;

VASE LIFE TECHNIQUES

On arrival at Chichester each treatment was divided into three replicates and all stems were re-cut and placed in plain water. The shelf life room was maintained at 17-20°C, 60-70° RH and had a 12 hour day at 800 lux.

Daily water uptake was monitored and observations on leaf colour, flower development and petal shatter made.

RESULTS

GENERAL COMMENTS

TRIAL 1

American Beauty does have a noticeable leaf yellowing problem. The earliest signs of yellowing started only 5 days into the vase life tests, with the control water treatments starting to yellow after 9 days. Petal shatter never occurred in any treatment in this trial, but once placed in the vases the flowers were not handled throughout their vase life. As the flower matured the lower petals started to wilt and eventually turn brown. Flowers harvested at the most mature stage suffered from brown petals the earliest, starting after 9 - 10 days and completing their vase life after 17 days.

STAGE OF HARVEST

Treatments were immediately obvious on arrival at Chichester. Immature blooms had a distinct green eye and a horizontal base, but after 7-10 days both these conditions had largely disappeared. The whole flower size never completely reached the size of those that had been left to mature on the plant, but was quite acceptable. The central green eye filled in and covered over, but the petals remained thin and less developed than those of mature flowers. The overall vase life of the flower and leaves was the longest of any with leaves starting to turn yellow after 10 days and flowers acceptable for 20 days.

Flowers harvested at a late stage of maturity arrived in excellent condition with fully expanded petals and a completely round flower. The flower also felt the most resilient and firm on arrival. However the lower petals became soft and turned brown quickly and this treatment had the shortest vase life.

STORAGE CONDITIONS

Comparing one day at ambient temperature 10°C with one day in cold storage at 5°C; there was no measurable difference in vase life between these treatments.

HANDLING AND PRE-TREATMENT CHEMICALS

Marketing flowers completely dry gave surprisingly good results. On arrival they had noticeably wilted leaves, but these quickly revived and the overall performance was good. The 'control' treatment of 24 hrs water/24 hours dry boxed performed well with leaf yellowing starting after 9 days and eventual death after 18 days. Keeping stems in water for 48 hours and marketing in a Aqua-pack produced a noticeably better, firmer flower with crisper leaves on arrival. However, there was no improvement in overall performance.

Using a pre-treatment chemical for 24 hours that is designed to enhance water uptake did achieve this with average daily uptake after 12 days:-

Water	8.5 cc
Bactoflor	9.6 cc
Chrysal	10.7 cc

However, leaf yellowing started earlier than the control after only 5 - 7 days and progressed more rapidly often associated with a tip blackening. Where the pre-treatment chemical, Chrysal RVB, was maintained in the Aqua-pack for 48 hours, the leaf yellowing was severe, see Table I but flower development and petal browning were not effected. Bactoflor caused a discoloration of the stem base.

TRIAL II

GENERAL COMMENTS

Following the result of Trial I it was obvious that late harvest A(3) and cold storage gave no benefit. Further concentration was made on vase life chemicals and the addition of sugar. The pre-treatment chemical Florissant 400 was not available on 19 December consequently those treatments were delayed by two days.

RESULTS

STAGE OF HARVEST

As in Trial I the early treatment A(1) had a green eye and a more horizontal base to the flower. All these treatments performed well with leaves remaining green for 3 - 4 days longer than the A(2) control. Flowers developed a closed eye and lost the green colour but never achieved the full round shape of A(2) flowers. The basal petals remained white for a further 3 days after A(2) had started to turn brown.

PRE-TREATMENT CHEMICALS

Water uptake was again higher as in Trial I with pre-treatment chemicals. Florissant 400 gave a similar stem base discoloration to Bactoflor. Leaf yellowing started earlier than the control. Adding 3% sugar to the various pre-treatments improved the leaf colour initially causing all leaves to become noticeably darker green. However this effect was only short lived and did not achieve an improvement over the A(2),C(2) control.

The graph Table 2 shows the effect on uptake of adding sugar to the water. Adding sugar alone caused a decrease in water uptake throughout the vase life of the flower. Mixing sugar with a pre-treatment known to enhance water uptake, showed an initial increase in uptake for the first few days and then uptake fell below the control.

HANDLING METHODS

Dry storage and marketing again produced an unexpected result with leaves remaining acceptable for 14 days but the flowers lasted no longer than the water control.

The use of aqua-packs produced a noticeably firmer, crisper flower on arrival but this was not sustained beyond the first day. Using pre-treatment chemical for 48 hours resulted in early leaf yellowing.

Adding 3% sugar to the pre-treatments in aqua pack marketing did not give any improvements in vase life over the control. The leaves became darker green for a time but there was no delay in the onset of leaf yellowing. Treatments A(2),C(5),D(2),Aqua pack + water + 3% sugar suffered from severe leaf wilting within two days of arrival. Although this wilting slowing disappeared the flowers suffered from early brown petals and the water uptake was low.

DISCUSSION

American Beauty does suffer from premature leaf yellowing compared to many popular spray chrysanthemums. The use of pre-treatment chemicals alone was of no advantage, and if used for 48 hours had a hastening effect on leaf yellowing. Cold storage compared to ambient storage for 24 hours had no detectable effect on vase life.

The stage of harvest had a marked effect on shelf life. Mature blooms had the shortest vase life with immature blooms lasting longest. Marketing throughout in water (Aqua -pack) did produce more turgid flowers on arrival and improved water uptake, but gave no longer vase life. The powers of recovery once stems are re-cut, demonstrate that marketing 48 hrs completely dry or in Aqua-pack has little effect on the vase life of the blooms.

Adding sugar gave a temporary improvement in colour. Sugar without any pre-treatment chemical gave the poorest vase life result probably due to a bacterial blockage in the stem base. The combination of sugar and a pre-treatment chemical initially had a better water uptake rate but after nine days this too had fallen below the control rate.

Petal shatter did not occur; the petals turned brown from the base and gradually the whole flower became soft as the vase life progressed.

The best combination of treatments from these trials was 'Early harvest with water or dry marketing'.

The question of the flatter bloom shape will have to be accepted if this form of marketing is to be adopted. Perhaps a compromise could be achieved with three-quarter developed flowers. Provided the industry is happy that stem bases are always re-cut by the wholesaler/florist and clean water is used then wet or dry marketing is acceptable.

FUTURE WORK

Since the market chain is (or should be) relatively short it would be beneficial to look at consumer Flower Foods. These contain sugars and various bactericides that should effect the shelf life. One other aspect might be to look at any clonal selections of American Beauty to see if leaf yellowing could be reduced by selection.

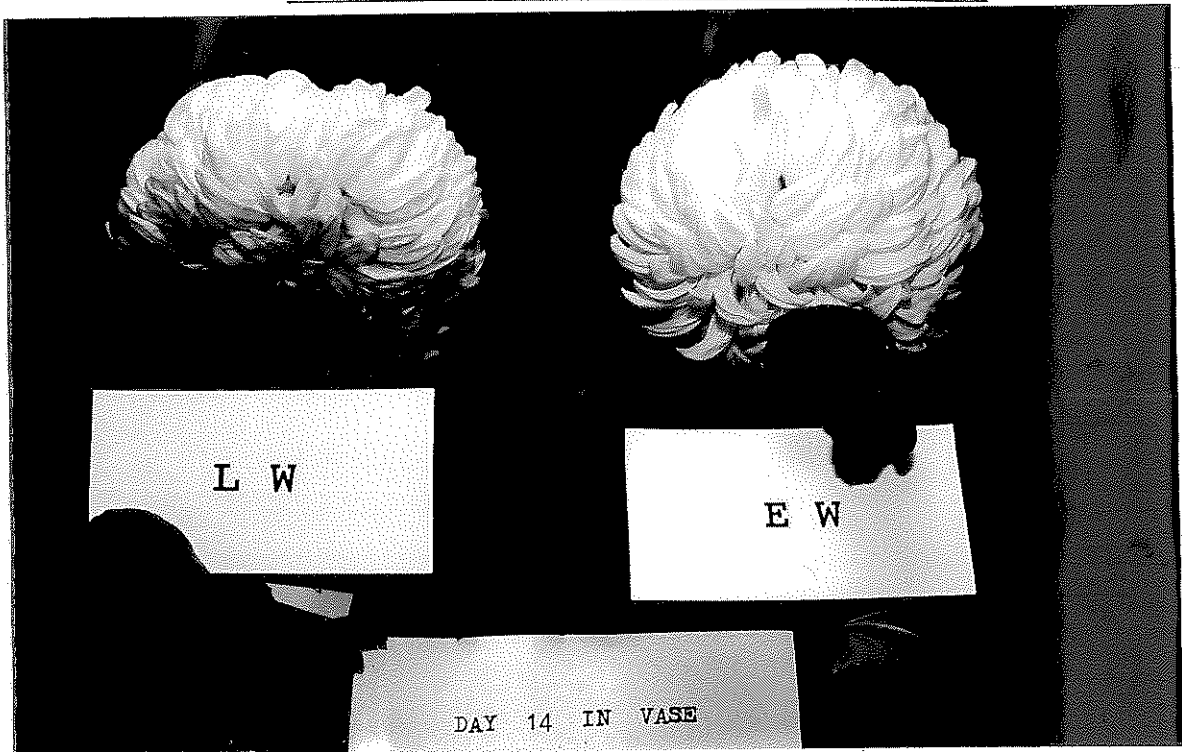
PHOTOGRAPHS

(1)



GENERAL VIEW OF SHELF LIFE TRIAL

(2)



Close up - showing basal petal browning.
EW = Early stage of maturity in water.
LW = Late stage of maturity in water.
photo taken 14 days after start of vase life tests.

TRIAL I

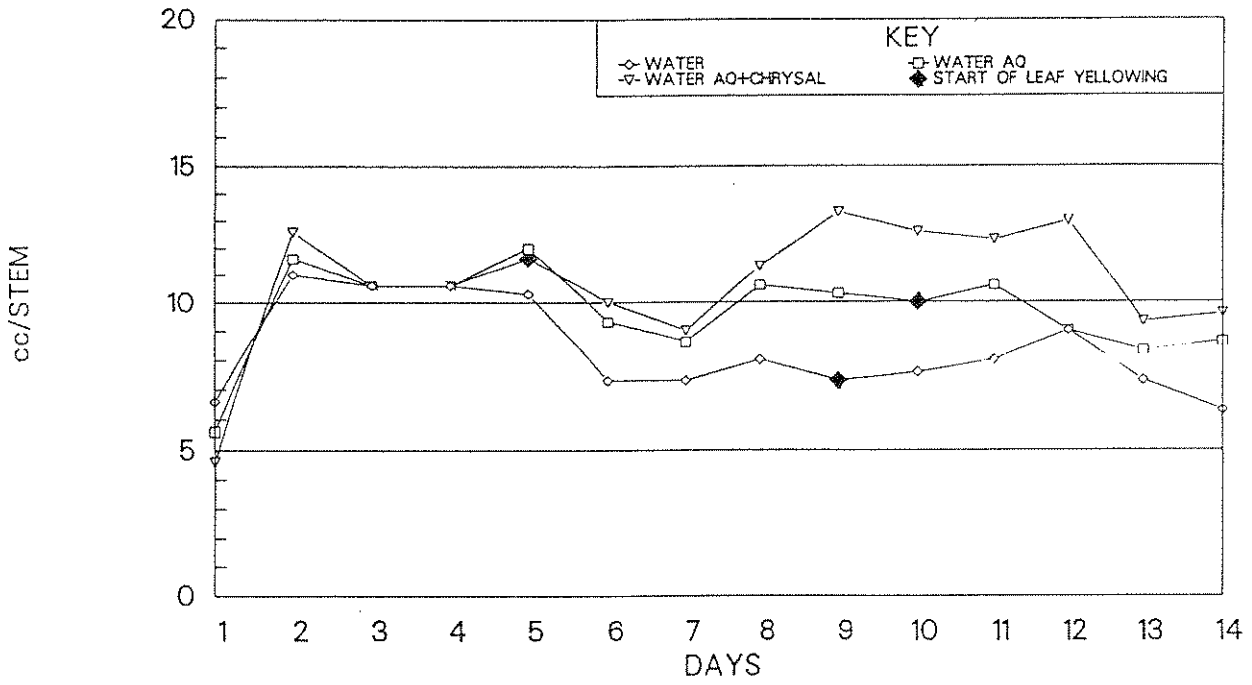


TABLE 1.

TRIAL II

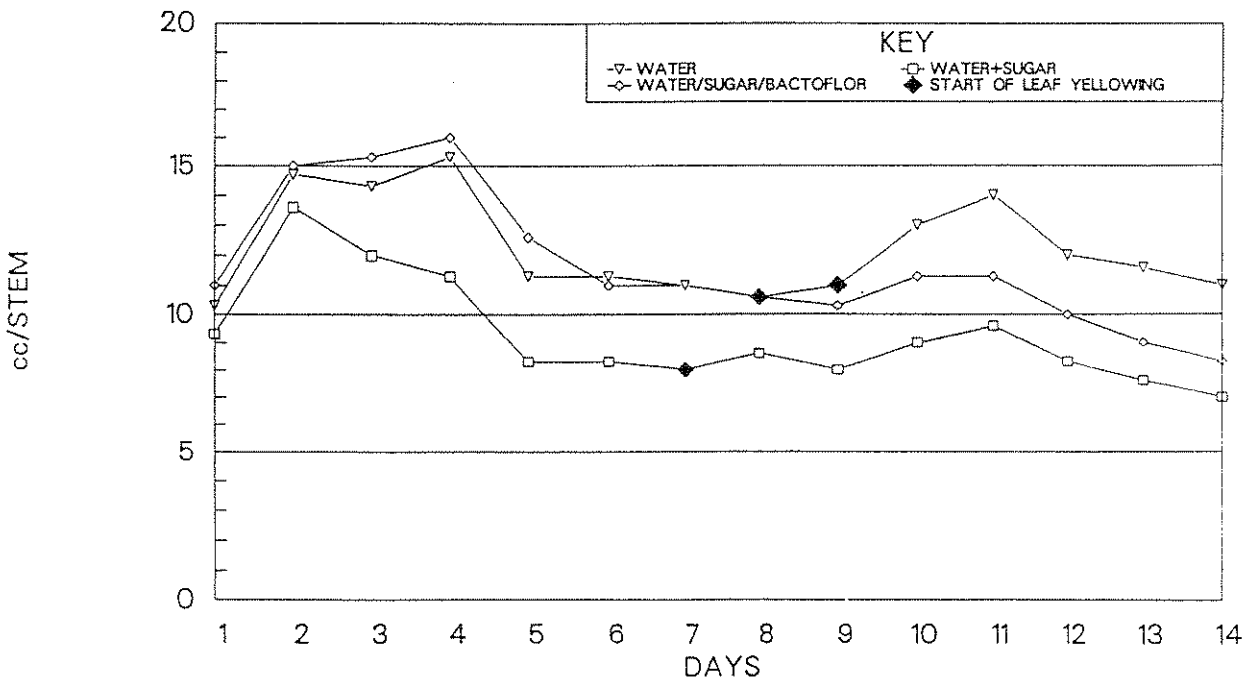


TABLE 2.