

Storage of Chinese Cabbage

HDC FV/14/C/87/0356

HDC /C/87/0356/1

**STORAGE OF CHINESE CABBAGE**

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Status of work: continuing

Year of experiment: 1

Report Number: 1

Period covering financial year 1987/88

**Abstract**

Chinese cabbages, grown according to standard commercial practice, were harvested from a Luddington site during October for storage trials investigating the effects of variety, crop maturity, fungicide sprays and refrigerated air or Controlled Atmospheres on long term storage and subsequent shelf life.

Heads were assessed after 13 to 17 weeks of cool storage, and subsequently during a 72 hour period in shelf life.

Results from the first year of this trial showed that choice of variety can have a major influence on storage potential and shelf life. Treasure Island and Jade Pagoda consistently produced good results. The use of a Controlled Atmosphere (CA) was not shown to confer any major benefits, but the use of a post harvest fungicide spray produced a dramatic improvement in head quality, both out of store and during shelf life.

Crops harvested either immature or overmature were shown to store less well than those harvested at the optimum stage.

## **Objective**

To define optimum storage conditions, with special reference to the significance of varietal choice, store environment and shelf life of the product after storage.

## **Introduction**

Although Chinese cabbage is a fairly recent introduction to the UK vegetable market, it is increasing in popularity and is now estimated to occupy over 350 ha of land with an output of £4.5M in 1985. Marketing from the field is only possible until November because the crop is frost sensitive. Between November and March imports are received, mostly from Spain, Austria and Israel. It should therefore be possible to compete successfully with these imports using home grown supplies taken from cool stores.

Optimum storage conditions, including pre-harvest culture, timing of harvest and store environment are not fully understood or defined. Consequently high wastage occurs during storage. The factors limiting success are desiccation, decay, and a physiological disorder, 'brown midrib', which is related to low temperature breakdown. 'Brown midrib' is influenced by the choice of variety, maturity at harvest and store environment. In many cases the disorder does not occur in store but expresses itself in the higher temperatures experienced during marketing.

## **Materials and methods**

The crop was grown at Luddington EHS to commercial standards using normal husbandry practices. Seed was sown on 14 July into Hassy 104 trays. Crops were planted out 4-6 August and harvested in October according to the trial requirements.

TRIAL 1 - MAIN STORAGE TRIAL

Treatments - Varieties:

Jade Pagoda  
Kingdom 65  
China Pride  
Treasure Island  
Kingfisher

Store environments: 1. Air: 2.5°C, 95% RH  
2. Controlled atmosphere: 3% O<sub>2</sub>; 3% CO<sub>2</sub> at 2.5°C, 95% RH.

The heads were harvested on 8-12 October and carefully placed into bulk bins (approximately four layers deep). Identical, conventional, high humidity stores were used. One was sealed and a Controlled Atmosphere of 3% CO<sub>2</sub>; 3% O<sub>2</sub> produced by 15 October, the other was maintained in normal air.

Treatments - Removals from store: i) 25 January (15 weeks)  
ii) 9 February (17 weeks)

TRIAL TWO - INVESTIGATION INTO THE EFFECT OF IPRDIONE (ROVRAL) AS A POST HARVEST STORAGE TREATMENT

Treatments - Varieties:

Jade Pagoda  
Kingdom 65  
Kingfisher  
China Pride

Treatment - Post harvest 1) Rovral (iprodione) spray  
2) None

Heads were harvested on 13-14 October and carefully loaded into bulk bins. Plots receiving the fungicide spray were sprayed with Rovral (50% a.i. iprodione) at 1g/litre as each layer was loaded. A conventional cold store at 2.5°C and 95% RH was used. The store was closed on 16 October. The cabbages were removed from store on 2 February (16 weeks).

#### TRIAL THREE - EFFECT OF HEAD MATURITY ON STORAGE OF CHINESE CABBAGE

Treatments - Varieties:

Jade Pagoda  
Kingdom 65  
Kingfisher  
China Pride  
Treasure Island

Treatments - Head maturity:    1. Slightly immature  
   2. Optimum maturity  
   3. Slightly overmature.

Heads were harvested as follows:

|                 | Harvest 1   | 2          | 3          |
|-----------------|-------------|------------|------------|
| Jade Pagoda     | 12 October  | 21 October | 28 October |
| Treasure Island |             |            |            |
| China Pride     | 8/9 October | 19 October | 28 October |
| Kingdom 65      |             |            |            |
| Treasure Island |             |            |            |

Heads were placed into bulk bins as previously described but stored in an ice bank store at 2.5°C, 95% RH.

Treatments - Removals from store:    i) 11 January  
   ii) 19 January  
   iii) 25 January

#### Store assessments (all trials)

On loading into store ten heads were pre-weighed into each bin (or bin compartment). At each store removal these heads were re-weighed and weight loss recorded. Any heads showing extensive rotting were replaced with an intact sample if a further removal was planned. At each removal an additional sample of 20 heads were randomly selected from each bin (10 heads from each bin compartment for trial three) and assessed for disease status, using a 1-5 scale (where 5 = excellent). Heads were weighed, trimmed and trimmings weighed. The number and weight of marketable heads was recorded.

A random sample of Class I heads was selected, bagged and used for shelf life assessments.

#### Shelf life assessments

Class I heads from each variety were harvested on 19 October, trimmed, bagged and assessed for quality during a 72 hour period under shelf life conditions of 20°C and 50% RH. Disease, turgidity and butt condition were assessed and scored on a 0-9 scale (where 9 = excellent, 6 = just unmarketable) at 24 hour intervals. Weight loss was similarly assessed. After 72 hours heads were split open and the initiation of flower stalks, and degree of internal rotting assessed. A diary of observations on external appearance, colour, etc was also made during shelf life. This is detailed in Appendix I.

Similar assessments were made at each store removal for each trial.

#### Statistical analysis

Three replicated bins of treatments were used in all trials during storage. Trials one and two shared the same air store. Shelf life assessments were made on two replicated plots for trial three but on three replicates for the other trials. Statistical analysis was undertaken by Mr Andrew Mead at IHR Wellesbourne.

## Results and discussion

Shelf life quality assessments of the five varieties at harvest showed disease levels on Kingdom 65 were higher than the other varieties throughout shelf life (Table 1). Jade Pagoda was less turgid and produced a higher weight loss than the other varieties. It was closely followed by Treasure Island.

There was very little internal rotting present on any variety except Treasure Island which showed some tipburn in the centre leaves. Flower stalks were also more extended in Treasure Island than in other varieties.

Table 1 Pre-storage shelf life assessments of varieties after 72 hours

| Variety                       | Disease<br>(scored 9-0) | Turgidity | % weight loss<br>(where 9 = excellent) |
|-------------------------------|-------------------------|-----------|--|
| Kingdom 65                    | 7.63                    | 8.40      | 0.75 (4.95)                            |
| China Pride                   | 8.00                    | 8.27      | 0.57 (4.31)                            |
| Jade Pagoda                   | 8.07                    | 6.90      | 2.57 (9.21)                            |
| Kingfisher                    | 8.23                    | 8.33      | 0.77 (4.97)                            |
| Treasure Island               | 8.53                    | 7.67      | 1.56 (7.17)                            |
| Mean                          | 8.09                    | 7.91      | 1.24 (6.12)                            |
| SED (between varieties, 8 df) | 0.246*                  | 0.157***  | 0.496***                               |

Figures in brackets refer to angularly transformed data upon which the statistical analysis has been based.

Where \* is significant at 5% level

    \*\* "      "      at 1% "

    \*\*\* "     "      at 0.1% "



TRIAL ONE - Effect of variety and store environment

Variety

Differences between the five varieties were quite marked at both removal dates and were manifest in a range of quality parameters.

After both 3½ months (15 weeks) and 4 months (17 weeks) storage the levels of disease on untrimmed heads coming out of store was significantly less for the variety Jade Pagoda, and even less for Treasure Island (Tables 2 and 3).

Table 2 Disease scores pre-trimming removed after 15 weeks

| Variety                          | Store environment |      | Mean |
|----------------------------------|-------------------|------|------|
|                                  | Air               | CA   |      |
| Kingdom 65                       | 2.67              | 2.17 | 2.42 |
| China Pride                      | 2.43              | 2.30 | 2.37 |
| Jade Pagoda                      | 2.93              | 2.90 | 2.92 |
| Kingfisher                       | 2.23              | 2.50 | 2.37 |
| Treasure Island                  | 3.37              | 3.13 | 3.25 |
| Mean                             | 2.73              | 2.60 |      |
| SED (between store environments) | 0.153 ns (18 df)  |      |      |
| SED (between varieties)          | 0.242** (18 df)   |      |      |

Table 3 Disease scores pre-trimming removed after 17 weeks

| Variety                          | Store environment |      | Mean |
|----------------------------------|-------------------|------|------|
|                                  | Air               | CA   |      |
| Kingdom 65                       | 2.60              | 2.47 | 2.53 |
| China Pride                      | 2.37              | 2.73 | 2.55 |
| Jade Pagoda                      | 3.20              | 3.20 | 3.20 |
| Kingfisher                       | 2.47              | 2.67 | 2.57 |
| Treasure Island                  | 3.57              | 3.20 | 3.38 |
| Mean                             | 2.84              | 2.85 |      |
| SED (between store environments) | 0.085 ns (18 df)  |      |      |
| SED (between varieties)          | 0.134*** (18 df)  |      |      |

In addition to less visible disease the percentage of marketable heads after trimming was also higher for Treasure Island and Jade Pagoda (Tables 4 and 5). The mean marketable headweight of Treasure Island was, however, the lowest of all varieties at both removals (Tables 6 and 7), although this was due to lower density at harvest. The percentage of leaf trimmed away was significantly lower for Jade Pagoda after 15 weeks storage. No differences in trimming were apparent after 17 weeks in store (Table 8).

Table 4 Percentage marketable heads out of store removed after 15 weeks

| Variety                          | Store environment |             | Mean        |
|----------------------------------|-------------------|-------------|-------------|
|                                  | Air               | CA          |             |
| Kingdom 65                       | 60.0 (50.8)       | 39.8 (38.4) | 49.9 (44.6) |
| China Pride                      | 56.7 (49.5)       | 48.3 (44.2) | 52.5 (46.9) |
| Jade Pagoda                      | 80.0 (65.0)       | 81.7 (65.2) | 80.8 (65.1) |
| Kingfisher                       | 35.0 (36.1)       | 60.0 (51.0) | 47.5 (43.5) |
| Treasure Island                  | 93.3 (77.7)       | 85.0 (68.0) | 89.2 (72.8) |
| Mean                             | 65.0 (55.8)       | 63.0 (53.3) |             |
| SED (between store environments) | 2.39 ns (18 df)   |             |             |
| SED (between varieties)          | 5.35*** (18 df)   |             |             |

Figures in brackets refer to angularly transformed data.

Table 5 Percentage marketable heads removed after 17 weeks

| Variety                          | Store environment |             | Mean        |
|----------------------------------|-------------------|-------------|-------------|
|                                  | Air               | CA          |             |
| Kingdom 65                       | 45.6 (42.1)       | 55.0 (48.0) | 50.0 (45.1) |
| China Pride                      | 51.7 (46.0)       | 65.0 (53.9) | 58.3 (49.9) |
| Jade Pagoda                      | 78.3 (62.5)       | 80.0 (65.0) | 79.2 (63.7) |
| Kingfisher                       | 50.0 (37.2)       | 36.7 (44.9) | 43.3 (41.1) |
| Treasure Island                  | 71.7 (63.2)       | 78.3 (58.0) | 75.0 (60.6) |
| Mean                             | 64.3 (54.0)       | 58.0 (50.2) |             |
| SED (between store environments) | 3.16 ns           |             |             |
| SED (between varieties)          | 5.00*** (18 df)   |             |             |

Table 6 Mean marketable headweight (grammes), removed after 15 weeks

| Variety                          | Store environment |     | Mean |
|----------------------------------|-------------------|-----|------|
|                                  | Air               | CA  |      |
| Kingdom 65                       | 1102              | 910 | 1006 |
| China Pride                      | 834               | 914 | 874  |
| Jade Pagoda                      | 1035              | 953 | 994  |
| Kingfisher                       | 971               | 898 | 935  |
| Treasure Island                  | 844               | 745 | 795  |
| Mean                             | 957               | 884 | 920  |
| SED (between store environments) | 33.0* (18 df)     |     |      |
| SED (between varieties)          | 52.2** (18 df)    |     |      |

Table 7 Mean marketable headweights out of store (grammes) removed after 17 weeks

| Variety                          | Store environment |     | Mean |
|----------------------------------|-------------------|-----|------|
|                                  | Air               | CA  |      |
| Kingdom 65                       | 881               | 897 | 889  |
| China Pride                      | 858               | 845 | 852  |
| Jade Pagoda                      | 922               | 826 | 874  |
| Kingfisher                       | 1015              | 866 | 941  |
| Treasure Island                  | 789               | 670 | 729  |
| Mean                             | 893               | 821 |      |
| SED (between store environments) | 37.7 ns           |     |      |
| SED (between varieties)          | 59.6* (18 df)     |     |      |

Table 8 Percentage trimming per marketable head. Mean for Air and CA stores

| Variety  | Removal from store |             |
|--|--------------------|-------------|
|  | 15 weeks           | 17 weeks    |
| Kingdom 65   | 40.8 (39.7)        | 45.0 (42.1) |
| China Pride  | 35.1 (36.3)        | 39.0 (38.7) |
| Jade Pagoda  | 29.9 (33.2)        | 36.5 (37.1) |
| Kingfisher   | 36.7 (37.3)        | 41.0 (39.8) |
| Treasure Island  | 36.4 (37.1)        | 39.0 (38.6) |
| Mean   | 35.8 (36.7)        | 40.1 (39.3) |
| SED (between varieties<br>at a single removal<br>date) 18 df | 1.34***            | 2.59 ns     |

Figures in brackets refer to angular transformation of data to which statistical analysis relates.

After assessing the varieties for a 72 hour shelf life period the levels of disease from both store removals were again lower on Treasure Island and Jade Pagoda, despite all heads being clean and of Class I quality at the start of the shelf life. (Table 9).

Table 9 Disease scores after 72 hours shelf life, using 1-5 scale where 5 = excellent. Mean for Air and CA stores

| Variety  | 15 weeks | 17 weeks |
|--|----------|----------|
| Kingdom 65   | 6.70     | 6.87     |
| China Pride  | 7.10     | 5.97     |
| Jade Pagoda  | 7.67     | 7.73     |
| Kingfisher   | 6.77     | 6.60     |
| Treasure Island  | 7.83     | 7.97     |
| Mean   | 7.21     | 7.03     |
| SED (between varieties<br>within a single<br>removal date) 18 df | 0.318*** | 0.438*** |

However, Jade Pagoda and Treasure Island also had the highest percentage weight loss during shelf life (Table 10) and Jade Pagoda in particular was the least turgid of the varieties after 72 hours.

Table 10 % weight loss after 72 hours shelf life. Mean of Air and CA stores

| Variety  | Removal date |             |
|--|--------------|-------------|
|  | 15 weeks     | 17 weeks    |
| Kingdom 65   | 0.81 (5.13)  | 0.81 (5.12) |
| China Pride  | 0.66 (4.67)  | 0.97 (5.63) |
| Jade Pagoda  | 2.64 (9.34)  | 1.89 (7.85) |
| Kingfisher   | 0.73 (4.84)  | 0.78 (5.06) |
| Treasure Island  | 1.63 (7.30)  | 2.10 (8.30) |
| Mean   | 1.29         | 1.31        |
| SED (between varieties within a single removal date) 18 df | 0.356***     | 0.316***    |

Figures in brackets refer to angularly transformed data to which statistical analysis was applied.

Development of the flower stalk inside the head also differed significantly between varieties. Jade Pagoda and China Pride consistently scored lower than most or all other varieties, as a result of increased extension growth (Table 11).

Table 11 Flower stalk extension score (0-9\*) removed after 15 weeks

| Variety                          | Store environment |      | Mean |
|----------------------------------|-------------------|------|------|
|                                  | Air               | CA   |      |
| Kingdom 65                       | 8.87              | 9.00 | 8.93 |
| China Pride                      | 8.07              | 8.87 | 8.47 |
| Jade Pagoda                      | 7.93              | 8.00 | 7.97 |
| Kingfisher                       | 8.67              | 8.87 | 8.77 |
| Treasure Island                  | 8.47              | 8.93 | 8.70 |
| Mean                             | 8.40              | 8.73 |      |
| SED (between store environments) | 0.083***          |      |      |
| SED (between varieties)          | 0.131***          |      |      |

\*Where 9 = excellent, very little extension growth

### Store environment

The effects of CA storage were not apparent at the first removal date although some effects became more marked at the later assessment (17 weeks).

After 15 weeks storage the ordinary air store actually produced slightly heavier trimmed marketable heads (Table 6) with a lower percentage of trimming necessary than from the CA store (Table 8). A benefit of CA at this time was seen in the higher flower stalk scores indicating extension growth had been inhibited (Table 11).

After 17 weeks storage there were no significant differences between heads stored in CA and air upon initial removal assessments, although for most varieties CA storage does appear to have slightly increased the percentage of marketable heads (Table 5). Shelf life records indicate, conversely, that heads from the CA store were initially less turgid than their air stored counterparts and went on to show higher weight losses during shelf life (Tables 12 and 13).

Table 12 Turgidity score after 0 hours shelf life removed after 17 weeks

| Variety                          | Store environment |      | Mean |
|----------------------------------|-------------------|------|------|
|                                  | Air               | CA   |      |
| Kingdom 65                       | 8.00              | 7.93 | 7.97 |
| China Pride                      | 8.07              | 7.47 | 7.77 |
| Jade Pagoda                      | 7.47              | 7.27 | 7.37 |
| Kingfisher                       | 7.93              | 7.67 | 7.80 |
| Treasure Island                  | 7.73              | 7.13 | 7.43 |
| Mean                             | 7.84              | 7.49 |      |
| SED (between store environments) | 0.128* (18 df)    |      |      |
| SED (between varieties)          | 0.203* (18 df)    |      |      |

Table 13 Percentage weight loss after 72 hours shelf life removed after 17 weeks

| Variety                         | Store environment |             | Mean        |
|---------------------------------|-------------------|-------------|-------------|
|                                 | Air               | CA          |             |
| Kingdom                         | 0.61 (5.74)       | 1.01 (4.49) | 0.81 (5.12) |
| China Pride                     | 0.99 (5.69)       | 0.95 (5.57) | 0.97 (5.63) |
| Jade Pagoda                     | 1.62 (7.29)       | 2.15 (8.42) | 1.89 (7.85) |
| Kingfisher                      | 0.19 (5.19)       | 0.22 (4.94) | 0.21 (5.06) |
| Treasure Island                 | 2.06 (8.41)       | 2.14 (8.19) | 2.10 (8.30) |
| Mean                            | (6.17)            | (6.62)      |             |
| SED (between store environment) | 0.200*            |             |             |
| SED (between varieties)         | 0.316*** (18 df)  |             |             |

Figures in brackets refer to angularly transformed data to which statistical analysis applied.

TRIAL TWO - Effect of fungicide treatments

Heads which had received a Rovral (iprodione) spray treatment before storage showed less disease when brought out of store (Table 14) needed less trimming (Table 15) and produced higher trimmed marketable headweights (Table 16) than unsprayed ones. In addition the sprayed treatments produced a higher percentage marketable number of heads than unsprayed ones (Table 17). The benefits of the fungicide spray were also noted during shelf life assessments. Sprayed heads had less disease after 72 hours shelf life and higher butt scores after 24 and 48 hours shelf life (Tables 18 and 19).

Variety differences were similar to those reported in trial one

Table 14 Disease scores pre-trimmed+, removed after 16 weeks

| Variety                        | Fungicide treatments |      |      |
|--------------------------------|----------------------|------|------|
|                                | Spray                | None | Mean |
| Kingdom 65                     | 3.27                 | 2.00 | 2.63 |
| China Pride                    | 3.37                 | 2.60 | 2.98 |
| Kingfisher                     | 3.57                 | 2.53 | 3.05 |
| Treasure Island                | 4.00                 | 3.17 | 3.58 |
| Mean                           | 3.55                 | 2.58 |      |
| SED (between spray treatments) | 0.183*** (14 df)     |      |      |
| SED (between varieties)        | 0.259*               |      |      |

+scored 1-5, where 5 = excellent, no disease present



Table 15 Percentage trimming per marketable head, removed after 16 weeks

| Variety                        | Fungicide treatments |             | Mean        |
|--------------------------------|----------------------|-------------|-------------|
|                                | Spray                | None        |             |
| Kingdom 65                     | 29.9 (33.1)          | 41.0 (39.8) | 35.4 (36.5) |
| China Pride                    | 30.2 (33.3)          | 36.4 (37.1) | 33.3 (35.2) |
| Kingfisher                     | 29.9 (33.1)          | 34.5 (35.9) | 32.2 (34.5) |
| Treasure Island                | 33.3 (35.3)          | 38.4 (38.2) | 35.8 (36.7) |
| Mean                           | (33.7)               | (37.8)      |             |
| SED (between spray treatments) | 0.85*** (14 df)      |             |             |
| SED (between varieties)        | 1.20 ns (14 df)      |             |             |

Figures in brackets refer to angularly transformed data to which statistical analysis applies.

Table 16 Mean marketable headweight (trimmed), removed after 16 weeks

| Variety                        | Fungicide treatments |      |      |
|--------------------------------|----------------------|------|------|
|                                | Spray                | None | Mean |
| Kingdom 65                     | 1129                 | 951  | 1040 |
| China Pride                    | 993                  | 872  | 933  |
| Kingfisher                     | 1166                 | 1039 | 1102 |
| Treasure Island                | 881                  | 701  | 791  |
| Mean                           | 1042                 | 891  |      |
| SED (between spray treatments) | 37.7*** (14 df)      |      |      |
| SED (between varieties)        | 53.4*** (14 df)      |      |      |

Table 17 Percentage marketable heads out of store, removed after 16 weeks

| Variety                        | Fungicide treatments |             | Mean        |
|--------------------------------|----------------------|-------------|-------------|
|                                | Spray                | None        |             |
| Kingdom 65                     | 61.7 (52.1)          | 51.7 (46.0) | 56.7 (49.0) |
| China Pride                    | 71.7 (58.2)          | 56.7 (48.9) | 64.2 (53.6) |
| Kingfisher                     | 81.7 (64.7)          | 60.0 (50.9) | 70.8 (57.8) |
| Treasure Island                | 85.0 (67.4)          | 68.3 (56.7) | 76.7 (62.1) |
| Mean                           | 75.0 (60.6)          | 59.2 (50.6) |             |
| SED (between spray treatments) | 3.63* (14 df)        |             |             |
| SED (between varieties)        | 5.14 ns              |             |             |

Table 18 Disease scores after 72 hours shelf life, removed after 16 weeks

| Variety                        | Fungicide treatments |      |      |
|--------------------------------|----------------------|------|------|
|                                | Spray                | None | Mean |
| Kingdom 65                     | 7.80                 | 6.80 | 7.30 |
| China Pride                    | 7.07                 | 6.53 | 6.80 |
| Kingfisher                     | 7.00                 | 6.07 | 6.53 |
| Treasure Island                | 8.20                 | 8.00 | 8.10 |
| Mean                           | 7.52                 | 6.85 |      |
| SED (between spray treatments) | 0.266* (14 df)       |      |      |
| SED (between varieties)        | 0.376** (14 df)      |      |      |

Table 19 Butt scores after 48 hours shelf life, removed after 16 weeks

| Variety                        | Fungicide treatments |      |      |
|--------------------------------|----------------------|------|------|
|                                | Spray                | None | Mean |
| Kingdom 65                     | 7.13                 | 5.87 | 6.50 |
| China Pride                    | 6.67                 | 6.67 | 6.67 |
| Kingfisher                     | 6.93                 | 6.00 | 6.47 |
| Treasure Island                | 7.13                 | 6.80 | 6.97 |
| Mean                           | 6.97                 | 6.33 |      |
| SED (between spray treatments) | 0.210* (14 df)       |      |      |
| SED (between varieties)        | 0.297 ns (14 df)     |      |      |

TRIAL THREE - Effect of harvest date on storage

Following high humidity storage in an ice bank cool store the Chinese cabbage were assessed at intervals of 3 weeks commencing approximately 13 weeks after loading into store.

Varieties

The varietal differences highlighted in this trial were generally consistent with those found in trial one.

Upon removal from store pre-trimming scores for disease were consistently better for Treasure Island than all other varieties (Tables 19 and 20) at every store assessment.

Table 20 Disease score out of store (Removal one - 13 weeks)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 3.13         | 3.23     | 2.37 | 2.91 |
| China Pride     | 2.87         | 3.07     | 2.13 | 2.69 |
| Jade Pagoda     | 3.27         | 3.07     | 2.60 | 2.98 |
| Kingfisher      | 2.23         | 3.30     | 2.77 | 2.77 |
| Treasure Island | 3.67         | 3.70     | 3.60 | 3.66 |
| Mean            | 3.03         | 3.27     | 2.69 |      |
| SED (28 df)     | H            | 0.208*   |      |      |
|                 | V            | 0.269**  |      |      |
|                 | HxV          | 0.465 ns |      |      |

Where H = Harvest date means  
V = Variety means  
HxV = Harvest x variety interaction

Table 21 Disease scores out of store (pre-trimming) (Removal two - 14 weeks)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 2.90         | 3.17     | 1.90 | 2.66 |
| China Pride     | 2.57         | 2.73     | 2.00 | 2.43 |
| Jade Pagoda     | 2.90         | 2.80     | 2.80 | 2.83 |
| Kingfisher      | 2.43         | 2.80     | 2.60 | 2.61 |
| Treasure Island | 3.63         | 3.70     | 3.57 | 3.63 |
| Mean            | 2.89         | 3.04     | 2.57 |      |
| SED (28 df)     | V            | 0.213*** |      |      |
|                 | H            | 0.165*   |      |      |
|                 | HxV          | 0.368 ns |      |      |

Following trimming the mean marketable headweight of Treasure Island and Jade Pagoda were lower than other varieties (Tables 22 and 23) although for Treasure Island more heads were of marketable quality (Table 24).

Differences in the amount of trimming required were evident between varieties but were not consistent, with the exception of China Pride, which required less trimming than other varieties (Table 25).

Table 22 Mean marketable trimmed weight (grammes) (Removal one - 13 weeks)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 1053         | 1320     | 1109 | 1161 |
| China Pride     | 1053         | 1236     | 1039 | 1109 |
| Jade Pagoda     | 1005         | 965      | 931  | 967  |
| Kingfisher      | 1150         | 1474     | 1296 | 1307 |
| Treasure Island | 839          | 951      | 1100 | 963  |
| Mean            | 1020         | 1189     | 1095 |      |
| SED (28 df)     | H            | 53.4*    |      |      |
|                 | V            | 68.9***  |      |      |
|                 | HxV          | 119.4 ns |      |      |

Table 23 Mean marketable trimmed weight (grammes) (Removal two - 14 weeks)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 934          | 1319     | 1043 | 1099 |
| China Pride     | 908          | 1325     | 1210 | 1148 |
| Jade Pagoda     | 853          | 929      | 997  | 926  |
| Kingfisher      | 1036         | 1245     | 1128 | 1136 |
| Treasure Island | 780          | 825      | 966  | 857  |
| Mean            | 902          | 1128     | 1069 |      |
| SED (28 df)     | V            | 89.8**   |      |      |
|                 | H            | 69.5**   |      |      |
|                 | HxV          | 155.5 ns |      |      |

Table 24 Percentage marketable by number (Removal one - 13 weeks)

| Variety         | Harvest date |              |             | Mean        |
|-----------------|--------------|--------------|-------------|-------------|
|                 | 1            | 2            | 3           |             |
| Kingdom 65      | 90.0 (75.0)  | 90.0 (75.0)  | 60.0 (51.1) | 80.0 (67.0) |
| China Pride     | 66.7 (55.9)  | 73.3 (63.9)  | 56.7 (48.4) | 65.6 (56.1) |
| Jade Pagoda     | 76.7 (61.9)  | 73.3 (59.2)  | 60.0 (51.1) | 70.0 (57.4) |
| Kingfisher      | 56.7 (49.1)  | 86.7 (68.9)  | 56.7 (49.1) | 66.7 (55.7) |
| Treasure Island | 100.0 (90.0) | 100.0 (90.0) | 83.3 (66.6) | 94.4 (82.2) |
| Mean            | 78.0 (66.4)  | 84.7 (71.4)  | 63.3 (53.3) |             |
| SED (28 df)     | V            | 6.50***      |             |             |
|                 | H            | 5.04**       |             |             |
|                 | HxV          | 11.27 ns     |             |             |

Figures in brackets refer to angularly transformed data to which statistical analysis applies.

Table 25 Percentage trimmings per marketable head (Removal two - 14 weeks)

| Variety         | Harvest date |             |             | Mean        |
|-----------------|--------------|-------------|-------------|-------------|
|                 | 1            | 2           | 3           |             |
| Kingdom 65      | 33.6 (35.4)  | 28.1 (32.0) | 38.6 (38.3) | 33.4 (35.2) |
| China Pride     | 34.2 (35.7)  | 19.0 (25.8) | 29.9 (32.5) | 27.4 (31.4) |
| Jade Pagoda     | 38.2 (35.7)  | 33.0 (35.0) | 31.0 (33.6) | 33.9 (35.6) |
| Kingfisher      | 37.5 (37.7)  | 28.7 (32.4) | 32.0 (34.4) | 32.7 (34.8) |
| Treasure Island | 33.3 (35.2)  | 30.6 (33.6) | 29.7 (33.0) | 31.2 (33.9) |
| Mean            | 35.3 (36.4)  | 27.9 (31.7) | 32.3 (34.8) |             |
| SED (28 df)     | V            | 1.33*       |             |             |
|                 | H            | 1.03** *    |             |             |
|                 | HxV          | 2.30        |             |             |

Figures in brackets refer to angularly transformed data to which statistical analysis applies.

Shelf life assessments indicated that Treasure Island and Jade Pagoda generally showed less disease than other varieties after 72 hours shelf life although the turgidity of these varieties was consistently lower and the weight loss during shelf life greater (Tables 26-30).

Table 26 Disease score after 72 hrs shelf life (Removal two - 14 weeks)  
(0-9, 9 = excellent)

| Variety         | Harvest date |           |      | Mean |
|-----------------|--------------|-----------|------|------|
|                 | 1            | 2         | 3    |      |
| Kingdom 65      | 6.70         | 7.60      | 7.30 | 7.20 |
| China Pride     | 7.00         | 5.90      | 5.90 | 6.27 |
| Jade Pagoda     | 8.00         | 7.40      | 7.70 | 7.70 |
| Kingfisher      | 7.10         | 6.90      | 7.10 | 7.03 |
| Treasure Island | 8.90         | 8.40      | 8.40 | 8.57 |
| Mean            | 7.54         | 7.24      | 7.28 |      |
| SED (28 df)     | V            | 0.135ns   |      |      |
|                 | H            | 0.159** * |      |      |
|                 | HxV          | 0.293*    |      |      |

Table 27 Turgidity score after 72 hrs shelf life (Removal two - 14 weeks)  
(0-9, 9 = fully turgid)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 6.90         | 7.30     | 7.30 | 7.17 |
| China Pride     | 6.60         | 7.50     | 7.10 | 7.07 |
| Jade Pagoda     | 6.20         | 6.00     | 6.30 | 6.17 |
| Kingfisher      | 7.20         | 7.40     | 7.50 | 7.37 |
| Treasure Island | 6.60         | 6.70     | 6.90 | 6.73 |
| Mean            | 6.70         | 6.98     | 7.02 |      |
| SED (28 df)     | H            | 0.086**  |      |      |
|                 | V            | 0.196*   |      |      |
|                 | HxV          | 0.252 ns |      |      |

Table 28 Disease scores after 72 hours shelf life (Removal three - 15 weeks)  
(0-9, 9 = disease free)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 7.40         | 6.20     | 6.30 | 6.63 |
| China Pride     | 6.40         | 6.20     | 5.50 | 6.03 |
| Jade Pagoda     | 7.70         | 7.50     | 7.30 | 7.50 |
| Kingfisher      | 6.70         | 6.10     | 6.40 | 6.40 |
| Treasure Island | 8.30         | 7.90     | 7.80 | 8.00 |
| Mean            | 7.30         | 6.78     | 6.66 |      |
| SED (28 df)     | H            | 0.150**  |      |      |
|                 | V            | 0.234**  |      |      |
|                 | HxV          | 0.360 ns |      |      |



Table 29 Turgidity scores after 72 hours shelf life (Removal three - 15 weeks)  
(0-9, 9 = fully turgid)

| Variety         | Harvest date |          |      | Mean |
|-----------------|--------------|----------|------|------|
|                 | 1            | 2        | 3    |      |
| Kingdom 65      | 6.6          | 6.9      | 6.5  | 6.67 |
| China Pride     | 6.4          | 6.6      | 6.7  | 6.57 |
| Jade Pagoda     | 5.8          | 5.8      | 5.7  | 5.77 |
| Kingfisher      | 6.1          | 6.6      | 6.7  | 6.47 |
| Treasure Island | 5.8          | 6.5      | 6.5  | 6.23 |
| Mean            | 6.14         | 6.48     | 6.40 |      |
| SED (28 df)     | H            | 0.105*   |      |      |
|                 | V            | 0.086**  |      |      |
|                 | HxV          | 0.209 ns |      |      |

Table 30 % weight loss at 72 hours (Removal two - 14 weeks)

| Variety         | Harvest date |           |           | Mean      |
|-----------------|--------------|-----------|-----------|-----------|
|                 | 1            | 2         | 3         |           |
| Kingdom 65      | 0.5 (4.2)    | 0.5 (4.2) | 0.5 (4.1) | 0.5 (4.2) |
| China Pride     | 0.8 (5.1)    | 0.7 (4.6) | 0.6 (4.6) | 0.7 (4.7) |
| Jade Pagoda     | 2.5 (9.1)    | 2.1 (8.3) | 2.0 (8.1) | 2.2 (8.5) |
| Kingfisher      | 0.7 (4.7)    | 0.5 (4.1) | 0.4 (3.8) | 0.5 (4.2) |
| Treasure Island | 2.1 (8.4)    | 1.4 (6.7) | 1.4 (6.6) | 1.6 (7.2) |
| Mean            | 1.3 (6.3)    | 1.0 (5.6) | 1.0 (5.4) | 1.1       |
| SED (28 df)     | H            | 0.18**    |           |           |
|                 | V            | 0.32**    |           |           |
|                 | HxV          | 0.46 ns   |           |           |

Figures in brackets refer to angularly transformed data to which statistical analysis applies.

Treasure Island in some instances suffered a higher incidence of internal rot (tipburn) although the trend was not consistent.

Table 31 Flower stalk formation (Removal two - 14 weeks). (Scored 0-9, 9 = no extension)

| Variety         | Harvest date |            |      | Mean |
|-----------------|--------------|------------|------|------|
|                 | 1            | 2          | 3    |      |
| Kingdom 65      | 8.00         | 7.50       | 6.70 | 7.40 |
| China Pride     | 6.40         | 6.00       | 6.10 | 6.17 |
| Jade Pagoda     | 8.00         | 6.80       | 6.70 | 7.17 |
| Kingfisher      | 7.00         | 6.90       | 6.40 | 6.77 |
| Treasure Island | 9.00         | 8.70       | 7.30 | 8.33 |
| Mean            | 7.68         | 7.18       | 6.64 |      |
| SED (28 df)     | H            | 0.175      |      |      |
|                 | V            | 0.154 ** * |      |      |
|                 | HxV          | 0.355 ns   |      |      |

### Harvest date

Maturity at harvest can have an important influence on storage quality of certain crops. It has been suggested this could be true for Chinese cabbage.

Results from several store removals consistently indicate that heads harvested at optimum maturity develop less disease in store (Tables 20 and 21), produce a higher percentage of marketable heads (Table 24) and require less trimming (Table 25) than either or both of the early and later harvests. In addition, the mean marketable headweight from the optimum harvest date was also greater, perhaps because the early harvest was lighter at loading into store, and the later harvest required more trimming (Tables 22 and 23).

Shelf life assessments revealed little post harvest quality variation between heads of different maturity. The immature harvest (H1) produced less turgid heads with greater weight loss during shelf life (Tables 28, 29 and 30).

As might be expected the elongation of the flower stalk inside the heads was most advanced from the later harvest date (H3) and least advanced in those heads harvested first (H1) (Table 31).

## **Conclusions**

1. The varieties Jade Pagoda and Treasure Island consistently showed the best storage potential after a prolonged period in store (over 15 weeks).
2. In the best varieties (Treasure Island and Jade Pagoda) over 75 per cent of the heads loaded into store were still of marketable quality even after 17 weeks storage.
3. After 17 weeks in store, up to 40 per cent of the total headweight can be lost through trimming. Heads should therefore be of an adequate size at harvest when loaded into store to withstand such losses and still remain above a minimum marketable headweight.
4. CA storage did not show a marked benefit over air storage after 15 weeks storage and showed only a slight benefit after 17 weeks storage.
5. The use of fungicide spray (Rovral) at harvest and loading into bulk bins improved the quality of heads coming out of store in every respect.
6. Heads harvested at optimum maturity developed less disease in store, produced a higher percentage of marketable heads and required less trimming compared to heads harvested over or undermature. Immature heads tended to suffer higher weight loss and be less turgid during shelf life.

## **Recommendations for future action**

These findings need to be confirmed in at least two more seasons. Alternaria in particular was a problem on autumn 1987 harvested Chinese cabbage. Fungicide sprays may have less benefit in years when the initial disease pressure was less. The absence of any benefits from the use of CA requires confirmation, as does the effect of crop maturity on storage potential.

## Shelf life diary

Pre-storage assessments of varieties (October 1987)

## KINGFISHER

- 0 hours: There was little disease. The heads were crisp and very solid and butts were fairly white although a little dry. The quality was very good with a bright, pale green coloration.
- 24 hours: There were some physiological disorders and disease on the leaf tips. The heads were still crisp and solid though the leaf tips were slightly flaccid. The butts were dryish. The quality was good, the leaves were pale and slightly pull.
- 48 hours: Small areas of disease were developing on the heads, the main disorder was physiological with some minor chlorotic spots on the leaf edges and mid rib browning. The heads were still crisp and solid. The butts were dry and slightly discoloured. The quality was very good, the leaves were pale green in colour.
- 72 hours: The physiological disorder and chlorotic spots on the leaf tips were more evident, the mid rib browning was starting to soften in some cases. A few heads were poor quality but could have been trimmed down. The heads were crisp and solid, the leaf tips were slightly flaccid. The butts were dry and browning. The quality was good, the leaves were pale mid green with a brightish hue, though the stalks were greyish.

All the heads were cut open at the end of the trial to assess for flower development and the incidence, if any, of internal breakdown. There was no sign of any flower development. No rotting had occurred though a few heads had black lesions in the leaf internodes around the stalk and one or two had damage caused by cabbage root fly maggot.

## JADE PAGODA

- 0 hours: There was some minor bruising on the mid ribs, the heads were crisp but the leaf tips were flaccid and the heads were not very solid. The butts were fairly white with dryness. The quality was good with a fairly bright, mid green coloration.
- 24 hours: The bruising on the mid ribs was discolouring and there were physiological disorders and slight chlorosis on the leaf tips. The heads were flaccid and softening in the tops whilst the basal area was more solid and still fairly crisp. The butts were slightly dry and discolouring. The quality was fairly good though the flaccidity detracted slightly, the leaves were mid green and fairly bright.
- 48 hours: The bruising had developed an orange discoloration and there was further development of the physiological disorders on the leaf tips. The heads were becoming soft and flaccid with the tips and some outer leaves quite limp, some crispness in the basal region. The butts were dry, orange brown discoloration with black lesions forming. The quality was only fair due to the softening, the colour was mid green and slightly dull.

72 hours: Three-quarters of the heads had physiological disorders developing on the leaf tips, if necessary the tips could have been trimmed across to eliminate this. The heads were soft and the outer leaves were flaccid and limpish, there was very little crispness. The butts showed darkish brown discoloration with black lesions. Although the appearance was fairly good the quality was only mediocre due to the softness of the heads. The colour was mid green with chlorosis of the tips and a dullish hue, the stalks were grey.

All the heads were cut open at the end of the trial to assess for flower development and the incidence, if any, of internal breakdown. There was bud formation in 40% of the cabbage but there was no evidence of any internal disorders.

#### CHINA PRIDE

0 hours: There was bruising at the base of the leaf stalks which was orange brown in colour. There was some rotting which gave an area of transparent, skeletal appearance. The heads were crisp and solid and the butts were fairly white with some light brown dryness. The quality was very good with a slight mid green, dullish, appearance to the leaves.

24 hours: The bruising was discolouring and there was some minor physiological disorder and transparent rotting on the leaf edges and tips. The heads were crisp and solid though the leaf tips were slightly flaccid. The butts were dry and slightly discoloured. The quality was good, the leaves were pale mid green with a very slight dullish appearance and the stalks were a little grey coloured.

48 hours: The bruising at the base and basal leaves was discoloured and softening of tissue plus some mid rib browning was visible. The transparent rotting and physiological disorders appeared no worse. The heads were crisp but there was some slight flaccidity. The butts were dry and a light brown discoloration with black lesions. The quality was still good, the leaves were brightish pale mid green, the stalks were grey.

72 hours: The bruising on the base and basal leaves was brown, soft and quite extensive giving an unacceptable appearance, a few of the heads were deemed unsaleable. There were other disorders present but mainly minor infections. The heads were crisp, the tips of the lesions were slightly flaccid. The butts showed dry brown discoloration with black lesions. Despite the bruising on and around the base the quality was fair to good, the leaves were mid green with a dullish appearance and the stalks were grey.

All the heads were cut open at the end of the trial to assess for flower development and the incidence, if any, of internal breakdown. There was some minor bud development in a few of the heads and in others there were minor physiological spots on the inner leaves.

#### TREASURE ISLAND

0 hours: There were some minor mid rib browning spots, the heads were crisp but not very solid. The butts were white with the central cells discoloured. The quality was good, the leaves were pale mid green in colour.

- 24 hours: The mid rib browning had intensified and there was some minor leaf rotting which had a transparent, skeletal appearance. The heads were crisp though not solid, the tips were slightly flaccid. The butts were dryish with brown central cells. The quality was good, the leaves were bright mid green.
- 48 hours: The mid rib browning and bruising on the leaf stalks had turned orange brown. The heads were fairly crisp though the outer leaves and tips were slightly flaccid. The butts were light brown and slightly dry, the centres were darker brown but as yet the tissues were not softening. The quality was fairly good, the leaves were pale to mid green and slightly dull.
- 72 hours: There was still little disease, the heads were fairly crisp though the outer leaves were flaccid. The butts were brown with dark central cells and black lesions forming. The quality was fair even though the heads were soft, the mid green coloration of the leaves was dull and the stalks grey.

All the heads were cut open at the end of the trial to assess for flower development and the incidence, if any, of internal breakdown. Over half of the heads examined showed bud formation at an early stage. Just under half showed breakdown of tissue for various reasons. The majority showed deterioration on the edges of the inner leaves (tipburn) and there was some damage caused by cabbage root fly maggots. The butts showed discoloration of the central cells further into the stalk though none had any softening of the tissue as yet, this could possibly deteriorate into butt rots later.

#### KINGDOM 65

- 0 hours: There was some minor bruising and mid rib browning with some physiological disorder on the leaf tips. The heads were crisp and solid and the butts whitish with some slight discoloration. The quality was very good, the leaves were pale mid green with a fairly bright appearance.
- 24 hours: There were a fair number of minor infections developing, the bruising was discoloured and beginning to soften. The heads were crisp and solid, the leaf tips were slightly flaccid. The butts were dry and slightly discoloured. The quality was quite good, pale to pale mid green in colour.
- 48 hours: There was quite a lot of mid rib browning developing, some areas were softening. There was some physiological disorder and chlorotic spots on the leaf tips. The heads were still crisp and solid, the tips were slightly flaccid and the butts were dryish and a light brown discoloration. The quality was fair to good except for a few which were poor quality because of the brown soft mid ribs. The leaves were brightish pale to mid green.
- 72 hours: The heads were deteriorating, the mid rib browning and bruising was softening, quite a lot of leaf rot developed and the physiological disorder and chlorosis on the leaf tips was much in evidence. The heads were crisp, only the leaf tips felt flaccid. The butts were dry and brown with black lesions. Some of the heads were very poor quality, of marginal marketability because of the disease and softening of the tissues. The quality of the remaining heads was fair.

All the heads were cut open at the end of the trial to assess for flower development and the incidence, if any, of internal breakdown. There were no signs of any flower formation but a third of the heads had internal disorders. Half of these were black lesions in the internodes at the leaf bases the rest was caused by minor physiological spots on the inner leaves.



Trial one

1st removal of CA and air stores 25/1/88

KINGDOM 65

CA Store

Removal: Colour yellow to yellow green. Very minor bruising on bases. Solid heads, very slight flaccidity of tops. Butts fairly clean, rims discoloured. Quality good, though lacking colour.

24 hours: Colour pale yellow green. Minor bruising on mid ribs, softening on bases. Heads solid, slight flaccidity of tops. Butts discolouring, small spots of tissue breakdown. Quality good though bruising downgrading some heads. Pale dull colouration.

48 hours: Colour yellow green, some pale. Bruising and bacterial rots on mid ribs and leaves (10% unmarketable due to bacterial rot). Solid heads, outer leaves and tops flaccid. Butts discoloured, spots of decay. Quality mediocre due to bitty disease over heads.

72 hours: Colour yellow green to pale green. Bruising and bacterial rots on mid ribs, bases and leaves (10% unmarketable). Slight pinking in mid ribs. Fairly solid heads, outer leaves flaccid. Butts discoloured, rims dark with black lesions and spots of decay. Quality poorish due to the bitty appearance of disease and pale coloration.

Internal: Very minor insect damage. Few buds only.

Air store

Removal: Colour pale yellow green. Minor bruising and spots of virus. Solid, turgid heads, slight flaccidity of tops. Butts clean, rims slightly discoloured. Quality good, colour very pale.

24 hours: Colour yellow. Minor bruising on mid ribs and viral spots. Solid heads, slight flaccidity of tops. Butt rims discoloured. Quality good though pale unattractive coloration.

48 hours: Colour yellow green, tops pale green. Bacterial soft rots on mid ribs and leaves. Solid heads, outer leaves flaccid. Butts discoloured, rims darker, black lesions, small spots of decay. Quality poorish due to rots and poor coloration.

72 hours: Colour yellow green, tops pale green. Bacterial rots and bruising on mid ribs, leaves rotting. Pink coloration in mid ribs. Solid heads, flaccid tops and outer leaves. Butts discoloured, rims dark, black lesions, small spots of decay. Quality poorish due to bitty appearance of disease over the heads and pale coloration.

Internal: No rotting. Minor bud formation.

## CHINA PRIDE

### CA store

Removal: Colour pale green. Very minor browning in veins and bruising on mid ribs. Fairly solid, slight flaccidity. Butts clean. Quality good, bright attractive appearance.

24 hours: Colour pale green. Bruising on mid ribs, softening of tissue. Flaccid tops. Butts discolouring on rims, tissue softening, no rot. Quality generally good, few downgraded because of bruising.

48 hours: Colour pale green. Bacterial rots on mid ribs and leaves, bruising (10% unmarketable, very bad decay). Outer leaves flaccid. Butts discoloured, rims darker, spots of decay (10% complete butt rot). Quality variable from very poor to fair depending on amount of disease, generally fair.

72 hours: Colour pale to mid green. Bacterial rots on mid ribs and leaves (10% unmarketable - rotten base). Flaccid outer leaves. Butts discoloured and decaying (10% butt rot). Quality mediocre, colour good, disease downgrades.

Internal: No rotting. Very minor bud formation.

### Air store

Removal: Colour yellow to pale green. Very minor spots of disease. Fairly solid heads, slightly flaccid tops. Butts fairly clean, rims discolouring. Quality good, colour lacking on some heads.

24 hours: Colour yellow to pale green. Minor bruising and virus on mid ribs. Slight flaccidity of tops. Butt rims discoloured. Quality good, generally of bright appearance.

48 hours: Colour pale to mid green. Bruising and bacterial rots on mid ribs and leaves. Solid heads, slight flaccidity of tops and outer leaves. Butts discoloured, rims darkish brown. Quality generally good, few heads downgraded due to disease.

72 hours: Colour pale to mid green. Bacterial rots on mid ribs and leaves (20% unmarketable - badly decayed). Flaccid outer leaves and tops. Butts very discoloured, dark rims, spots of decay. Quality generally fairly good though some heads are of very poor quality because of disease.

Internal: Very minor insect damage. Flower bud formation.

## JADE PAGODA

### CA store

Removal: Colour yellow, tops green. Bruising on bases, minor areas of rot on tops. Fairly solid heads, some flaccidity. Butts fairly clean, rim discoloured. Quality fairly good, colour and appearance not too bad.

24 hours: Colour pale green. minor bruising on base of mid ribs. Heads not too solid, flaccid outer leaves few limp. Butts rims discoloured. Quality good, bright coloration though little soft.

48 hours: Colour pale to pale mid green. Bruising on mid ribs discoloured. Minor bacterial rots. Soft heads, outer leaves flaccid and limp. Butts discoloured, rims darker. Quality fair. Good coloration though lack turgidity.

72 hours: Colour pale to mid green. Minor bacterial rots and bruising on mid ribs. Soft heads, flaccid limp outer leaves, some wilting. Butts discoloured, rims darker. Quality fair, though heads lacking turgidity.

Internal: No rotting. Minor flower development and stem elongation.

#### Air store

Removal: Colour pale yellow green, tops greener. Minor bruising, vein browning and rots. Solid heads, slightly flaccid tops Butts clean though some softening of tissue. Quality good, colour little pale.

24 hours: Colour pale green. Minor rots on leaves and tops, bruising on mid ribs. Heads little soft, outer leaves flaccid. Butts discolouring, softening of tissue. Quality fair, brightish coloration.

48 hours: Colour pale to mid green. Bacterial rots, tops and veins slight rotting (10% unmarketable due to basal mid rib rot). Soft head, leaves flaccid and limp. Butts discoloured, rims darker with spots of decay (10% complete butt rot). Quality generally fair though variable from poor to fair depending on disease. Good coloration.

72 hours: Colour pale to mid green. Bacterial rots and bruising on mid ribs tops rotting slightly (10% unmarketable - basal rot). Soft heads, leaves flaccid and limp, slight wilting. Butts very discoloured, some black lesions and decay (10% complete butt rot). Quality fair, though the colour and appearance is generally good, the heads lack turgidity.

Internal: No rotting. Flower buds formed.

#### KINGFISHER

##### CA store

Removal: Colour yellow green. Minor spots of virus. Fairly solid heads, slight flaccidity. Butts clean, slight discolouring of rims. Quality good though very pale.

24 hours: Colour yellow pale green. Minor bruising on mid ribs, virus. Fairly solid heads, flaccid tops. Butts rims discolouring. Quality fair to good, pale unattractive coloration.

48 hours: Colour pale yellow green to pale green, tops greener. Bruising on mid ribs discoloured, bacterial rots and minor leaf rots. Flaccid tops and outer leaves. Butts discoloured, rims darker, spots of decay. Quality mediocre, spots of disease all over heads.

72 hours Colour pale green yellow. Bruising and bacterial rots on mid ribs, leaf tissue rotting (20% unmarketable - bacterial rots). Softening of heads, leaves flaccid. Butts discoloured, black lesions, decay. Quality poor due to bitty disease over heads.

Internal: No rotting. No flower development.

Air store

Removal: Colour yellow. Minor bruising on base. Solid, turgid heads. Butts fairly clean, black lesions on rims. Quality good but very pale and unattractive.

24 hours: Colour very pale, yellow green. Bruising on mid ribs, minor spots of rot on bases. Slight flaccidity. Butts discoloured, spots of rot and black lesions. Quality fair, very pale, dull coloration.

48 hours: Colour yellow green. Bacterial rots on mid ribs and leaves. Outer leaves flaccid. Butts discoloured, rims darker, spots of decay and black lesions. Quality poorish due to bitty disease spread all over heads.

72 hours: Colour pale yellow green to green. Bacterial rots and bruising on mid ribs and bases, leaves rotting. Pink discoloration in mid ribs and veins. Flaccid tops and outer leaves. Butts discoloured, dark rims, black lesions and decay. Quality poor due to amount of disease and pale coloration.

Internal: No rotting. Minor bud formation.

TREASURE ISLAND

CA store

Removal: Colour pale to mid green. No disease. Loose heads, quite turgid, slight flaccidity of tops. Butts discoloration of central tissue. Quality good, very attractive though loose.

24 hours: Colour pale to mid green. Virus mainly, minor rots and bruising. Flaccid tops but crisp. Butts discoloured, central tissue darker. Quality good, bright appearance.

48 hours: Colour pale mid green. Bruising on mid ribs discoloured, minor leaf rots. Soft heads, leaves flaccid, some crisp, some wilting. Butts very discoloured, central spots dark, some softening. Quality fair, good coloration.

72 hours: Colour pale mid to mid green. Bruising on mid ribs discoloured. Soft heads, leaves flaccid and limp. Butts discoloured, some central spots soft. Quality fair, lacking turgidity and density.

Internal: Minor internal tipburn. No flower development.

Air store

- Removal: Colour pale green. No disease. Looseness but turgid and crisp. Butts central tissue discolouring. Quality very good nice appearance.
- 24 hours: Colour pale green. Bruising on mid ribs. Loose heads. slightly flaccid tops, very crisp. Butts discoloured, central tissue darker. Quality good, bright coloration.
- 48 hours: Colour pale green. Bruising on mid ribs discoloured, small bacterial rots. Soft heads, outer leaves flaccid. Butts discoloured, central spots darker, black lesions. Quality fair, bright coloration.
- 72 hours: Colour pale to pale mid green. Bruising on mid ribs, spots of bacterial rot. Soft, loose heads, outer leaves flaccid. Butts discoloured, central spots and rims darker. Quality fair despite lack of density.
- Internal Minor internal tipburn. Flower bud formation.

2nd removal from CA and air stores 9/2/88

KINGDOM 65

CA store

Removal: Colour yellow to yellow green. Minor bruising on mid ribs and bases. Solid heads, flaccidity of tops and outer leaves. Butt rims discoloured and blackening, grey coloration. Quality good, very pale

24 hours: Colour yellow green, edges pale green. Bruising discoloured minor leaf rots. Heads solid, flaccid outer leaves and tops. Butts dry, some very grey in colour, rims discoloured, slight softening of tissue. Quality fair to good.

48 hours: Colour yellow green, leaf edges pale green. Bruising on mid ribs, discoloured and softening, leaf tissue rots. Heads fairly solid, leaves flaccid. Butts discoloured, rims darker, spots of decay. Quality mediocre.

72 hours: Colour yellow green, edges greener. Bacterial rots on mid ribs and leaves, tops rotting. Pink discoloration in mid ribs (7% unmarketable). Butts grey, rims darker, decay. Quality mediocre to poor, bitty appearance of disease.

Internal: No rotting. No signs of flower development.

Air store

Removal: Colour yellow to yellow green. Minor bruising on mid ribs. Fairly solid heads, slight flaccidity tops. Butt rims green discoloration. Quality good, very pale.

24 hours: Colour yellow to yellow green. Bruising discoloured, softening. Leaf tissue rots. Outer leaves and tops flaccid, bitty diseased appearance.

48 hours: Colour yellow green. Bacterial rots on mid ribs and leaves. Slight discoloration in mid ribs and leaves. Butts dry and discoloured, rims darker, spots of decay. Quality fairly poor.

72 hours: Colour pale green. Bacterial rots on mid ribs and leaves. Pink discoloration in mid ribs (13% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims darker, decay. Quality quite poor.

Internal: No rotting. Some elongation of flower stalks.

CHINA PRIDE

CA store

Removal: Colour variable, yellow green to mid green, leaf edges greener on paler heads. Minor bruising on mid ribs. Heads fairly solid, flaccid leaves and tops. Butt rims slightly discoloured. Quality good.

- 24 hours: Colour pale green to mid green. Bruising, minor leaf rots, mid rib browning. Fairly solid heads, some slight softening, leaves flaccid. Butts dry, rims discoloured. Quality fair.
- 48 hours: Colour pale to mid green. Bacterial rots on mid ribs. leaf tissue rots, mid rib browning quite bad (27% unmarketable). Heads fairly solid, leaves flaccid. Butts dry and discoloured, rims darker. spots of decay. Quality poor.
- 72 hours: Colour pale to mid green. Bacterial rots on mid ribs, leaves and tops, chlorosis of leaf edges. Mid rib browning very bad (60% unmarketable). Softening of heads, leaves flaccid. Butts discoloured, rims darker, spots of decay. Quality very poor.
- Internal: No rotting. Bud formation.

Air store

- Removal: Colour yellow green to green, edges greener on paler heads. Very little disease. Solid, turgid heads, slight flaccidity of tops. Butt rims green discoloration. Quality good.
- 24 hours: Colour yellow green to pale green. Bruising discoloured, leaf rots, basal rots developing. Solid heads, flaccid tops and outer leaves. Butts slightly dry, rims discoloured, softening tissue. Quality fairly good.
- 48 hours: Colour yellow green to pale green. Bruising discoloured, bacterial rots and leaf tissue rots. Flaccid leaves. Butts dry and discoloured around rims, softening tissue. Quality fair to mediocre.
- 72 hours: Colour yellow green to pale green. Bacterial rots on mid ribs bases, leaves. Mid rib browning and pink discoloration. (13% unmarketable). Heads softening, leaves flaccid. Butts discoloured, rims dark, decay (7% butt rot). Quality poor.
- Internal: No rotting. Slight elongation of flower stalks.

JADE PAGODA

CA store

- Removal: Colour pale green. Bruising and tops rotting. Fairly solid heads, flaccid leaves. Butts slightly discoloured on rims. Quality good.
- 24 hours: Colour pale green. Minor bruising, leaf rot and veinal browning. Few heads softening, fairly dense, leaves flaccid. Butts little dry, rims discoloured. Quality good.
- 48 hours: Colour pale mid green. Minor bruising and leaf tissue rots. Softening heads, leaves flaccid and limp. Butts dry and discolouring. Quality fairly good though lacking turgidity.
- 72 hours: Colour pale mid green. Bruising on the mid ribs and bases, some softening of tissue, mid rib discoloration. Heads soft, leaves flaccid, outer leaves limp. Butts discoloured, rims darker, spots of decay. Quality fair, some mediocre.
- Internal: No rotting. Some elongation of flower stalks.

Air store

- Removal: Colour yellow green to pale green. Little disease. Fairly solid head, flaccid tops and outer leaves. Butt rims slightly discoloured. Quality good.
- 24 hours: Colour yellow green to pale green. Minor bruising and leaf rots. Leaves and tops flaccid. Butts dry and discoloured, rims more so. Quality fair to good.
- 48 hours: Colour yellow green, edges and tops greener, some heads pale mid green. Bruising and leaf tissue rots, mid rib browning. Semi dense heads, softening, leaves flaccid. Butts dry and discoloured, black lesions, spots of decay. Quality fair.
- 72 hours: Colour pale mid green. Minor bacterial rots and bruises, slight chlorosis and rotting of tops. Mid rib browning signs. Soft heads, flaccid, slightly limp leaves. Butts discoloured, rims darker, spots of soft decaying tissue. Quality fair, some mediocre lacking turgidity.
- Internal: No rotting. Elongation of flower stalks.

KINGFISHER

CA store

- Removal: Colour yellow to yellow green. Bruising on mid ribs, slight leaf tissue rot. Solidish heads, flaccid leaves and tops. Butt rims discoloured. Quality good.
- 24 hours: Colour yellow to yellow green, edges greener. Bruising discoloured, rotting of leaf tissue and tops. Bitty appearance developing. Heads fairly solid, flaccid tops and outer leaves. Butts slightly dry, rims discoloured. Quality fair.
- 48 hours: Colour yellow green to very pale green. Bacterial rots on mid ribs and leaves, tops rotting. Leaves and tops flaccid. Butts dry, discoloured spots and rims, decay. Quality mediocre, disease bitty and spreading.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, chlorosis and rotting of tops. Pink discoloration in veins. (13% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims dark, spots of decay. Quality poor.
- Internal: No rotting. Minor bud development.

Air store

- Removal: Colour yellow green. Minor disease. Solid, turgid heads, slight flaccid tops. Butt rims discoloured. Quality good, very pale.
- 24 hours: Colour yellow, yellow green. Bruising discoloured, slight softening of tissue, minor leaf tissue rots. Solid heads, flaccid tops and outer leaves. Butts quite dry, discoloured, rims darker. Quality fair.



48 hours: Colour yellow green, greening up. Bruising discoloured, bacterial rots on mid ribs, leaf tissue and tops rotting. Fairly solid heads, flaccid tops and leaves. Butts discoloured, dark spots. Quality mediocre to poor, disease spreading and bitty appearance.

72 hours: Colour yellow green to pale green. Bacterial rot on mid ribs, leaves and tops. Mid rib browning. (20% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims dark with black lesions, soft decay. Quality poor.

Internal: No rotting. Bud formation, slight elongation of flower stalks.

#### TREASURE ISLAND

##### CA store

Removal: Colour pale green. Very little disease. Semi dense heads, slight flaccidity of leaves, crisp. Butts clean, slight discoloration of some centres. Quality very good.

24 hours: Colour pale to pale mid green. Minor leaf rot. Heads soft, semi dense, flaccid leaves and tops, some limpness. Butts dry, slight discoloration to rims and centres. Quality good though lacking turgidity and density.

48 hours: Colour pale green. Some bruising and leaf tissue rots. Soft heads, flaccid leaves, tops wilted appearance. Butts discoloured and dry, rims and some central tissue darker. Quality fairly good, lacking turgidity and density.

72 hours: Colour pale to mid green. Minor bruising, leaf rots and chlorosis. Heads loose, flaccid limp leaves. Butts discoloured, rims slightly discoloured, darker. Quality fair.

Internal: Some internal tipburn, couple heads. Minor bud development

##### Air store

Removal: Colour pale green. No disease. Semi dense heads, flaccid outer leaves, crisp. Butt rims and centres slightly discoloured. Quality good, lacking density.

24 hours: Colour pale green. Minor bruising discoloured, leaf tissue rots. Turgid heads, outer leaves flaccid. Butts dry and discoloured, rims and centres slightly darker on some. Quality fairly good, some heads lacking turgidity and density.

48 hours: Colour pale green. Bruising discoloured, some softening, minor leaf tissue rots. Loose, softening heads, leaves flaccid. Butts discoloured, rims and few centres darker. Quality fair.

72 hours: Colour pale green. Bruising and bacterial rots on mid ribs, slight mid rib browning. (7% unmarketable). Loose, softening heads, leaves flaccid. Butts discoloured. Quality mediocre to fair

Internal: Minor internal tipburn. Some bud formation.

Trial two  
Effect of fungicide spray on storage 2/2/88

KINGDOM 65

Rovral sprayed

- Removal: Colour yellow/pale green. Very little disease. Some heads solid whilst others lack density, flaccid tops and outer leaves. Butts clean, slight discoloration on rims, few black lesions. Quality good though coloration pale.
- 24 hours: Colour yellow to pale green. Bruising on mid ribs, rotting of leaf tissue. Fairly solid heads, flaccid tops and outer leaves. Butt rims discoloured, black lesions. Quality fair.
- 48 hours: Colour very pale to pale green. Minor bacterial rots on mid ribs skeletal rots of leaf tissue. (7% unmarketable, pink discoloration of mid ribs and rotting). Outer leaves and tops flaccid Butts discoloured, rims darker. Quality fair.
- 72 hours: Colour pale to mid green. Bacterial rots on mid ribs, rotting of leaf tissue. (7% unmarketable, rotting and pink discoloration). Heads fairly solid, leaves flaccid. Butt rims discoloured, spots of decay. Quality fair, few of poor quality.
- Internal: No rotting. Minor bud formation only.

Unsprayed

- Removal: Colour yellow, pale green leaf edges. Little disease. Solid heads, slight flaccidity of tops. Butts fairly clean, rims discoloured, few black lesions. Quality very good though discoloration pale.
- 24 hours: Colour yellow, leaf edges green. Minor rots, bruising and basal rots developing. Outer leaves and tops flaccid. Butts discoloured, spots of decay. Quality mediocre.
- 48 hours: Colour yellow green to pale green. Bacterial rots on mid ribs and leaves, skeletal rots on leaf tissue, some basal rots. Fairly solid heads, leaves flaccid. Butts discoloured, rims darker, spots of decay. Quality poorish, bitty disease appearance.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, tops rotting, pink discoloration of mid ribs. (20% unmarketable). Some softening of heads, leaves flaccid. Butts discoloured, rims darker, spots of decay (7% butt rot). Quality poor.
- Internal: No rotting. Bud development.

CHINA PRIDE

Rovral sprayed

- Removal: Colour pale to mid green, brightish. No disease. Solidity to heads, tops slightly flaccid. Butts clean, discolouring of rims. Quality very good.
- 24 hours: Colour pale to mid green. Minor rotting on leaves, basal rot developing. Solid heads, tops flaccid. Butt rims discoloured, slight softening of tissue. Rippling on base leaf stalks. Quality very good.

- 48 hours: Colour pale to mid green. minor bruising and bacterial rots on mid ribs, basal rots (13% unmarketable). Solid, fairly turgid heads, tops flaccid. Butt rims discoloured, some decay (10% butt rots). Quality generally good, some poor due to disease.
- 72 hours: Colour pale mid to mid green. Bacterial rots on mid ribs, chlorosis on leaf edges starting to deteriorate, discolouring in mid ribs. (13% unmarketable). Fairly solid heads, leaves and tops flaccid. Butts discoloured, rims blackening, decay (10% butt rot). Quality mediocre to poor.
- Internal: Minor discoloration in leaf mid ribs. Buds, with some stem elongation starting.

Unsprayed

- Removal: Colour yellow to pale green. Little disease. Fairly solid heads, slight flaccidity of tops and leaves. Butts clean, rims discolouring. Quality quite good.
- 24 hours: Colour yellow green to pale green. Bruising and bacterial rots on mid ribs, browning in mid ribs. Solidish heads, tops and outer leaves flaccid. Butt rims discoloured, slight spots of decay. Quality fairly good, poorish variable coloration.
- 48 hours: Colour pale green. Bacterial rots and bruising on mid ribs, slight rotting of leaf tissue and chlorosis of tops. (13% unmarketable). Fairly solid heads, tops and leaves flaccid. Butt rims dark, spots of decay. Quality mediocre to fair.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, chlorosis on leaf edges starting to deteriorate, slight pinking in mid ribs. (20% unmarketable). Leaves flaccid. Butts very discoloured and decay (7% butt rots). Quality poor.
- Internal: No rotting. Slight elongation of flower stalks.

KINGFISHER

Rovral sprayed

- Removal: Colour yellow green to pale green. Minor rots. Solid heads, tops slight flaccidity. Butt rims discoloured green. Quality good, pale discoloration.
- 24 hours: Colour yellow green to pale green. minor bruising, bacterial rots on leaf tissue. Solid heads, tops and outer leaves flaccid. Butts discoloration of rims. Quality good, pale dull coloration.
- 48 hours: Colour yellow green to pale green. Bacterial rots on mid ribs and leaf tissue, bitty appearance. (7% unmarketable). Tops and leaves flaccid. Butt rims discoloured. Quality mediocre.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, chlorosis on leaf edges, pink discoloration in mid ribs. (7% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims dark. Quality poor, bitty appearance of disease.
- Internal: No rotting. Bud formation, some slight elongation of flower stalks.

Unsprayed

- Removal: Colour pale yellow green. Minor rots. Solid heads, flaccidity tops and outer leaves. Butt rims discoloured, few black lesions. Quality good, though pale coloration.
- 24 hours: Colour yellow to yellow green. Bacterial rots on mid ribs and leaves. Solid heads, tops and outer leaves flaccid. Butts discoloured, slight spots of decay. Quality mediocre, rots spreading.
- 48 hours: Colour yellow green to pale green. Bacterial rots on mid ribs and leaves, tops rotting, pink discoloration in mid ribs. (13% unmarketable). Solid heads, outer leaves flaccid. Butts discoloured, rims darker, spots of decay. Quality very poor, bitty diseased appearance.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, tops rotting, pink discoloration in mid ribs. (20% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims darker, spots of decay. Quality very poor.
- Internal: No rotting. Bud formation.

TREASURE ISLAND

Rovral sprayed

- Removal: Colour pale to pale mid green, bright. No disease. Majority fairly dense, turgid and crisp, some heads soft and flaccid. Butts some discoloration of rims and centre tissue. Quality very good.
- 24 hours: Colour pale mid green. Minor rots on leaves. Softness, outer leaves slightly flaccid, some heads very soft and limp. Butt rims and central tissue discoloured. Quality good, some poor due to complete lack of density and turgidity.
- 48 hours: Colour pale mid green. Bruising and skeletal rots on leaf tissue. Looseness, flaccid leaves, slight limpness. Very little turgidity left to some heads. Butts discoloured, rims and centres darker. Quality good, some poor due to complete lack of density and turgidity.
- 72 hours: Colour mid green. Skeletal rots on leaf tissue. Soft, loose heads, flaccid leaves, slight wilting. Butts discoloured, rims and centres dark. Quality fair though lacking density and turgidity.
- Internal: No rotting. Bud formation.

Unsprayed

- Removal: Colour pale green. No disease. Semi dense heads, turgid and crisp. Butts, slightly discoloured rims and some central tissue. Quality good.
- 24 hours: Colour pale green. Minor bruising on mid ribs. Softish heads, outer leaves flaccid. Butts discolouring, rims and central tissue slightly darker. Quality fair, lack of density.

48 hours: Colour pale green. Bruising and minor rots on leaf tissue. Loose, leaves flaccid. Butts discoloured, rims and centres darker. Quality fair, lack of density

72 hours: Colour pale green. Bruising discoloured on mid ribs, minor skeletal rots on leaf tissue. Softish, loose heads, leaves flaccid. Butts discoloured, rims and centres darker. Quality fair, lacking density and turgidity.

Internal: Minor internal tipburn. Minor bud formation.

Trial three - Effect of harvest date on storage  
1st removal from ice bank 11/1/88

KINGDOM 65

Harvest date 1

Removal: Colour pale green. Pepperspot. Slight flaccidity to leaf tips.  
Butts fairly clean, few black lesions.

24 hours: Colour yellow green. Minor rots developing. Outer leaves flaccid.  
Butts discolouring. Not very attractive

48 hours: Colour greening. Bacterial rots, 10% unsaleable. Outer leaves  
flaccid, slight softening. Butts discoloured, minor breakdown.

72 hours: Colour pale mid green. Bacterial rots, 10% unsaleable. Outer  
leaves flaccid. Butts discoloured, softening of tissue. Quality  
mediocre.

Internal: No rotting. Minor flower development.

Harvest date 2

Removal: Colour pale green. Pepperspot. Slight flaccidity of leaf tops.  
Butts fairly clean

24 hours: Colour pale yellow green. Rots developing, minor bruising. Outer  
leaves flaccid. Butts discolouring.

48 hours: Colour pale green yellow. Bacterial rots, tops rotting. Outer  
leaves flaccid. Butts discoloured. 10% unsaleable.

72 hours: Colour fairly pale. Bacterial soft rots. 20% unmarketable. Leaves  
flaccid. Butts discoloured, some breakdown. Mediocre.

Internal: No rotting. Slight elongation of flower stems.

Harvest date 3

Removal: Colour yellow, pale green. Minor pepperspot. Slight flaccidity of  
tops. Butts fairly clean

24 hours: Colour pale green. Bruising and bacterial rots developing. Outer  
leaves flaccid. Butts discolouring. Appearance not too good.

48 hours: Colour pale green. Bacterial rots. Outer leaves flaccid, some  
limp. Butts discoloured.

72 hours: Colour greener. Bacterial rots, 30% unmarketable. Outer leaves  
flaccid, limpness to some. Butts discoloured, slight softness.  
Poorish.

Internal: No rotting. Flower stem elongation.

CHINA PRIDE

Harvest date 1

Removal: Colour pale green. Minor virus. Solid heads, very slight  
flaccidity. Butts fairly clean.

24 hours: Colour pale to pale mid green. Slight bruising on mid ribs Slight flaccidity to some outer leaves. Butts fairly clean. Rippling stalk bases

48 hours: Colour pale green. Bacterial rots. Flaccid outer leaves. Butts discolouring, dry.

72 hours: Colour mid green. Bacterial rots, mid rib browning, 20% unmarketable. Outer leaves flaccid. Butts discoloured, some breakdown of tissue. Poorish quality.

Internal: Very minor rot in core (1/10). Flower development, stem elongation and flower head formation.

#### Harvest date 2

Removal: Colour pale green. Minor mid rib browning. Solid, fairly turgid. Butts fairly clean. Good heads.

24 hours: Colour pale green. Minor bruising and virus. Slight flaccidity of outer leaves. Butts discolouring outer edge. Slight rippling base stalks.

48 hours: Colour pale mid green. Bruising on mid ribs. Outer leaves flaccid. Butts discoloured, some minor breakdown. Fair.

72 hours: Colour pale mid green. Bacterial soft rots, 10% unmarketable. Outer leaves flaccid, some limpness. Butts discoloured, some breakdown.

Internal: No rotting. Elongation of flower stems and head formation.

#### Harvest date 3

Removal: Colour pale green. Minor mid rib browning. Solid, slight flaccidity. Butts fairly clean. Good heads.

24 hours: Colour pale green. Bruising on mid ribs. Outer leaves flaccid. Butts fairly clean. Slight rippling base stalks.

48 hours: Colour greener. Bacterial soft rots, 10% unmarketable. Outer leaves flaccid Butts discolouring, minor tissue breakdown.

72 hours: Colour mid green. Bacterial soft rots. 40% unmarketable. Still fairly solid, outer leaves flaccid. Butts discoloured, softening of tissue.

Internal: Very minor spot (1/10). Flowers well formed, stems elongated.

#### JADE PAGODA

#### Harvest date 1

Removal: Colour yellow green to pale green. Slight rotting around tops, semi trimmed. Heads slightly flaccid. Butts fairly clean, black lesions on some.

24 hours: Colour yellow green to pale green. Chlorotic spots on tips, browning in leaf veins. Heads softening, outer leaves limp. Butts fairly clean, black lesions. Appearance good.

48 hours: Colour greener. Rotting around tops. Heads softening, outer leaves limp Butts discolouring, few slight rots Fair.

72 hours: Colour green, attractive. Rotting, minor mid rib bruising. Heads softish, outer leaves limp. Butts discoloured, slight rots developing. Quality fair.

Internal: No rotting. Flower development, 60% stem elongation and head formation. No bolting.

#### Harvest date 2

Removal: Colour pale green. Slight rotting around tops, browning in leaf veins. Heads slightly flaccid. Butts fairly clean.

24 hours: Colour pale green. Browning in veins, rotting of tops with chlorotic spots. Heads softening, leaves flaccid. Butts little discoloured. Appearance bright.

48 hours: Colour slightly greener. Mid rib browning softening, rots around tops. Heads softening. leaves flaccid. Butts discoloured, minor breakdown. Fair.

72 hours: Colour greener. Mid rib browning, bruises softening and tops rotting. 10% unmarketable. Heads soft, leaves limp. Butts quite discoloured, tissue soft on some. Mediocre.

Internal: No rotting. Flowers well developed, stems elongated in all. No bolting.

#### Harvest date 3

Removal: Colour pale yellow to pale green. Mid rib browning, rotting around tops. Heads slightly flaccid. Butts fairly clean.

24 hours: Colour pale yellow to pale green. Mid rib browning, rotting around tops. Heads softening, leaves becoming limp. Butts fairly clean, dry. Appearance fair.

48 hours: Colour greener. Rotting around leaf tips. Heads softening, outer leaves limp. Butts discoloured. Quality fair.

72 hours: Colour green. Rotting on leaf tips, bruising softening. Heads soft, leaves limp. Butts quite discoloured, minor breakdown Appearance slightly scruffy.

Internal: No rotting. Flowers well developed, elongation of stems No bolting.

### KINGFISHER

#### Harvest date 1

Removal: Colour pale yellow to pale green. Minor bruising, pepperspot. Solid, fairly turgid. Butts fairly clean, few black lesions. Mediocre.

24 hours Colour pale yellow green. Bruising, pepperspot. Outer leaves flaccid. Butts discolouring. Dull appearance.



48 hours: Colour pale mid green. Bacterial soft rots. Outer leaves flaccid. Butts discoloured, centres softening tissue.

72 hours: Colour mid green. Bacterial soft rots. 20% unmarketable. Leaves flaccid. Butts discoloured, breakdown on some. Quality poorish.

Internal: No rotting. Bud formation.

#### Harvest date 2

Removal: Colour pale yellow green. Rots in top of heads. Solid, turgid. Butts fairly clean. Quality not too good

24 hours: Colour pale yellow green. Rots in tops. Solid heads, outer leaves slightly flaccid. Butts slight discoloration.

48 hours: Colour pale green. Bacterial, rots in tops. Outer leaves flaccid. Butts discoloured around perimeter

72 hours: Colour pale to mid green. Bacterial and rots in tops, 10% unmarketable. Outer leaves flaccid. Butts discoloured Quality poorish.

Internal: No rotting. Bud formation, slight stem elongation.

#### Harvest date 3

Removal: Colour pale yellow green. Pepperspot. Solid, fairly turgid. Butts quite clean. Quality good.

24 hours: Colour pale yellow green. Minor rotting in tops. Slight flaccidity. Butts discoloured. Dullish appearance.

48 hours: Colour pale to mid green. Bacterial and rotting in tops. Outer leaves flaccid. Butts discolouring, minor softening.

72 hours: Colour pale mid green. Bacterial soft rots, 20% unmarketable Outer leaves flaccid Butts discoloured, tissue breakdown. Quality poorish.

Internal No rotting. Slight flower stem elongation.

### TREASURE ISLAND

#### Harvest date 1

Removal: Colour pale yellow green. No disease. Heads soft due to lack of density, fairly turgid. Butts perimeter discoloured and centres brown. Quality good.

24 hours Colour pale green. No disease. Softening leaves flaccid. Butts discolouring, centres brown. Quality good.

48 hours: Colour mid green. Very minor disease. Heads loose, flaccid, limpness of outer leaves. Butts discoloured, centres brown Very attractive.

72 hours Colour bright green. Bruising. Loose, leafy not very crisp. Butts discoloured, centres brown. Attractive.

Internal: No rotting. Few buds only in base.

Harvest date 2

Removal Colour pale green. No disease. Loose but fairly turgid. Butts clean though centres discoloured. Quality good.

24 hours: Colour pale green. No disease. Loose, slight flaccidity. Butts centres discoloured. Appearance good.

48 hours: Colour mid green. Bruising. Flaccid outer leaves, limpness. Butts discoloured, centres brown, slight breakdown of tissue.

72 hours: Colour bright green. Bruising. Loose, flaccid, limp outer leaves. Butts discoloured, softening of central tissue. Appearance good.

Internal: Breakdown on leaf edges, dry, 1/10 badly infected. Bud formation.

Harvest date 3

Removal: Colour pale green. No disease. More solid head, very crisp. Butt centres discoloured. Good appearance.

24 hours: Colour pale green. No disease. Slight flaccidity of outer leaves. Butts discolouring, centres brown

48 hours: Colour mid green. Bruising at base. Fairly dense, outer leaves flaccid. Butts discoloured, centres brown. Appearance good

72 hours: Colour mid green. Bruising. Outer leaves flaccid, limpness. Butts discoloured. Quality good

Internal: Minor breakdown on leaf edged dry. Stem elongation and flower head formation

2nd removal from ice bank 19/1/88

KINGDOM 65

Harvest date 1

Removal Colour yellow, few pale green. Pepperspot, minor rots. Butts fairly clean, discoloration around perimeter. Heads not too solid, flaccid outer leaves.

24 hours: Colour pale yellow green. Bacterial rots and virus. Flaccid outer leaves, heads not too solid. Butts discoloured, slight breakdown.

48 hours: Colour pale yellow green. Bacterial rots, basal decay. Flaccid outer leaves. Butts discoloured, tissue breakdown. Quality poor.

72 hours: Colour yellow green. Bacterial rots on mid ribs and tops, 10% unmarketable. Flaccid outer leaves. Butts discoloured, tissue breakdown. Quality poor, unattractive.

Internal: No rotting. Some flower formation, bud stage.

Harvest date 2

Removal Colour yellow. Few tops rotting, semi-trimmed. Butts fairly clean. Solid heads, slight flaccidity of tops.

24 hours: Colour pale yellow green. Minor rotting of tops. Solid heads, very slight flaccidity Butts discolouring. Unattractive slightly.

48 hours: Colour pale yellow green. Tops rotting. minor spots of rot. Solid, slightly flaccid outer leaves. Butts discoloured, black lesions on perimeter. Quality mediocre, unattractive.

72 hours: Colour yellow green. Bacterial rots, tops also rotting. Flaccidity of outer leaves. Butts discoloured, very bad black lesions, minor breakdown. Quality mediocre.

Internal: No rotting. Budds plus some stem elongation of flowers.

Harvest date 3

Removal: Colour yellow, pale green. Virus and pepperspot. Butts fairly clean, perimeter discolouring. Very slight flaccidity of tops, firm heads.

24 hours: Colour very pale yellow green. Minor rotting of tops. Very slight flaccidity of tops. Butts discolouring. Not very attractive.

48 hours: Colour yellow green, top slightly greener. Bacterial rots developing on mid ribs and tops. Solid heads, flaccid tops. Butts discoloured, black lesions, tissue softening. Unattractive appearance.

72 hours: Colour pale green, tips slightly greener. Bacterial rots on mid ribs and tops. Flaccid outer leaves. Butts black lesions and tissue breakdown. Quality mediocre, unattractive.

Internal: No rotting, minor pepperspot. Flower stalk elongation, heads not formed.

CHINA PRIDE

Harvest date 1

Removal: Colour pale yellow green. No disease. Butts fairly clean, few black lesions. Solid heads, quite turgid, tops flaccid.

24 hours: Colour pale green. Bruising on mid ribs. Fairly solid, slight flaccidity. Butts discolouring, minor breakdown of tissue. Quality fair.

48 hours: Colour pale green. Bruising, bacterial and basal rots. Flaccid outer leaves. Butts discoloured, tissue breakdown. Quality mediocre. Slight rippling on the bases.

72 hours: Colour pale to mid green. Bruising, bacterial and basal rots. Looseness to some heads, flaccid leaves. Butts discoloured. tissue breakdown. Quality poor not very attractive. Slight rippling on bases.

Internal: Couple of heads flower stems rotting. Elongation of flower stems, flower head formation

Harvest date 2

- Removal: Colour pale yellow green to pale green. Minor rots of leaf tips. Butts fairly clean, perimeters discoloured. Solid heads, tops flaccid. Rippling on bases.
- 24 hours: Colour pale yellow to mid green. Bruising, rotting in tops. Solid heads, slight flaccidity. Butts discolouring. Rippling on bases. Fair.
- 48 hours: Colour pale to mid green. Bacterial rots, tops rotting. Flaccid outer leaves. Butts discoloured, tissue breakdown. Quality mediocre to poor. Rippling on bases.
- 72 hours: Colour pale to mid green. Very bad bacterial rots on mid ribs and tops. 20% unmarketable. Flaccid outer leaves. Butts very discoloured, small areas of rotting. Quality very poor. Rippling.
- Internal: Couple of heads flower stems rotting. Flower stems elongated, flower heads formed.

Harvest date 3

- Removal: Colour yellow, some pale green yellow. Minor rotting on tops. Butts fairly clean. Solid heads, quite turgid.
- 24 hours: Colour pale yellow green. Bruising, minor rotting on tops. Solid, slightly flaccid. Butts discolouring. Slightly unattractive. Rippling.
- 48 hours: Colour pale yellow green, tops greener. Bacterial rots on mid ribs and tops. 10% unmarketable. Flaccid outer leaves. Butts discoloured, tissue breakdown. Quality poor. Rippling on bases.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and tops. 30% unmarketable. Outer leaves flaccid. Butts breaking down, one complete rot. Quality very poor. Rippling on bases.
- Internal: Couple of flower stems rotting. Elongated flower stems, heads well formed

JADE PAGODA

Harvest date 1

- Removal: Colour pale to mid green, bright. Rotting of leaf tops and veinal browning. Butts fairly clean. Heads not very solid, quite turgid, flaccid tops. Quality fair.
- 24 hours: Colour pale mid green, bright. Mid vein browning and rotting of tops. Not very solid, flaccid outer leaves. Butts slightly discoloured. Fair.
- 48 hours: Colour pale mid green. Mid vein browning and rotting tops. Flaccid outer leaves, limpness. Butts discoloured, few minor rots developing. Quality mediocre to fair.

72 hours: Colour mid green. Bruising, tops rotting. Loose, slightly soft heads, limpness of outer leaves. Butts discoloured, black lesions and rotting. Quality fair but not very attractive.

Internal: No rotting. Minor flower development.

Harvest date 2

Removal: Colour pale and mid green. Rotting tops and veinal browning. Butts fairly clean. Not very solid heads, some turgid, flaccid tops. Fair.

24 hours: Colour pale green. Mid vein browning, rotting of tops. Heads softish, flaccid outer leaves. Butts discolouring. Quality fair.

48 hours: Colour pale green. Tops rotting and veinal browning. Softish heads, outer leaves flaccid. Butts discoloured. Quality fair.

72 hours: Colour mid green. Tops rotting and veinal browning. Unsightly. Loose heads soft, flaccid, limp leaves. Butts discoloured, black lesions on perimeter. Quality slightly poor, unattractive.

Internal: No rotting. Flower stems elongated, flower head formation.

Harvest date 3

Removal: Colour pale green. Tops rotting and veinal browning. Butts fairly clean, perimeter discolouring. Heads not very solid, flaccid leaves. Fair.

24 hours: Colour pale green. Mid vein browning, minor rotting of tops. Heads firmer, flaccid outer leaves. Butts discolouring. Quality fair.

48 hours: Colour pale to mid green. Veinal and mid rib browning, tops rotting. Softish heads outer leaves flaccid, limp. Butts discoloured, black lesions on perimeter. Quality fair.

72 hours: Colour pale to mid green. Tops rotting and veinal browning. Unsightly. Loose heads, soft, flaccid, limp leaves. Butts discoloured, black lesions on perimeter. Quality fair but not too attractive.

Internal: No rotting. Elongation of flower stem and head formation.

KINGFISHER

Harvest date 1

Removal: Colour yellow pale green. Minor virus. Butts fairly clean, perimeters discoloured. Slight flaccidity of tops, heads fairly solid.

24 hours: Colour pale yellow green. Bruising, bacterial soft rots. Heads fairly solid, outer leaves flaccid. Butts discoloured. Not very attractive.

48 hours: Colour pale green. Bacterial rots and mid vein browning. Flaccid outer leaves. Butts discoloured, black lesions on perimeters. Quality poorish, not very attractive appearance.

72 hours: Colour pale green. Bacterial rots 10% unmarketable. Outer leaves flaccid. Butts black lesions and tissue breakdown. Quality poorish.

Internal: Minor insect damage only. Flower stems elongated, heads.

Harvest date 2

Removal: Colour pale yellow green. Rotting tops, semi-trimmed. Butts fairly clean, perimeter discoloured. Slight flaccidity of tops, heads solid.

24 hours: Colour pale yellow green. Minor bruising and bacterial soft rots. Heads solid, slight flaccidity of tops. Butts discolouring.

48 hours: Colour pale yellow green. Bacterial rots, tops rotting. Leaves flaccid. Butts discoloured, black lesions. Quality poorish, unattractive.

72 hours: Colour pale green. Bacterial rots on mid ribs and tops, 10% unmarketable. Solid heads, leaves flaccid. Butts black lesions very bad. Poor.

Internal: No rotting Flower stem elongation, flower heads forming

Harvest date 3

Removal: Colour pale yellow green. Minor mid vein browning and virus. Butts fairly clean, perimeters discoloured. Slight flaccidity, heads solid.

24 hours: Colour pale yellow green. Slight bruising on mid ribs, minor rots on tops. Heads quite solid, slight flaccidity. Butts discolouring.

48 hours: Colour pale yellow green. Bacterial rots, veins browning and tops rotting. Solid, slight flaccidity Butts discoloured, black lesions on perimeters, small spots tissue breakdown. Quality poorish, not very attractive appearance.

72 hours: Colour yellow green. Bacterial rots on tops, mid ribs and leaves. Solid heads, leaves flaccid. Butts black lesions very bad, small areas of tissue breakdown. Quality poor, unattractive.

Internal: No rotting. Flower stem elongation, flower head formation

TREASURE ISLAND

Harvest date 1

Removal: Colour mid green, bright. No disease. Heads not solid, fairly turgid and crisp. Butt central tissue discoloured.

24 hours: Colour mid green, bright fresh. No disease. Flaccid leaves, heads soft. Butts discolouring, centres darker.

48 hours: Colour mid green. No disease. Flaccid outer leaves. Butts discoloured, brown centres. Quality good.

72 hours: Colour mid green. Very minor bruising. Loose heads, outer leaves flaccid, some limpness. Butts centres dark, black lesions. Quality and appearance good.

Internal Couple of heads internal tipburn. No flower development.

Harvest date 2

Removal: Colour pale yellow green. No disease. Heads not solid but fairly turgid. Butts centres discolouring.

24 hours: Colour pale mid green, fresh. No disease. Slight firmness, leaves flaccid. Butts discolouring, centres darker.

48 hours: Colour pale mid green. Minor spots of disease. Outer leaves flaccid. Butts discoloured, centres brown. Quality good.

72 hours: Colour pale mid green. Very minor bruising and leaf tissue rot. Loose heads, leaves flaccid some limpness. Butt centres dark, very slight softening. Quality and appearance good.

Internal: No rotting. Minor bud formation.

Harvest date 3

Removal: Colour pale green, bright. No disease. Heads not solid, fairly turgid and crisp, slight flaccidity of tops. Butts centres discolouring.

24 hours Colour pale mid green, fairly bright and fresh. No disease. Leaves flaccid. Butts discolouring, centres darker.

48 hours: Colour pale mid green. Minor bruising. Outer leaves flaccid. Butts discoloured, central tissue brown. Quality good.

72 hours: Colour mid green. Slight bruising and tissue breakdown. Loose heads, outer leaves slightly limp. Butts discoloured, centres dark. Quality and appearance good.

Internal: Internal tipburn in 40%. Flower stem elongation.

3rd removal from ice bank 29/1/88

KINGDOM 65

Harvest date 1

Removal: Colour pale yellow green. Minor bruising on mid ribs and virus. Fairly solid heads, tops slightly flaccid. Butts clean, rims discolouring. Quality fairly good except for very pale coloration.

24 hours: Colour pale yellow green. Virus and a bitty appearance of minor rots and bruising. Heads fairly solid, tops and outer leaves flaccid. Butts discoloured, rims darker, black lesions. Quality mediocre.

48 hours: Colour yellow green. Bruising discoloured, rotting of leaf tissue. Slight softening of heads, tops and leaves flaccid. Butts discoloured, dark rims, black lesions. Quality poorish, very pale.

72 hours: Colour yellow to pale green. Bacterial rots on mid ribs and leaves. Flaccid tops and leaves. Butts quite discoloured, black lesions. Quality mediocre to poor.

Internal: Half of heads show slight breakdown in the flower stalks. The flower stalks are elongated. heads forming.

Harvest\_date\_2

Removal: Colour pale yellow green. minor bruising on mid ribs and virus. Solid heads, tops slightly flaccid. Butts clean, rims discolouring. Quality fairly good, very pale.

24 hours: Colour pale yellow green. Mid veinal browning and virus. Heads solid, tops and outer leaves flaccid. Butts discoloured, rims darker. Quality mediocre to fair.

48 hours: Colour yellow green to green. Bruising on mid ribs and rots on leaves (10% unmarketable bacterial rot). Fairly solid heads, leaves flaccid. Butts discoloured, minor spot decay. Quality mediocre, some poor.

72 hours: Colour very pale green. Bacterial rots on mid ribs, leaves and bases (10% unmarketable). Tops very brown edges where trimmed. Solid heads, leaves and tops flaccid. Butts discoloured, rims black lesions and spots of decay. Quality poor.

Internal: Minor rotting of flower stalks. Flower stalks elongated, flower heads forming.

Harvest\_date\_3

Removal: Colour pale yellow green. Bruising on mid ribs, virus. Fairly solid heads tops and outer leaves flaccid. Butts fairly clean. Quality fairly good, very pale.

24 hours: Colour pale yellow green. Bruising on mid ribs discoloured virus. Heads solid, tops and outer leaves flaccid. Butts discoloured, rims darker. Quality mediocre to fair.

48 hours: Colour yellow green to pale green. Bruising and bacterial rots on mid ribs and leaves. Fairly solid heads, leaves flaccid. Butts discoloured, dark rims, small spot decay. Quality mediocre to poorish, bitty appearance of disease.

72 hours: Colour very pale green. Bacterial rots on mid ribs and leaves, bitty appearance (10% unmarketable). Softening heads, flaccid leaves. Butts discoloured, black lesions spots of decay. Quality poor.

Internal: Minor rotting of flower stalks. Flower stalks elongated, heads well formed in a few cases.



CHINA PRIDE

Harvest date 1

- Removal: Colour yellow green to pale green Minor bruising on bases Some heads fairly solid, some looseness, outer leaves and tops flaccid. Butts clean, slight discoloration of rims. Quality good though little pale.
- 24 hours: Colour yellow to pale green. Bruising and bacterial rots on mid ribs. Outer leaves and tops flaccid. Butts discoloured, rims darker, some decay. Quality fair, coloration patchy. Slight rippling on bases.
- 48 hours: Colour pale to mid green. Bacterial rots on mid ribs, bases and leaves (10% unmarketable). Softening heads, leaves flaccid. Butts very discoloured, black rims and decay (10% butt rot). Quality mediocre to poorish.
- 72 hours: Colour pale to mid green. Bacterial rots on mid ribs and leaves, basal rots, chlorosis of tops (30% unmarketable). Pinking in mid ribs. Softening heads, flaccid leaves. Butts badly discoloured, black lesions and decay (10% butt rot). Quality very poor.
- Internal: Breakdown of flower stalks, some minor blackening in vein. Flower stalks elongating, heads forming.

Harvest date 2

- Removal: Colour yellow to pale green. Minor bruising and virus. Solid heads, slight flaccidity of tops. Butts clean, rims discolouring, slight softer tissue. Quality good.
- 24 hours: Colour yellow green to pale green. Bruising on mid ribs and slight rots on leaves, basal rot. Fairly solid heads, tops and outer leaves flaccid. Butts discoloured, some decay (10% butt rot). Quality fair, coloration patchy. Rippling on bases.
- 48 hours: Colour pale green. Bacterial rot and bruising on mid ribs, leaf tissue and tops rotting (20% unmarketable, bacterial/basal rots). Solid heads, leaves flaccid. Butts discoloured, some decay (20% butt rots). Quality mediocre, some heads very poor.
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, basal rots. Skeletal rots on leaf tissue (30% unmarketable). Fairly solid heads, leaves flaccid. Butts discoloured, rims dark and decaying (20% butt rot). Quality poor.
- Internal: Slight breakdown on flower stalks, blackening in veins. Flower stalks elongating, heads forming.

Harvest date 3

- Removal: Colour pale green. Minor bruising, tops slight rots. Solid heads, tops flaccid. Butts clean, rims discoloured. Quality good. Rippling on bases
- 24 hours: Colour pale green. Bruising discoloured, slight bacterial rots on mid ribs. Solid heads, flaccid tops and outer leaves. Butts discoloured, rims darker. Quality fair to good.

- 48 hours: Colour pale green. Bacterial rots on mid ribs and leaves tops rotting (10% unmarketable). Solid heads, outer leaves and tops flaccid. Butts darkly discoloured. soft spots of decay. Quality poor.
- 72 hours: Colour pale green. Bacterial rots on mid ribs, leaves and tops, skeletal rotting of leaf tissue. (60% unmarketable) Fairly solid heads, flaccid leaves. Butts badly discoloured, black lesions and decay. Quality very poor.
- Internal: Flower stalks breaking down, blackening in veins. Flower stalks elongating, flower heads formed.

#### JADE PAGODA

##### Harvest\_date 1

- Removal: Colour pale green. Minor rots and bruising. Softish heads, not very solid, tops flaccid. Butts clean, slight discoloration of rims, minor spot of decay. Quality good, bright appearance.
- 24 hours: Colour pale green. Bruising, veinal browning and rotting of tops Softish heads, tops and leaves flaccid. Butt rims discoloured, slight decay. Quality good though lack turgidity.
- 48 hours: Colour pale to pale mid green. Bruising discoloured, minor rots of tops with veinal browning. Soft heads, leaves flaccid and limp. Butts discoloured, decay also causing basal rot. Quality mediocre to fair, colour dull, lacking turgidity.
- 72 hours: Colour pale to mid green. Bacterial rots on mid ribs and tops. Heads very soft, flaccid limp leaves, tops wilting. Butts discoloured, spots of decay. Quality mediocre to fair, lack of turgidity.
- Internal: Minor breakdown in flower stalk (1/10). Slight elongation of flower stalks

##### Harvest\_date 2

- Removal: Colour pale green. Minor veinal browning and rotting of tops. Firmish heads, outer leaves and tops flaccid Butt rims discolouring. Quality fair to good.
- 24 hours: Colour pale green. Tops rotting, veinal browning. Softness, tops and leaves flaccid. Butts discolouring, rims darker. Quality good though lacking turgidity.
- 48 hours: Colour pale mid green. Tops rotting, bruising on mid ribs discoloured. Softening of heads, outer leaves flaccid and limp, tops wilting. Butts discolouring, minor spots of decay. Quality fair, dull appearance, lack of turgidity.
- 72 hours: Colour pale mid green. Tops rotting, basal rots with mid rib browning. Heads soft, flaccid, limp leaves. Butt discoloured, black lesions around rim and spots of decay. Quality mediocre to fair, lacking turgidity.
- Internal: No rotting. Flower stalks elongated, formation of flower heads.

Harvest date 3

Removal: Colour pale green. Minor veinal browning. Heads fairly solid, tops and outer leaves flaccid. Butts fairly clean. Quality good.

24 hours: Colour pale green. Veinal browning and rotting of tops, slight bruising on mid ribs. Heads softening, leaves and tops flaccid. Butts slightly discoloured, rims darker. Quality good, though lacking turgidity.

48 hours: Colour pale mid green. Bruising discoloured on mid ribs, spot of rotting on tops with veinal browning. Butts discoloured. Quality mediocre to fair.

72 hours: Colour pale mid green. Bacterial rots, tops rotting with veinal browning (10% unmarketable - basal and bacterial rot). Soft heads, leaves flaccid and limp, tops wilting. Butts discoloured, black lesions on rims, soft spots of decay. Quality poorish, lack of turgidity.

Internal: Bad breakdown of ribs (1/10). Flower stalks elongated, flower heads formed.

KINGFISHER

Harvest date 1

Removal: Colour very pale yellow green. Minor bruising on mid ribs and virus. Heads not very solid, outer leaves and tops flaccid. Butts discolouring, grey black outer rims. Quality fair, lack turgidity, very pale.

24 hours: Colour yellow/pale yellow green. Bruising on mid ribs and virus. Not very solid heads, flaccid tops and leaves. Butts discoloured, rims dark and blackening spots of decay. Quality mediocre to fair.

48 hours: Colour very pale green. Bruising and bacterial rots on mid ribs. Minor spots of rot on leaves and tops. Softening heads, flaccid leaves. Butts very discoloured, blackening and spots of decay. Quality mediocre to fair, disease gives bitty appearance.

72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, tops rotting (10% unmarketable). Bitty appearance. Flaccid leaves, soft heads lacking density. Butts were discoloured, black lesions, decay. Quality poor.

Internal: Minor disorders. Flower stalks elongated.

Harvest date 2

Removal: Colour yellow to pale green. Minor bruising, tops rotting slightly with signs of pinking in the veins. Fairly solid heads, flaccidity of tops. Butts fairly clean, rims discoloured. Quality good, little pale.

24 hours: Colour pale yellow green. Bruising on mid ribs, veinal browning with tops rotting. Flaccid leaves and tops. Butts discoloured, darker rims, minor spots of decay. Quality fair.

- 48 hours: Colour pale green. Bruising, bacterial rots on leaves and tops with mid veinal browning. Fairly solid, flaccid outer leaves and tops. Butts discoloured, black lesions around rims, spots of decay. Quality mediocre to poor
- 72 hours: Colour pale green. Bacterial rots on mid ribs and leaves, mid veinal browning with tops rotting (40% unmarketable, badly rotted). Fairly solid heads, flaccid leaves. Butts some badly discoloured and decayed areas. Quality very poor.
- Internal: Few minor breakdown of flower stalks. Elongation of flower stalks taking place.

Harvest date 3

- Removal: Colour very pale green. Minor bruising and virus. Solid, turgid heads, tops slightly flaccid. Butts clean, rims discoloured. Quality good although pale.
- 24 hours: Colour pale yellow green. Bruising on mid ribs, slight veinal browning and virus. Heads solid, flaccid outer leaves and tops. Butt discolouring, rims darker. Quality fair.
- 48 hours: Colour very pale green. Bruising and slight rots on mid ribs, leaves and tops rotting. Solid heads, flaccid tops and outer leaves. Butts discoloured, dark rims with black lesions. Quality mediocre to poor, bitty disease appearance.
- 72 hours: Colour pale yellow green. Bacterial rots on mid ribs and leaves, tops also rotting (10% unmarketable). Solidish heads, leaves flaccid. Butts darkly discoloured, black lesions. Quality poor.
- Internal: Minor breakdown on flower stalks. Elongation of flower stalks.

TREASURE ISLAND

Harvest date 1

- Removal: Colour pale mid green. Very little disease. Looseness to heads but turgid and crisp. Butt centres discoloured. Quality very good, bright appearance.
- 24 hours: Colour pale mid green. Minor bruising and mid veinal browning. Loose heads, slightly flaccid, still crisp. Butts slightly discoloured, central tissue darker. Quality good, bright.
- 48 hours: Colour pale mid green. Bruising on the mid ribs, minor rots. Some softening, outer leaves flaccid. Butts discoloured, centres darker. Quality good though lacking density.
- 72 hours: Colour pale mid green. Minor bruising, mid rib discoloration. Soft heads, flaccid, limp leaves. Butt discoloured, rims and centre, black lesions. Quality fair, desperately lack density and turgidity.
- Internal: Minor internal tipburn. Very minor bud formation.

Harvest date 2

Removal: Colour pale mid green. Very little disease. Heads fairly solid, turgid and crisp. Butt centres discolouring. Quality very good. bright appearance.

24 hours: Colour pale mid green. Minor bruising on mid ribs. Some density, slight flaccidity, crisp. Butts slightly discoloured, central tissue darker. Quality good, bright.

48 hours: Colour pale mid green. Bruising on mid ribs, minor rots. Not very dense, outer leaves flaccid. Butt rims and centres discoloured. Quality good, bright.

72 hours: Colour pale mid green. Bruising and bacterial rots on mid ribs and leaf tissue. Soft heads, flaccid leaves. Butt rims and centres darker discoloration. Quality fair, lack density and turgidity.

Internal: No rotting. Bud formation, some minor elongation of flower stalks

Harvest date 3

Removal: Colour pale green. Very little disease. Heads fairly solid, turgid and crisp. Butts discolouring around rims and central tissue. Quality very good, coloration not as green.

24 hours: Colour pale green. Minor bruising and leaf tissue rots. Slight flaccidity, very crisp. Butts slightly discoloured, central tissue darker. Quality good.

48 hours: Colour pale green. Bruising on mid ribs, minor rots. Flaccid outer leaves, density fair. Butt rims and centres discoloured. Quality fair, colour pale and dullish.

72 hours: Colour pale mid green. Bruising and minor bacterial rots on mid ribs, rotting of leaf tissue has skeletal appearance. Soft heads, leaves flaccid. Butt central tissue quite discoloured black lesions. Quality fair despite lack of density and turgidity.

Internal: Minor internal tipburn. Buds and some well formed flower heads extended up the centres.