FINAL REPORT

2007-2008 Storage Cabbage Variety Evaluation

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Varieties:

Twenty-two storage cabbage varieties were evaluated from five seed companies (Table 1). Amtrak, Huron and Rona were used as industry standards. Two varieties from Bejo, with black rot tolerance, were entered for field observation only.

Table 1. Storage cabbage varieties in observed order of maturity.

Entry	Market Class	YR[1]	Seed Source	Days to Maturity	Plant Spacing	Harvest Date	Years in Trial
Green:							
Thunderhead	Green FM[2]	Yes	Harris Moran	74	18"	Oct 1	2007
Blue Thunder	Green FM	Yes	Harris Moran	84	18"	Oct 1	2007
Deuce	Green Proc[2]	Yes	Harris Moran	95	18"	Oct 1	2007
B2658 (obs)	*Green FM*	*Yes*	*Bejo*	*80-85*	*18"*	*Oct 1*	*2007*
B2659 (obs)	*Green FM*	*Yes*	*Bejo*	*85*	*18"*	*Oct 1*	*2007*
Reaction	Green, small box	Yes	Bejo	100	14"	Oct 16	2007
Paradox	Green, small box	Yes	Bejo	105	14"	Oct 16	2007
B2672	Green, small box	Yes	Bejo	115	14"	Oct 16	2005, 2007
Budena	Green, small box	No	Bejo	105-110	14"	Oct 16	2005, 2007
Candella	Green, small box	No	Bejo	110	14"	Oct 16	2005, 2007
Bloktor	Green	Yes	Rogers/Syngenta	112	18"	Oct 31	2007
Superstor 112 (WC 287)	Green	Yes	Reeds	112	18"	Oct 31	2005, 2007
Novator	Green	Yes	Rogers/Syngenta	110	18"	Oct 31	2007
Amtrak	**Green (standard)**	**Yes**	**Bejo**	**115**	**18"**	**Oct 31**	**2001, 2005, 2007**
Huron	**Green (standard)**	**Yes**	**Seminis**	**115**	**18"**	**Oct 31**	**2001, 2005, 2007**
Constellation (3307)	Green	Yes	Seminis	112	18"	Oct 31	2005, 2007
Busoni (NIZ 17-764)	Green	Yes	Reeds/Vilmorin	115	18"	Oct 31	2005, 2007
BC06146	Green	Yes	Reeds	120-125	18"	Oct 31	2007
Fundaxy (3316)	Green	Yes	Seminis	125	18"	Oct 31	2007
Red:							
Sandaro	Red	Yes	Bejo	115	18"	Oct 31	2007
Rona	**Red (standard)**	**No**	**Seminis**	**115**	**18"**	**Oct 31**	**2005, 2007**
Buscaro	Red	No	Bejo	105	18"	Oct 31	2007
B2673	Red	No	Bejo	120	18"	Oct 31	2007
Rendero	Red	Yes	Bejo	125	18"	Oct 31	2007

[1]**YR**: Fusarium Yellows Resistant. [2]**FM**: fresh market; **Proc**: processing.

Procedures:

Transplant Production. Seeds were seeded into 72-cell trays in Cornell's soil-less potting mix on 24-May and grown in a greenhouse at the NYSAES, Geneva. About once every week they were fertilized with 20-20-20 NPK soluble Peters Mix. Plants were taken outside to harden off on 10-Jun at which time no further fertilizer was added until 2 days before transplanting. When plants were 2-5 true leaves (4-5 inches tall), they were transplanted by hand into ample moisture on 20-June.

Experimental Design. The trial was located in a grower's (Martin Farms) cabbage (cv. Huron and Constellation) field near Hamlin, NY in Monroe County and was arranged as a complete randomized design with 24 varieties and 3 replicates. Each replicate consisted of a single row of 30 plants spaced 18" apart with 32" between rows. Reaction, Paradox, Budena, Candella and B2672 were planted with 14" plant spacing. Fertility and pest management was maintained by the grower.

Field Information. The soil pH was 6.5 – 6.8. Crop rotation included 5 years out of crucifers and the field was cropped to alfalfa in 2006. Fertilizer application included 550#/A 9-4-24 NPK pre-plow and 25 gal/A 32% N side-dressed 3-4 weeks after planting. Weed control consisted of 1qt/A Treflan pre-plant, and 1 pt/A Dual Magnum and 8 oz/A Stinger post-transplanting. Bravo was applied once for management of *Alternaria* leaf spot. Warhawk was applied immediately after planting for control of cabbage maggot. Tombstone and Thiodan were applied twice during the season for control of diamondback moths, and dimethoate was applied 3 times for control of onion thrips. The trial received 1" of irrigation in both June and July.

Harvest Evaluation. Earlier maturing varieties, Thunderhead, Blue Thunder, Deuce, B2658 (obs) and B2659 (obs) were harvested on 1-Oct. Reaction, Paradox, Budena, Candella and B2672 were harvested on 16-Oct, while the rest of the varieties were harvested on 31-Oct. First, a field evaluation was conducted to evaluate plant size, uniformity and growth characteristics, and to note splits, rots, off-types and worm infestations. In the 2 best replicates, the best 25 heads were harvested. Of these, 5 were cut, peeled and evaluated for thrips damage, severity and depth. The remaining 20 heads were divided into two groups of 10 and weighed separately. Each field replicate transferred into a replicate in storage. One group went into cold (refrigerated) storage and the other into common storage. Both storages were commercial facilities and maintained by the grower cooperator.

The cabbage was removed from common and cold storage on 22-Feb-08 and 30-Apr-08, respectively. It was weighed, trimmed and evaluated for shrink loss, trim loss and physiological disorders. For green varieties, the amount of green color remaining after trimming on a cut head was measured on a sub-sample of 5 heads.

Data Analysis: Statistical differences among entries was determined by General analysis of variance with mean separation by Fisher's Protected LSD test, $p = 0.05$.

2007-2008 Season. The 2007 growing season was sunny, hot and dry with a notably cool July. The trial was planted into ample moisture following decent rainfall and was then subjected to 90 degree temperatures and high humidity for a couple of weeks. July saw normal precipitation and below normal temperatures. August, September and October had above normal temperatures and below normal rainfall. Ninety degree days occurred as late as 25-Oct. Nearby Rochester experienced the warmest 6 month (May to October) in 76 years. Approximate seasonal rainfall at the trial was 3.1", 1.45", 3.0" and 3.85" for July, August, September and October, respectively. Insect and disease pressure in this trial was low to moderate. **The location of the trial within the field was such that growing conditions were really tough compared to other parts of the field resulting in reduced head size and yield and higher frequency of off-types. Comparison among varieties is all relative.**

During storage, outside temperatures were normal for the months of November (actual mean: 38.5˚F; norm: 39.9˚F) and February (actual mean: 26.4˚F; norm: 25.3˚F), above normal for the second half of December, January (actual mean: 30.4˚F; norm: 23.9˚F) and April (actual mean: 52.4˚F; norm: 45.3˚F), and below normal for the first half of December and March (actual mean: 31.5˚F; norm: 42.7˚F).

Field Results (Table 2):

Plant Characteristics: *Plant size* - Fundaxy had the largest plant size (very large) in the trial, while Paradox had the smallest plant size (small) followed by B2658(obs) (small-medium to small). *Uniformity* – Budena had very good uniformity and was the most uniform in the trial followed by Novator, Superstor 112, B2673, Buscaro, Reaction and Bloktor. Uniformity was variable among replicates for B2672 (very good to fair), Amtrak (good to excellent), BC06146 (good to excellent) and Rendero (fair to excellent). *Growth habit* – B2673 and Budena had the most upright growth habit in the trial, followed by Huron, Candella, Buscaro and Rendaro. Deuce had the least upright plant growth, which was slightly tipped to upright, followed by Bloktor, and Paradox. Growth habit varied among replicates in B2659(obs) (upright to tipped).

Unmarketable Heads: *Off-types* – consisted of i) SM – abnormally small head size; ii) MULTI – multiple heads per plant; iii) FRILLY – margins of wrapper leaves unusually frilly compared to the other plants/heads; iv) UP – instead of forming a head, the leaves grew straight up; v) OFF – odd head and wrapper leaf formations. Buscaro was the only variety in the trial that had no off-types. Deuce had the highest incidence of off-types, specifically abnormally small heads, followed by Blue Thunder, and then by Rona and Paradox. Blue Thunder and Paradox also had abnormally small heads, while Rona had a lot of malformed heads (UP and OFF). *Rots* – Only 8 varieties had unmarketable rots with Thunderhead having the most followed by Amtrak, Blue Thunder, Fundaxy, Candella and Budena, and, B2672 and Busoni. Thunderhead, Blue Thunder, Fundaxy and Busoni had white mold while Amtrak, Candella and Budena had Alternaria leaf spot. *Splits* – Only heads with large splits were considered to be unmarketable. Thirteen of the varieties had a portion of split heads with Thunderhead having the highest incidence, although all small splits, followed by B2658(obs), Blue Thunder, Sandaro, Deuce, B2659(obs) and Rona. Of these, Sandoro and Deuce had the highest incidence of large splits. Blue Thunder and Rona also had some heads with large splits.

Yield: *Average head size* – Deuce, which is more of a processing variety, had the largest head size in the trial, followed by Fundaxy, Novator, Superstor 112, Amtrak and BC06146. Budena had the smallest head size in the trial, followed by B2673. *Estimated yield* – was based on weight of 20 heads per replicate. Deuce had the highest marketable yield in the trial, followed by Fundaxy, while Budena and B2673 had the lowest. *Estimated marketable yield* – is estimated yield corrected for rots, off-types and large splits. Fundaxy had the highest marketable yield in the trial, followed closely by Deuce, while Budena and B2673 had the lowest. Notably, Blue Thunder had the biggest difference in estimated yield and marketable yield, due to higher incidences of off-types, rots and splits. This variety was also harvested when it was over mature and otherwise would have looked better in the field.

Insect damage: *Onion thrips* – Reaction, Buscaro and B2673 did not have any onion thrips damage. Deuce had the highest thrips damage in the trial with an average depth of damage of 4.4 leaves and a severity rating of 1.1 out of 5, followed by B2659(obs) (depth: 4.1; severity: 1.2). B2659(obs) (depth: 4.1; severity: 1.2) and B2658(obs) (depth: 4.1; severity: 0.7) also had notably some of the highest thrips damage in the trial. *Worm damage:* moderate worm damage in the head was observed in Busoni. Slight worm damage in the head was observed in Fundaxy, Novator, Deuce and Blue Thunder. Very slight worm damage in the head was observed in Huron, Superstor 112 and Thunderhead.

Storage Results (Table 3):

Storability: In general, shrink loss, percent unmarketable heads, total loss, and amount of greenness was higher in the cabbage coming out of common storage compared to cabbage coming out of cold storage. Trim loss was lower in common storage, while percent dry weight stayed the same. We suspect that the above average outdoor temperatures during the months of December and January made it more challenging to keep storage conditions stable, thus the shorter unstable conditions of common storage made for tougher storage conditions than the more stable conditions for the longer term in cold storage.

Shrink loss – Differences in shrink loss were not significant. Out of common storage, Superstor 114 had the least shrink loss, followed by Novator, Bloktor and Huron, while the red varieties, especially Buscaro and B2673 had the highest shrink loss out of cold storage. Out of cold storage, Superstor 112 and Bloktor had the lowest shrink loss in the trial followed by Amtrak, Novator and Constellation, while Huron and Paradox had the highest shrink loss. Notably, red varieties Buscaro and Rona and green variety, B2672, had above average shrink loss out of common storage, but below average shrink loss out of cold storage. Huron had below and above average shrink loss out of common and cold storage, respectively.

Trim loss – Out of common storage, Rona had the lowest trim loss in the trial followed by Bloktor, Superstor 112 and Huron, which had significantly lower trim loss than Paradox, Budena and Reaction. Out of cold storage, Busoni and Paradox had the least amount of trim loss in the trial followed by Constellation and Rona. Notably, Paradox and Budena had above average trim loss out of common storage, but below average trim loss out of cold storage. Green varieties, Superstor 112 and Huron and red varieties, B2673 and Rendero, had below and above average trim loss out of common and cold storage, respectively.

Unmarketable heads – Out of common storage, the only varieties that had unmarketable heads were Reaction (10%), Budena (5%) and B2672 (5%). Out of cold storage, the only varieties that had unmarketable heads were Sandero (9.8%), Rendero (5%), B2672 (5%), Superstor 112 (5%) and Reaction (5%).

Total loss – Out of common storage, Superstor 112 had the least total loss in the trial followed by Bloktor, Novator and Huron, while Paradox, Budena and Reaction had the highest. Out of cold storage, Constellation had the lowest total loss in the trial followed by Rona, while the red varieties Sandero, B2673 and Buscaro had the highest total loss in the trial. Notably, total trim loss was above average for Paradox and Budena out of common storage, but it was below average out of cold storage.

Final head weight – Out of common storage, Superstor 112 had the largest head weight in the trial followed by Novator and Amtrak and then by Fundaxy, while Budena, Reaction, B2673, Sandaro and Buscaro had the smallest head weight. Out of cold storage, Fundaxy had the largest head weight in the trial, followed by Constellation and Superstor 112, while B2673 had the smallest head weight followed by Budena and Buscaro.

Dry weight – Out of common storage, Rona had the highest percent dry weight in the trial, followed by B2673 and Budena, and then by BC06146, while Amtrak had the lowest dry weight followed by Paradox. Out of cold storage, B2673 and Rendero had the highest percent dry weight in the trial, followed by Rona and Paradox, while Fundaxy had the lowest. Notably, percent dry weight was below average out of common storage for Paradox, Bloktor and Rendaro, while it was above average out of cold storage. Alternatively, percent dry weight was above average out of common storage for Constellation and Busoni, while it was below average out of cold storage.

Greenness – Out of common storage, Novator had the greenest heads in the trial, followed by BC06146 and Fundaxy, while Paradox had the least. Out of cold storage, Novator had the greenest heads in the trial, followed by Superstor 112 and Budena, while Huron and Candella had the least.

Physiological disorders: *Pepper spot* – Out of common storage, mild pepper spot was observed on Reaction (50% of heads), Candella (40%), Paradox (40%), Bloktor (40%), Busconi (20%), BC06146 (10%), Buscaro (10%) and Rendaro (10%). No pepper spot was observed out of cold storage. *Tipburn* –

Rona had mild tipburn out of common (10%) and cold storage (40%). Bloktor had 10% tipburn out of common storage and Novator had 10% tipburn out of cold storage. *Black midrib* – Constellation had 10% black midrib out of cold storage. Core rot – out of common storage, the cores of Superstor 112 (40%) and Bloktor (10%) were beginning to rot.

Schematic Diagram of Relative Storability (Figure 1):

Figure 1 is a schematic diagram that illustrates the relative head size of varieties coming out of the field (light green or dark red) compared to coming out of 16 weeks of common storage (yellow or pink) and 26 weeks of cold storage (dark green or lavender). The head diameter is scaled according to average head size in pounds.

Small green box types – With exception of Candella, these varieties stored better in long term storage than they did in common storage as indicated by the larger head sizes coming out of cold storage (dark green). Above average temperatures throughout the storage period likely made it difficult to maintain 32 °F consistently in common storage. Under these conditions, these small varieties had high losses from shrinkage and trimming. The schematic diagram also shows that of these varieties, Candella stores the best as indicated by the least differences in head size among coming out of the field, and, common and cold storage. Alternatively, Paradox and B2672 lost a lot of size in storage.

Green Amtrak types – Constellation and Superstor 112 had the least differences in head size at harvest compared to coming out of common and cold storage, indicating that these are the best storing varieties in the trial. Final head size out of storage was comparable for Novator, Busoni, Bloktor and Amtrak. Comparatively, BC06146 and Fundaxy lost a lot of weight in storage. Fundaxy notably stored better in cold than in common storage. Huron stored very poorly for the long-term, perhaps because it was over-mature at harvest.

Reds – Rona stored the best out of both storages as indicated by the smallest differences in head weight among coming out of the field (red), and common (pink) and cold (lavender) storage. Sandero notably stored very well for the long-term, while Buscaro, B2673 and Rendaro lost a lot of weight in both storage types.

Variety Summaries:

Non-storage and observation varieties (not included in ratings):

Thunderhead (Harris Moran). Green fresh market type, 74 days to maturity, YR. One of the smaller plant sizes in the trial (small to medium) with good uniformity (3rd poorest in the trial) and upright to slightly tipped growth habit. Average number of off-types (3.3%) due to odd wrapper leaf formations, BIG basal buds. Highest incidence of rots (5.4%) due to white mold and small splits (75.8%) in the trial**.** Above average head size (4.27 lb) and estimated yield (466 cwt), and average marketable yield (402 cwt). Forth highest thrips damage in trial (depth: 3.0 layers; severity: 1.1 out of 5). Very slight worm feeding damage. Downy mildew on lower frame leaves. **Past maturity at harvest – only sound heads put into storage!** 100% unmarketable heads out of common and cold storage **– this variety did not store!**

Blue Thunder (Harris Moran). Green fresh market type, 84 days to maturity, YR. Medium to small plant size with good uniformity and upright to slightly tipped growth habit (4th best in trial). Second highest incidence of off-types in the trial (7.8%) due to abnormally small heads. Above average incidence of rots (2.2%) due to white mold, and above average incidence of split heads (21.1%) with 1 in 5 heads having unmarketable large splits. Small to large basal buds. Above average head size (4.50 lb), estimated yield (471 cwt) and marketable yield (401 cwt). Notably the highest drop in estimated yield and marketable yield due to higher incidences of rots and large splits. If this variety was harvested sooner, it would have performed better in the field. Average thrips damage (depth: 1.8 leaves; severity: 0.2 out of 5). Slight

worm feeding damage in heads. **Past maturity at harvest – only sound heads put into storage!** 31% and 100% unmarketable heads out of common and cold storage, respectively **– this variety did not store!**

Deuce (Harris Moran). Green processing type, 95 days to maturity, YR. Medium-large plant size, very good uniformity, slightly tipped to upright growth habit. No rots at harvest. Above average incidence of split heads (13.4%) with 9 in 14 splits being large. Highest number of off-types in the trial (8.6%) due to abnormally small heads. In the entire trial, Deuce had the largest average head size (6.00 lb) and estimated yield (626 cwt/A), and second highest marketable yield (602 cwt/acre). Highest thrips damage in the trial (depth: 4.4 layers; severity: 1.1 out of 5). Slight worm feeding damage in the heads. **Slightly over mature at harvest – only sound heads were put into storage!** 5% unmarketable heads and 51% total loss out of common storage, and 100% unmarketable heads out of cold storage **– this variety did not store!**

B2658(obs) (Bejo). Green fresh market type, 80-85 days to maturity, YR. Second smallest plant size in the trial (small medium to small) with very good uniformity (3rd best in trial) and upright to slightly tipped growth habit. Above average incidence of off-types (6.6%) due to odd formed leaves and heads, some basal buds, no rots and above average incidence of split heads (23.9%). Above average head size (4.35 lb), estimated yield (454 cwt/A) and marketable yield (421 cwt/A). Third highest thrips damage in trial (depth: 4.1 layers; severity: 0.7 out of 5). Slight worm damage in heads. **This variety was not stored.**

B2659(obs) (Bejo). Green fresh market type, 85 days to maturity, YR. Medium to medium-large plant size with very good to good uniformity and variable growth habit across replicates (ranged from upright to tipped). Average incidences of off-types (3.6%) due to abnormally small heads and split heads (8.6%), and no rots. Above average head size (4.70 lb), estimated yield (494 cwt/A) and marketable yield (476 cwt/A). Second highest thrips damage in the trial (depth: 4.1 layers; severity: 1.2 out of 5). **This variety was not stored.**

What is rank score? For each trait/variable (i.e. head size, % shrink, yield, etc.), except plant size, total splits, and % greenness for red varieties, the entries are ranked from best (=1) to worst (=18) (data not shown). The rank scores for all of the variables for each of the field, common storage and cold storage evaluations are added up separately, and then totaled for a total rank score (= field + common + cold, data not shown). Low rank scores indicate that a variety is performing very well across several traits/variables.

5-heart ratings
♥♥♥♥♥ - perfect; ♥♥♥♥ - very good; ♥♥♥ - average; ♥♥ - below average; ♥ - unacceptable.

Small Green Box Types (14 inch plant spacing):

Reaction (Bejo). ♥♥♥½ Green, 100 days to maturity, 14" plant spacing, YR. Medium-small plant size with very good uniformity and upright to slightly tipped growth habit (6th best in the trial). Below average off-types (1.1%) due to abnormally small heads, no rots and second lowest incidence of split heads (1.1%) in the trial. One of the smaller average head sizes (2.35 lb), estimated yields (264 cwt/A) and marketable yields (260 cwt/A) in the trial. One of the only three varieties in the trial that had no thrips damage. 5% split cores at harvest. Of the small box-types, second smallest final head size out of common (1.3 lb) and cold (1.8 lb) storage. Stored better in cold than in common storage with 10% and 5% unmarketable heads out of common and cold storage, respectively, and below average shrink loss out of cold storage. Above and below average greenness out of common (5 mm) and cold (1.5 mm) storage, respectively. Below average percent dry weight (8.3%) out of both storage types. 50% pepper spot out of common storage. Thin leaves, cuts nicely, looks good, if you like small head size. **Rank score (field + common + cold): 68 + 73 + 61 = 202 (4th out of box types).**

Paradox (Bejo). ♥♥♥ Green, 105 days to maturity, 14" plant spacing, YR. Paradox had the smallest plant size in the trial with good uniformity and slightly tipped to upright growth. Third highest incidence of off-types (7.7%) in the trial, due to abnormally small heads and odd leaf and head formations. Below average incidence of split heads (2.6%). No rots, slight downy mildew on outer frame leaves. Average head size (4.00 lb) and estimated yield (418 cwt/A) with slightly below average marketable yield (377 cwt/A). Thrips damage was slightly above average (depth: 1.6 layers; severity: 0.4 out of 5). Of the small box types, largest final head size out of common (2.1 lb) and cold (2.6 lb) storage. Stored better in cold storage than in common storage. Lost a lot of weight in storage - Highest trim (37%) and total (58.3%) loss in the trial out of common storage, but below average trim (16%) and total (34%) loss out of cold storage. Below average greenness out of both storage types (common – 3.6 mm; cold – 1.2 mm). Below and above average percent dry weight out of common (7.3%) and cold (9.2%) storage, respectively. 40% mild pepper spot out of common storage, big cores. **Rank score (field + common + cold): 89 + 81 + 42 = 212 (5th out of box types).**

B2672 (Bejo). ♥♥♥ Green, 105 days to maturity, 14" plant spacing, YR. Medium plant size with uniformity varying among replicates and ranging from very good to fair, growth habit upright to slightly tipped. Second lowest incidence of off-types (1.1%) in the trial, due to abnormally small heads. Above average incidence of *Alternaria* head rot (1.1%). Second lowest incidence of split heads (1.1%) in trial. B2672 had just below average head size (3.90 lb) and above average estimated yield (446 cwt/A) and marketable yield (439 cwt/acre). Thrips damage was average (depth: 1.2 layers; severity: 0.2 out of 5). 2.5% splits at harvest. Above average total loss out of common (46%) and cold (37%) storage due to 5% unmarketable heads in each storage type, and trim loss due to thrips. Largest head size of the box types out of common (2.5 lb) and cold (2.7 lb) storage. Shrink loss was much less out of cold (13.5%) compared to common (25%) storage. Greenness was below average out of common (4 mm) storage, but above average out of cold (2.4 mm) storage. Thin leaves, wide core. **Rank score (field + common + cold): 62 + 71 + 51 = 184 (2nd out of box types).**

Candella (Bejo). ♥♥♥½ Green, 110 days to maturity, 14" plant spacing, not YR. Medium-large plant size with very good uniformity (3rd best in trial) and upright growth habit (2nd best in trial). Third least incidence of split heads (1.2%) in the trial, due to abnormally small heads. Slightly above average incidence of *Alternaria* rot (1.2%), no splits. Candella was below average for average head size (2.90 lb), estimated yield (330 cwt/A) and marketable yield (300 cwt/acre). Thrips damage was above average (depth: 2.3 layers; severity: 0.2 out of 5). Second largest final head size of the small box types out of common (2.1 lb) and cold (1.9 lb) storage. Stored well in both storage types, especially cold storage with below average shrink (common - 19.7%; cold – 14.8%), trim (common - 16%; cold – 19%) and total (common - 35.6%; cold – 33.8%) losses out of both storage types. Trim was due to thrips. Above average and second least amount of greenness out of common (5 mm) and cold (0.9 mm) storage, respectively. Average percent dry weight out of both storage types (common – 9%; cold – 8.4%). 40% mild pepper spot out of common storage. **Rank score (field + common + cold): 70 + 56 + 44 = 170 (1st out of box types).**

Budena (Bejo). ♥♥♥½ Green, 105-110 days to maturity, 14" plant spacing, not YR. Medium-large plant size, notably the best uniformity (very good) and most upright growth in the trial. Average incidence of off-types (3.6 %) due to abnormally small plants, no splits, and slightly above average incidence of *Alternaria* rot (1.2%). In the entire trial, Budena had the smallest average head size (1.55 lb), estimated yield (173 cwt/A) and marketable yield (173 cwt/acre). Average thrips damage (depth: 1.6 layers; severity: 0.1 out of 5). Stored better in cold than in common storage. Of the box types, Budena had the smallest final head size out of common (0.9 lb) and cold (1.9 lb) storage. Out of common storage, it had the second largest trim (24.4%) and total (48.8%) loss, and 5% unmarketable heads. Out of cold storage, it had below average trim (19.7%) and total (34.7%) loss, 0% unmarketable heads, and the second highest

amount of greenness (3.6 mm) in the trial. Out of cold storage, greenness was below average (4.7%). Percent dry weight was second highest out of common (10.3%) storage and above average out of cold (8.8%). Cuts easily. **Rank score (field + common + cold): 89 + 69 + 42 = 200 (3rd out of box types)**.

Green Amtrak Types:

Bloktor (Rogers/Syngenta). ♥♥♥♥ Green, 112 days to maturity, YR. Medium plant size with very good uniformity and slightly tipped to upright growth habit. Average incidence of off-types (3.3%) due to abnormally small heads, minor basal buds. No rots or split heads. Above average head size (4.13 lb), estimated yield (433 cwt/A) and marketable yield (419 cwt/A). Barely existent thrips damage (depth: 0.1 layers; severity: 0.1 out of 5), very slight worm feeding damage observed in some of the heads**.** Above average head size out of common (3.2 lb) and cold (2.8 lb) storage. One of the best storing varieties in the trial with the second lowest total loss out of common (26.5%) and cold (32.7%) storage. Above average greenness out of common storage (5.1 mm), but below average greenness out of cold storage (1.9 mm). Below and above average percent dry weight out of common (7.8 mm) and cold (8.7 mm) storage, respectively. 17.5% split cores at harvest, may have been slightly past maturity. Out of common storage, had 40% pepper spot, 10% tipburn and 10% of the cores were starting to rot. Fine leaves, easy trim. **Rank score (field + common + cold): 64 + 30 + 27 = 121 (4th out of Amtrak types).**

Superstor 112 (Reeds). ♥♥♥♥½ Green, 112 days to maturity, YR. Large plant size with very good uniformity (3rd best in the trial) and upright to slightly tipped growth habit. Below average incidence of off-types (2.2%), due to abnormally small heads and some odd frilly leaves. No rots or split heads. Superstor had the fourth largest head size (4.97 lb), estimated yield (521 cwt/A) and marketable yield (509 cwt/acre) in the trial. Average thrips damage (depth: 1.3 layers; severity: 0.2 out of 5), slight worm feeding damage observed in some of the heads. Looks good overall! One of the best storing varieties in common storage in the trial. Largest and second largest head size in the trial out of common and cold storage, respectively. Least shrink loss (14%) and total loss (25.3%) in the trial out of common storage. Out of cold storage, Superstor 112 had the least shrink loss in the trial (11%), but above average trim loss (24%) due to 5% unmarketable heads. Below average greenness out of common storage (4.2 mm), but second most greenness in the trial out of cold storage (3.6 mm). Below average percent dry matter out of common (7.8%) and cold (8%) storage. May have been slightly over-mature at harvest (7.5% split cores at harvest). Out of common storage, 40% of the cores had started to rot. Slanted cores. **Rank score (field + common + cold): 37 + 26 + 39 = 102 (2nd of the Amtrak types).**

Novator (Rogers/Syngenta). ♥♥♥♥½ Green, 110 days to maturity, YR. Large plant size (3rd largest in trial), very good uniformity (2nd best in trial), and upright to slightly tipped growth habit. Second lowest incidence of off-types (1.1%) in the trial, due to multiple heads. No rots and second lowest incidence of head splits (1.1%) in the trial. Third largest average head size (5.13 lb), estimated yield (536 cwt/A) and marketable yield (532 cwt/acre). Above average thrips damage (depth: 2.4 layers; severity: 0.2 out of 5), slight worm feeding damage in head. One of best storing varieties in the trial with the second and third largest head size out of common (3.8 lb) and cold (3.2 lb) storage, respectively. Greenest variety out of common (6.4 mm) and cold (3.9 mm) storages in the trial. Slightly below average dry weight. Thick leaves, sweet, looks good! **Rank score (field + common + cold): 34 + 24 + 26 = 84 (1st in entire trial).**

Amtrak (Bejo). ♥♥♥♥ **Green Standard**, 115 days to maturity, YR. Large plant size (3rd largest in trial) with variable uniformity among replicates, ranging from good to excellent. Slightly tipped growth habit (poorest in the trial). Second lowest incidence of off-types (1.1%) in the trial, due to oddly formed leaves and heads. Second highest incidence of rot (3.3%) due to *Alternaria*. No splits. Amtrak had the fifth largest head size (4.90 lb) and estimated yield (510 cwt/A), and the sixth highest marketable yield (488 cwt/A) in the trial. Thrips damage was well below average (depth: 0.4 layers; severity: 0.02 out of 5). Second and fourth largest head size in the trial out of common (3.8 lb) and cold (3.0 lb) storage, respectively. Below average shrink and total loss out of common and cold storage. Below average

greenness out of common (3.9 mm) storage, but third most green out of cold (3 mm) storage. Below average percent dry weight out of common (7.2%) and cold (8.2%). May have been slightly over mature at harvest with 5% split cores. **Rank score (field + common + cold): 43 + 43 + 37 = 123 (5th out of the Amtrak types).**

Huron (Semins). ♥♥♥½ **Green Standard**, 115 days to maturity, YR. Large plant size (4th largest in trial) with very good to good uniformity and upright growth habit (2nd best in the trial). One of highest incidences of off-types (6.7%) in trial, due to abnormally small heads and frilly leaves. No rots or split heads. Below average head size (3.73 lb), estimated yield (392 cwt/A) and marketable yield (367 cwt/A). Below average thrips damage (depth: 0.8 layers; severity: 0.2 out of 5), very slight worm feeding damage observed on a few heads. Performed better out of common storage with below average shrink (15.7%), trim (11.8%) and total (27.5%) loss, and above average head size (5 lb). Out of cold storage, had above average shrink (20.6%), trim (27.6%) and total (38.8%) loss and below average (1.9 lb) head size. Above average greenness out of common (5 mm) storage, but below average greenness out of cold (0.8 mm) storage. Average percent dry matter out of common and cold storages. Over-mature at harvest with 89% leaf separation from core and 2.3% split cores may have caused Huron to not store as well for the long term. **Rank score (field + common + cold): 63 + 32 + 65 = 160 (9th out of Amtrak types).**

Constellation (Seminis). ♥♥♥♥¾ Green, 112 days to maturity, YR. Large plant size (3rd largest in trial) with very good to good uniformity and upright to slightly tipped growth habit (3rd best in the trial). Below average off-types (2.2%), due to abnormally small heads, and below average head splits (2.4%). No rots. Above average head size (4.43 lb), estimated yield (463 cwt/A) and marketable yield (453 cwt/acre). Thrips damage barely existent (depth: 0.3 layers; severity: 0.01 out of 5). Fourth and second largest head size out of common (3.4 lb) and cold (3.6 lb) storage, respectively. Stored the best in the trial for the long-term with the least total loss (29.3%) out of cold storage. One of the greener varieties in the trial coming out of both common (5.0 mm) and cold (2.2 mm) storage. Fourth highest percent dry weight out of common storage and below average dry weight out of cold storage. Looked slightly immature. Easy to trim, looks good! **Rank score (field + common + cold): 44 + 35 + 25 = 104 (3rd out of the Amtrak types).**

Busoni (Reeds/Vilmorin). ♥♥♥½ Green, 115 days to maturity, YR. Medium sized plant with good uniformity (one of poorest in trial) and upright to slightly tipped growth habit (4th best in trial). Below average incidence of off-types (2.3%) due to abnormally small heads and some frilly leaf formations, odd wrap on heads. 1.1% incidence of white mold. No split heads. Above average head size (4.57 lb), estimated yield (478 cwt/A) and marketable yield (461 cwt/A). Below average thrips damage (depth: 0.8 layers; severity: 0.2 out of 5), moderate worm feeding damage observed in most heads (most worm damage in trial). Fifth and third largest head size out of common (3.3 lb) and cold (3.2 lb) storage, respectively. Below average total loss out of both storage types with the least trim loss in the trial out of cold storage. Good for long-term storage. Average and slightly below average greenness out of common (5 mm) and cold (1.8 mm) storage. Above and below average percent dry weight out of common (9.5%) and cold (7.9%) storage. 2.5% split cores at harvest. Wide cores and fine leaves. 20% pepper spot out of common storage. **Rank score (field + common + cold): 58 + 47 + 41 = 146 (8th out of Amtrak types).**

BC06146 (Reeds). ♥♥♥½ Green, 120-125 days to maturity, YR. Large plant size (2nd largest in the trial) with good to very good uniformity and upright to slightly tipped growth habit. Below average incidence of off-types (2.3%) due to abnormally small heads. No rots or split heads, *Alternaria* leaf spot observed on lower frame leaves in a few plants. Sixth largest average head size (4.87 lb) and estimated yield (509 cat/A) and fifth highest marketable yield (499 cwt/acre). Below average thrips damage (depth: 0.6 layers; severity: 0.1 out of 5). Looks good overall! 7.5% split cores at harvest. Above average final head size out of common (3 lb) storage and fourth largest head size out of cold (3 lb) storage. Below and above average shrink, trim and total loss out of common (19%, 16%, 35%) and cold (15.7%, 24.8%, 40.5%)

storage. Second most greenness out of common storage in the trial (5.8 mm), below average greenness out of cold (1.8 mm) storage. Third highest percent dry weight (10%) out of common storage and above average dry weight out of cold (8.8%) storage. 10% mild pepper spot out of common storage. Easy trim, heads have yellow centers, looks good! **Rank score (field + common + cold): 38 + 38 + 57 = 133 (7th out of Amtrak types).**

Fundaxy (Seminis). ♥♥♥♥ Green, 125 days to maturity, YR. Very large plant size (largest in trial) with good uniformity and upright to slightly tipped growth habit. Second lowest incidence of off-types (1.1%) in the trial, due to abnormally small heads. No splits. Above average incidence of white mold (1.4%), *Alternaria* leaf spot observed on lower frame leaves on a few plants. Second largest head size (5.90 lb) and estimated yield (616 cwt/A), and largest marketable yield (607 cwt/A) in trial! Below average thrips damage (depth: 0.4 layers; severity: 0.1 out of 5), slight worm feeding damage observed in some of the heads. Looks good overall**!** Third largest and largest head size in the trial out of common (3.7 lb) and cold (4.3 lb) storage. Below average shrink, trim and total loss out of both storage types (common: 19%, 15%, 34%; cold: 14%, 22%, 36%). Third most greenness out of common storage (5.4 mm) and below average greenness out of cold (1.5 mm) storage. Below average percent dry weight out of both storage types (common – 7.6%; cold – 7.1%). Appeared immature at packout, pressure bruises after long-term storage, tough peel. **Rank score (field + common + cold): 31 + 46 + 47 = 124 (6th out of Amtrak types).**

Reds:

Sandoro (Bejo). ♥½ Red, 115 days to maturity, YR. Medium-large plant size with good uniformity (although poorest in the trial) and upright to slightly tipped growth habit. Average incidence of off-types (3.4%) due to multiple heads and formation of upright growth instead of heads. Some plants have basal buds, odd extra wrapper leaves. Third highest incidence of split heads (17%) in trial with 10 out of 15 heads having large splits. Third smallest in the trial and second smallest of the red varieties for head size (2.32 lb), estimated yield (242 cwt/A) and marketable yield (239 cwt/A). Highest thrips damage of the red varieties (depth: 2 layers; severity: 0.3 out of 5). 2.5% split cores at harvest. Small head size out of common (1.5 lb) and cold (1.9 lb) storage. Above average total loss out of common (41.4%) storage and highest total loss out of cold (48.2%) storage due to 9.8% unmarketable heads, thick leaves and thrips damage. Highest percent dry weight out of both storage types (common – 9.8%; cold – 8.9%). Big core. **Rank score (field + common + cold): 97 + 58 + 64 = 219 (5th out of reds).**

Rona (Seminis). ♥♥♥½ **Red Standard**, 115 days to maturity, not YR. Large-medium plant size with very good uniformity and upright to slightly tipped growth habit (4th best in trial). Second highest incidence of off-types (7.7%) in trial due to abnormally small heads and other odd growth including frilly leaves and funnel instead of a head. Lots of basal buds in one replicate. Below average incidence of split heads with 1 in 3 being large splits. No rots. 10% split cores at harvest. Below average in trial, but best of red varieties for head size (3.17 lb), estimated yield (330 cwt/A) and marketable yield (303 cwt/A). Below average thrips damage (depth: 0.9 layers; severity: 0.1 out of 5). Largest final head size out of the red varieties out of both storage types (common – 2.2 lb; cold – 2.3 lb). Below average and second lowest total loss in trial out of common (31.4%) and cold (29.4%) storage, respectively. Lowest and third lowest trim loss in the trial out of common (10.3%) and cold (17%) storage, respectively. Highest and second highest percent dry weight out of common (10.4%) and cold (9.3%) storage, respectively. 10% and 40% tip burn out of common and cold storage, respectively. **Rank score (field + common + cold): 78 + 20 + 20 = 118 (1st out of reds).**

Buscaro (Bejo). ♥♥♥♥ Red, 105 days to maturity, not YR. Medium-large plant size with very good uniformity and upright growth habit (2nd best in trial). Only variety in the trial with no off-types, although the plants did have basal buds. No rots and no split heads. Of the red varieties, average head size (2.50 lb), estimated yield (260 cwt/A) and marketable yield (260 cwt/A). One of three varieties in entire trial

that did not have any thrips damage. 2.5% split cores at harvest. Small head size out of both storage types (common – 1.6 lb; cold – 1.4 lb). Above average total loss out of both storage types (common – 42.7%; cold – 41%). Below average percent dry weight out of both storage types (common – 8%; cold – 8.1%). 10% mild pepper spot out of common storage. Looks nice, just small. **Rank score (field + common + cold): 58 + 62 + 59 = 179 (3rd out of reds).**

B-2673 (Bejo). ♥♥ Red, 120 days to maturity, not YR. Small-medium plant size (3rd smallest in trial), very good uniformity (4th best in trial), and most upright growth habit in trial. Leaves have spiny margins. Below average off-types (2.6%) due to multiple heads. No rots or split heads. Second smallest head size (2.00 lb) in the trial and smallest of the red varieties, second lowest estimated yield (205 cwt/A) and marketable yield (205 cwt/A) in the trial and lowest of the red varieties. **May have made more size if left in field longer!** One of three varieties in the trial with no thrips damage. 5% split cores at harvest. Of the red varieties, smallest final head size out of common (1.3 lb) and cold (1 lb) storage. Second highest total loss in common (41.4%) and cold (47%) storage. Below average trim loss out of common storage (13.7%), but above average trim loss out of cold (31.5%) storage. Second highest and highest percent dry weight out of common (10.3%) and cold (9.8%) storage. Looks good internally, but is very small. **Rank score (field + common + cold): 79 + 52 + 60 = 191 (4th out of reds).**

Rendero (Bejo). ♥♥♥½ Red, 125 days to maturity, YR. Medium to medium-large plant size with variable uniformity across the replicates ranging from fair to excellent. Upright growth habit (2nd best in the trial). Below average incidence of off-types (2.5%) due to abnormally small heads and other odd growth, a few basal buds, spiny leaf margins. No rots or split heads. Below average for the trial but second best of the red varieties for head size (2.87 lb), estimated yield (298 cat/A) and marketable yield (290 cwt/acre). **May have made more size if left in field longer!** Below average thrips damage (depth: 0.6; severity: 0.1 out of 5), bird damage in a few heads. Similar final head size as Rona out of common (2.1 lb) and cold (1.8 lb) storage, respectively. Below average total loss (35.4%) out of common storage, but above average total loss out of cold storage (39%) due to 5% unmarketable heads. Average and highest percent dry weight in the trial out of common (8.5%) and cold (9.8%) storage, respectively. 10% mild pepper spot out of common storage. **Rank score (field + common + cold): 74 + 48 + 47 = 169 (2nd out of reds).**

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Table 2. Plant characteristics, unmarketables, head size, yield and onion thrips damage of storage cabbage varieties, Hamlin, NY, 2007.

	Plant Characteristics			Unmarketables					Yield			Onion Thrips Damage	
				Off-types		Rots		% Total Splits	Average Head Size	Estimated Yield	Estimated Marketable Yield		
Variety	Size (Rank)[1]	Uniformity (Rank)[2]	Growth Habit (Rank)[3]	%	type	%	Type	(# Lg)	(lbs)	(cwt/A)[6]	(cwt/A)[7]	Depth[9]	Severity[10]
Thunderhead	SM (16)	G (13)	U-ST (7)	**3.2 a-c**	**Off**[4]	5.4 a[5]	WM[8]	75.8	**4.25 b-e**	**446 b-d**	**402 c-h**	3.0 ab	1.1 ab
Blue Thunder	MS (13)	G (12)	U-ST (4)	7.8 ab	sm	2.2 bc	WM	21.1 (1/6)[11]	**4.50 b-d**	**471 bc**	**401 c-h**	1.8 b-d	**0.2 d**
Deuce	ML (8)	VG (7)	ST-U (12)	8.6 a	sm	**0.0 c***		15.6 (9/14)	**6.00 a**	**626 a**	**602 a**	4.4 a	1.1 ab
B2658(obs)[12]	SM-S (17)	VG (3)	U-ST (9)	6.6 a-c	off	**0.0 c**		23.9	**4.35 b-e**	**454 b-d**	**421 b-g**	4.1 a	0.7 bc
B2659(obs)	M-ML (10)	VG-G (10)	ST/U-ST/T	3.6 a-c	sm	**0.0 c**		8.6	**4.70 a-d**	**494 a-c**	**476 a-e**	4.1 a	1.2 a
Green Box Types:													
Reaction	MS (14)	VG (6)	U-ST (6)	**1.1 bc**	**sm**	**0.0 c**		**1.1**	2.35 gh	264 fg	260 i-k	**0.0 f**	**0.0 d**
Paradox	S (18)	G (14)	ST-U (10)	7.7 ab	sm,off	**0.0 c**		**2.6**	**4.00 b-f**	**418 b-e**	377 d-i	1.6 b-e	0.4 cd
B2672	M (11)	VG-F (var)	U-ST (5)	**1.1 bc**	**sm**	1.1 bc	Alt	**1.1**	3.90 c-f	**446 b-d**	**439 b-f**	**1.2 b-f**	**0.2 d**
Budena	ML (8)	**VG (1)**	**U (1)**	3.6 a-c	sm	1.2 bc	Alt	**0.0**	1.55 h	173 g	173 k	1.6 b-e	**0.1 d**
Candella	ML (7)	VG (3)	U (2)	**1.2 a-c**	**sm**	1.2 bc	Alt	**0.0**	2.90 fg	330 d-f	330 f-j	2.3 b	**0.2 d**
Green Amtrak Types:													
Bloktor	M (11)	VG (7)	ST-U (11)	**3.3 a-c**	**sm**	**0.0 c**		**0.0**	**4.13 b-e**	**433 b-d**	**419 c-g**	**0.1 f**	**0.1 d**
Superstor 112	L (5)	VG (3)	U-ST (6)	**2.2 a-c**	**sm,fril**	**0.0 c**		**0.0**	**4.97 a-c**	**521 ab**	**509 a-c**	**1.3 b-f**	**0.2 d**
Novator	L (3)	VG (2)	U-ST (5)	**1.1 bc**	**multi**	**0.0 c**		**1.1**	**5.13 ab**	**536 ab**	**532 ab**	2.4 b	**0.2 d**
Amtrak (std)	L (3)	G-E (var)	ST (13)	**1.1 bc**	**off**	3.2 ab	Alt	**3.3**	**4.90 a-c**	**510 ab**	**488 a-d**	**0.4 d-f**	**0.02 d**
Huron (std)	L (4)	VG-G (9)	U (2)	6.7 a-c	sm,fril	**0.0 c**		**0.0**	3.73 d-f	392 c-e	367 e-i	**0.8 c-f**	**0.2 d**
Constellation	L (3)	VG-G (8)	U-ST (3)	**2.2 a-c**	**sm**	**0.0 c**		**2.4**	**4.43 b-d**	**463 bc**	**453 b-f**	**0.3 ef**	**0.01 d**
Busoni	M (12)	G (15)	U-ST (4)	**2.3 a-c**	**fril**	1.1 bc	WM	**0.0**	**4.57 b-d**	**478 bc**	**461 b-e**	**0.8 c-f**	**0.2 d**
BC06146	L (2)	G-VG/E	U-ST (4)	**2.3 a-c**	**sm**	**0.0 c**		**0.0**	**4.87 a-c**	**509 ab**	**499 a-d**	**0.6 c-f**	**0.1 d**
Fundaxy	**VL(1)**	G (11)	U-ST (3)	**1.1 bc**	**sm**	1.4 bc	WM	**0.0**	**5.90 a**	**616 a**	**607 a**	**0.4 d-f**	**0.1 d**
Reds:													
Sandaro	ML (8)	G (16)	U-ST (7)	3.4 a-c	multi,up	**0.0 c**		17.0 (10/15)	2.30 gh	242 fg	239 jk	2.0 bc	0.3 cd
Rona (std)	LM (6)	VG (7)	U-ST (4)	7.7 ab	up,sm,fril	**0.0 c**		**3.5 (1/3)**	3.17 e-g	330 d-f	303 g-j	**0.9 b-f**	**0.1 d**
Buscaro	ML (9)	VG (5)	U (2)	**0.0 c**		**0.0 c**		**0.0**	2.50 gh	260 fg	260 i-k	**0.0 f**	**0.0 d**
B2673	SM (15)	VG (4)	**U (1)**	**2.6 a-c**	**multi**	**0.0 c**		**0.0**	2.00 gh	205 fg	205 jk	**0.0 f**	**0.0 d**
Rendero	ML (8)	F/G- VG/E	U (2)	**2.5 a-c**	**Sm,off**	**0.0 c**		**0.0**	2.87 fg	298 e-g	290 h-k	**0.6 c-f**	**0.1 d**
Trial Average[13]				***3.4***		***0.7***		***7.1***	***4.00***	***416***	***400***	***1.4***	***0.3***
P Value				0.5020		0.0070		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Footnotes for Table 2

[1]Plant Size: **S** – small; **M** – medium; **L** – large; **VL** – very large. For combinations, the first trait listed is the strongest. Ex. SM = more small than medium, ML is smaller than LM. Rank: in order from largest to smallest, based on evaluations of 3 replicates.

[2]Uniformity: **E -** Excellent, **VG** – Very Good; **G** – Good, **F** – Fair. For combinations, the first trait listed is the strongest. Ex. VG-G is more very good than it is good. Rank: in order of Excellent to Fair. Var = trait is variable across replicates, range is shown.

[3]Growth habit: **U** – upright; **ST** – slightly tipped; **T** – tipped. For combinations, the first trait listed is the strongest. Rank is in order of most upright to tipped.

[4]Type of off-types: **sm** – abnormally small heads; **multi** – multiple heads; **off** – odd head and wrapper leaf formations; **fril** – oddly frilly leaf margins compared to the other plants; **up** – upright growth instead of head formation.

[5]Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, $P<0.05$.

[6]Estimated yield = based on the weight of 20 heads per replicate extrapolated to cwt per acre, 32" row spacing and 14" or 18" plant spacing.

[7]Marketable yield = estimated yield per acre corrected for %rots, %off-types and %large splits.

[8]Type of rot: **WM** – white mold; **Alt.** – *Alternaria* head rot.

[9]Depth of onion thrips damage: number of leaf layers damaged by thrips.

[10]Thrips damage severity rating: 0 = no damage; 1 = trace; 2 = low; 3 = maximum commercial acceptability; 4 = high; 5 = severe.

[11]Proportion of total splits that were large: ex. 1 in 6 = out of the total number of splits (6), 1 was large.

[12]Obs: observational – field data only, will not be stored.

[13]Trial average: average of all data pooled together.

*Numbers in **bold** are equal to or better than the trial average. <u>underlined</u> values indicate the best result per variable.

Table 3. Percent shrink, trim, unmarketable heads and total loss, and final head size and greenness of storage cabbage varieties out of common and cold (refrigerated) storage, 2008.

	Common Storage (16weeks, 22-Feb-08)							Cold Storage (26 weeks, 30-Apr-08)						
Entry	**% Shrink Loss**	**% Trim Loss**	**% Unmarketable Heads[1]**	**% Total Loss**	**Final Avg. Head wt (lb)**	**Green (mm)[2]**	**% Dry wt**	**% Shrink Loss**	**% Trim Loss**	**% Unmarked able Heads[1]**	**% Total Loss**	**Final Avg. Head wt (lb)**	**Green (mm)[2]**	**% Dry wt**
Thunderhead	--	--	100*	100*	--	--	--	--	--	100*	100*	--	--	--
Blue Thunder	31.7*	43.5*	31.1*	75.3*	2.8*	0.0*	6.5*	28.3*	--	100*	100*	--	--	--
Deuce	22.6*	28.7*	5.0*	51.3*	3.8*	0.0*	6.0*	18.9*	--	100*	100*	--	--	--
Small Green Box Types:														
Reaction	24.8	23.2 ab[4]	10.0 ab	48.1	1.3 fg	**5.0**	8.3 d-f	**15.4**	23.6	5.0 bc	39.0	1.8 d-f	1.5 c-e	8.3 c-e
Paradox	21.0	37.3 a	**0.0 c**	58.3	2.1 d-f	3.6	7.3 f	18.3	**15.9**	**0.0 c**	**34.2**	**2.6 b-e**	1.2 de	**9.2 a-c**
B2672	25.0	20.9 bc	5.0 bc	45.9	2.5 b-e	4.0	8.1 ef	**13.5**	23.8	5.0 bc	37.3	**2.7 b-d**	**2.4 a-d**	8.0 e
Budena	24.4	24.4 ab	5.0 bc	48.8	0.9 g	4.7	**10.3 a**	**15.0**	**19.7**	**0.0 c**	**34.7**	1.1 f	**3.6 ab**	**8.8 b-e**
Candella	**19.7**	**15.9 b-d**	**0.0 c**	**35.6**	2.1 d-f	**5.0**	**8.9 b-e**	**14.8**	**19.0**	**0.0 c**	**33.8**	1.9 c-f	0.9 de	8.4 c-e
Green Amtrak Types:														
Bloktor	**15.6**	**10.8 cd**	**0.0 c**	**26.5**	**3.2 a-c**	**5.1**	7.8 ef	**11.3**	**21.4**	**0.0 c**	**32.7**	**2.8 b-d**	1.9 c	**8.7 b-e**
Superstor 112	**14.0[3]**	**11.3 cd**	**0.0 c**	**25.3**	**4.0 a**	4.2	7.8 ef	**11.3**	24.0	5.0 bc	**35.2**	**3.6 ab**	**3.6 ab**	8.0 de
Novator	**14.3**	**12.4 cd**	**0.0 c**	**26.7**	**3.8 ab**	**6.4**	8.1 ef	**12.3**	**21.4**	**0.0 c**	**33.7**	**3.2 a-c**	**3.9 a**	8.3 de
Amtrak (std)	**16.7**	**13.1 cd**	**0.0 c**	**29.8**	**3.8 ab**	3.9	7.2 f	**11.8**	23.4	**0.0 c**	**35.3**	**3.0 b-d**	**3.0 a-c**	8.2 de
Huron (std)	**15.7**	**11.8 cd**	**0.0 c**	**27.5**	**3.3 ab**	**5.0**	8.2 d-f	20.6	27.6	**0.0 c**	38.8	1.9 c-f	0.8 e	**8.7 b-e**
Constellation	**18.4**	**14.3 b-d**	**0.0 c**	**32.7**	**3.4 ab**	**5.0**	**9.8 a-c**	**12.4**	**16.9**	**0.0 c**	**29.3**	**3.6 ab**	**2.2 b-e**	8.1 de
Busoni	20.6	**14.9 b-d**	**0.0 c**	**35.5**	**3.3 ab**	**5.0**	**9.5 a-d**	17.6	**15.9**	**0.0 c**	**33.5**	**3.2 a-c**	1.8 c-e	7.9 ef
BC06146	**19.4**	**15.8 b-d**	**0.0 c**	**35.2**	**3.0 a-d**	**5.8**	**10.0 ab**	15.7	24.8	**0.0 c**	40.5	**3.0 b-d**	1.8 c-e	**8.8 b-e**
Fundaxy	**19.2**	**15.1 b-d**	**0.0 c**	**34.3**	**3.7 a**	**5.4**	7.6 ef	**14.1**	**21.9**	**0.0 c**	**36.0**	**4.3 a**	1.5 c-e	7.1 f
Reds:														
Sandaro	25.5	**15.9 b-d**	**0.0 c**	41.4	1.5 e-g	NA	**9.8 a-c**	17.3	29.9	9.8 ab	48.2	1.9 c-f	NA	**8.9 b-d**
Rona (std)	21.0	**10.3 d**	**0.0 c**	**31.4**	2.2 c-f	NA	**10.4 ab**	**12.4**	**17.0**	**0.0 c**	**29.4**	2.3 c-f	NA	**9.3 ab**
Buscaro	28.4	**14.3 b-d**	**0.0 c**	42.7	1.6 e-g	NA[6]	8.0 ef	**14.1**	26.9	4.5 c	41.0	1.4 ef	NA	8.1 de
B2673	27.8	**13.7 cd**	**0.0 c**	41.4	1.3 fg	NA	**10.3 a**	15.6	31.5	**0.0 c**	47.1	1.0 f	NA	**9.8 a**
Rendero	21.0	**14.4 b-d**	**0.0 c**	**35.4**	2.1 d-f	NA	8.5 c-f	**14.7**	24.4	5.0 bc	39.1	1.8 d-f	NA	**9.8 a**
Trial Average[5]	***20.1***	***18.2***	***2.7***	***39.5***	***2.6***	***4.9***	***8.7***	***15.3***	***22.3***	***1.6***	***36.5***	***2.5***	***2.2***	***8.5***
P Value	NS	0.0097	0.0015	NS	0.0000	NS	0.0000	NS	NS	0.0001	NS	0.0029	0.0002	.0042

*Variety does not store, not included in statistical analysis. [1]% Unmarketable heads included in shrink loss. [2]Milimeters of green on cut head after trimming. [3]Numbers in **bold** are equal to or better than the trial average. underlined values indicate the best result per variable. [4]Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, $p<0.05$. [5]*Trial average*: average of all data pooled together. [6]NA: not applicable.

Figure 1. Summary of scale diagrams for average head size prior to storage, and after common (16 weeks) and cold (refrigerated, 26 weeks) storage, presented in order of approximate maturity by type.