FINAL REPORT

2006 Kraut Cabbage Variety Evaluation

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Objectives:

1. To evaluate kraut cabbage varieties for yield, head and growth characteristics, maturity and tolerance to disease, disorders and insects, especially onion thrips.

2. To involve Cornell and industry representatives in the selection and evaluation of new kraut cabbage varieties.

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Materials:
Eighteen kraut cabbage varieties were evaluated from four seed companies (Table 1). Fresco, Kaitlin, and Hinova were used as early, main and late industry standards, respectively.

Table 1. 2006 kraut cabbage variety entries in approximate order of maturity.

Entry	Seed Source	Days to Harvest	Years in Trial	Comments
1. B-2635	Bejo	85	2006	Almanac type
2. Fresco	***Bejo***	***75***	***Early standard***	
3. Tobia (3196)	Seminis	87	2004, 2006	
4. B5-152	Reed's	Mid-late	2006	
5. Superkraut 86 (WC 01066)	Reed's	86	2004, 2006	
6. B-2658	Bejo	74	2006	Fresco type
7. B5-150	Reed's	Early-mid	2006	
8. Rotunda	Bejo	80	2002, 2004, 2006	
9. Kaitlin	***Bejo***	***90***	***Main standard***	
10. B-2646	Bejo	90	2006	Kaitlin type
11. Puccini (NIZ 698)	Vilmorin	Mid-late	2004, 2006	
12. Bobcat	Reed's	76	2000, 2002, 2004, 2006	
13. Ambrosia (3198)	Seminis	Mid-late	2004, 2006	
14. Moreton	Reed's	105	2000, 2002, 2004, 2006	
15. Mandy	Bejo	105	2002, 2006	
16. Score	Bejo	90	2006	
17. Hinova	***Bejo***	***100***	***Late standard***	
18. B-2660	Bejo	100	2006	Jaguar type

Methods:

Transplant Production. Seeds were seeded into 72-cell trays in Cornell mix on Apr 27 and grown in a greenhouse at the NYSAES, Geneva. The two Seminis varieties Ambrosia and Tobia were planted on May 8 due to a delay in seed delivery. About once every week they were fertilized with 15-16-17 NPK soluble Peters Mix. Plants were taken outside to harden off on 1-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 Jun 7.

Experimental Design. The trial was located at the Bejo Research Farm in Geneva, NY in Ontario County and was arranged as a complete randomized design with 18 varieties replicated three times. Each replicate consisted of a single row of 30 plants spaced 18 inches apart with 36 inches between rows. Fertility and pest management was maintained by the Bejo Research Farm staff.

Field Information. The soil pH was ~ 6.9. Crop rotation included wheat in 2005 with a clover cover crop, red kidney beans in 2004 and field corn in 2002 and 2003. This was the first time that this ground was cropped to crucifers in over 10 years. Fertilizer application included 500 lbs per acre of 10-10-30 NPK plowed down, 500 lbs per acre of 10-20-20 N-P-K broadcast pre-plant, and 15 gals per acre of 32% N side-dressed at last cultivation. Weed control consisted of 1 qt. per acre Treflan pre-plant incorporated and 1 pt of Goal sprayed on prepared ground before planting. Bravo + Manex was applied 5 times from Jul 20 to Aug 31 for disease management. Insects were managed using Capture, Dipel, Xantari and Dimethoate in 5 sprays from Jul 20 to Aug 31.

Harvest Evaluation. The trial was harvested on Sep 8, Sep 15, Sep 25, Oct 10 and Oct 26 with most varieties being harvested three times. Each plot was divided into three sections of 10 heads and only one section was evaluated per harvest. First, plant size, uniformity, growth habit, and number of splits, rots and off-types were evaluated. On the Sep 15 harvest, damage caused by worm (diamondback moth, imported cabbage worm and cabbage looper) feeding was rated on a scale of 1 to 3 with a rating of 1 indicating only a few holes, while a rating of 3 indicated a lot of worm holes including in the head. Then, the best five sound heads were harvested per section and weighed. Finally, each head was cut in half and head length and width, and core length were measured, thrips severity was rated, and number of layers affected by thrips was counted. Head shape, internal color and other quality observations were made. Head shape was quantified by the difference between the width and length. Negative values indicated that the heads were taller than they were wide, and the closer this value was to zero (negative or positive) indicated the more perfectly round the head was. Internal tipburn and cabbage maggot damage was calculated from the total number of heads assessed over the multiple harvests. A representative slice from 1 head per replicate was taken back to the laboratory for dry weight analysis for the Sep 15, Sep 25 and Oct 10 harvests. Marketable yield was estimated from the total yield per 5 heads, which was corrected for the percentage of unmarketable rots, multiple heads and other unmarketable off-types, and large head splits, but not for small splits. Maturity date was selected based on marketable yield, number of splits and rots in the field, and core splits.

2006 Season. The 2006 growing season was generally warm and wet with above average temperatures and rainfall in June and July, relatively normal weather in August and one of the wettest autumns in recorded history. Local weather data from the Northeast Weather Association (NEWA) weather station located in Geneva reported monthly average temperatures of 66.4, 73.3, 68.6, 59.5 and 48.7 °F for June, July, August, September and October, respectively. Total monthly rainfall was 4.6, 5.2, 2.6, 7.7 and 5.0 inches for June, July, August, September and October, respectively. Total number of rain days per month was 11, 10, 9, 11 and 9 days for June, July,

August, September and October, respectively. In the trial, worm and disease pressure was moderate while onion thrips pressure was very high.

Results:

Head Weight (Table 2). The average head weight was 11.3, 12.0, 12.0, 13.1 and 14.1 lbs on Sep 8, Sep 15, Sep 25, Oct 10 and Oct 26, respectively. ***Early maturity class (entries 1-5):*** B-2635, Fresco and Tobia had the largest head weight (all 13.6 lb) while B5-152 had the smallest head weight (12.1 lb). ***Mid-season maturity class (entries 6-12):*** Bobcat had consistently one of the largest head weights and had the third largest head weight in the trial on Sep 25 (15.4 lb). Puccini had the second largest head weight on Sep 25 (13.2 lb) and the largest head weight on Oct 10 (14.9 lb). Rotunda notably also had a very large head weight of 12.4 lb on Sep 25, while B-2658 (8.6, 9.7 lb) and B5-150 (9.2, 10.1 lb) had the smallest head weights. ***Late Maturity Class (entries 12-18):*** Score (16.6 lb) and B-2660 (15.7 lb) had the largest and second-largest head weight, respectively, in the entire trial on Oct-26. Hinova had the smallest head weight on Oct 10 (10.6 lb) and Oct 26 (11.6 lb).

Marketable Yield (Table 2 and 3): ***Early maturity class (entries 1-5):*** Tobia had the highest marketable yield (20.9 ton/acre on Sep 15) followed by Fresco (19.9 ton/acre on Sep 8; 20.4 ton/acre on Sep 15), and B-2635 (19.5 ton/acre on Sep 8). Superkraut 86 had the lowest marketable yield (17.1 ton/acre). Superkraut 86 had the highest incidence of unmarketable heads (11% on Sep 8, 31.4% on Sep 15) due mostly to total splits (43.7%, 46.7%) and unmarketable off-types (8.5%). B5-152 notably had no unmarketable heads due splits, rots or off-types. None of these early varieties had any rot problems. Tobia (10.2%), Superkraut 86 (8.5%) and Fresco (8.3%) had the three highest incidences of off-types in the entire trial. B-2635 was the earliest variety and probably harvested about 1 week late, as indicated by the high percentage of splits (44.4, 70%) and rots (0, 10%) on Sep 8 and Sep 15.

Mid-season maturity class (entries 6-12): On Sep 25, Bobcat had the highest marketable yield in the entire trial (24.9 ton/acre). Puccini (22.1 ton/acre) also had a notably high marketable yield on Oct 10. B-2658 (13.1 ton/acre on Sep 25) and B5-150 (16.1 ton/acre on Sep 25) had the lowest marketable yields in the entire trial. Kaitlyn, Bobcat and Rotunda had no unmarketable heads at optimum harvests (Sep 15 and Sep 25). Bobcat had the lowest incidence of small and large splits (0%, 0%, 2.6%) in the trial. Incidence of total splits increased dramatically between Sep 15 and Sep 25 for B5-150 (0 to 69.7%), Rotunda (16.7 to 63.3%), B-2658 (15.9 to 41.9%) and B-2646 (8.8 to 30.7%). Puccini consistently had higher incidence of rot than the trial average (6.7%, 3.3%, 8.3%). Bobcat (1.4%) and B-2646 (1.9%) notably had less than 2% of off-types of any kind.

Late maturity class (entries 12-18): On Oct 26, Score (23.1 ton/acre) and B-2660 (22.7 ton/acre) had the second and third, respectively, highest marketable yield in the entire trial. Bobcat (22.0 ton/acre on Oct 10), Ambrosia (21.1 ton/acre on Oct 10) and Mandy (20.7 ton/acre on Oct 26) notably had above trial average yields. Hinova (17.1 ton/acre on Oct 10) had the lowest marketable yield in this maturity class. Mandy and Hinova had no unmarketable heads. Notably, Ambrosia had the lowest incidence of all splits in the entire trial (0%). Mandy also had consistently lower incidence of splits than the trial average (0%, 2%, 12.6%). Incidence of splits (0 to 16.9%) and rots (0 to 16.9%) increased dramatically between Sep 25 and Oct 10 in Moreton. B-2660 tended to have higher incidences of rot (5.1%, 10.3%) than the other varieties in this maturity class, while Ambrosia and Mandy had no rots. Mandy also had no off-types of any kind, while Hinova (0.6%) and Ambrosia (1.1%) notably had less than 2% off-types.

Plant Characteristics (Table 4). ***Plant Size:*** Mandy and B-2660 were the largest plants in the entire trial was a rating of very large. Fresco, B-2658 and B5-150 were the smallest plants in the trial with a size rating of medium. ***Uniformity:*** B-2635 and B-2658 were the most uniform varieties in the trial with a rating of very good to excellent, while Puccini was the least uniform with a rating of good to fair. ***Growth Habit:*** B-2658 had the most upright growth habit in the trial, while B5-152 had the most tipped growth habit with a rating of tipped to slightly tipped.

Head Characteristics (Table 4). ***Headshape and Roundness:*** B-2635 (R; w-l = (0.1)) had the most perfectly round head shape in the entire trial, followed by Fresco (R; w-l = (0.2)). B5-150 (FR; w-l = 6.4) had the flattest head shape in the entire trial, followed by B5-152. ***Dry weight:*** The trial average dry weights on Sep 15, Sep 15 and Oct 10 were 6.7%, 7.0% and 7.2%, respectively. In the early class (entries 1-5), B5-152 had the highest dry weight (7.1 % on Sep 15), while Tobia had the lowest dry weight (6.4 % on Sep 15). In the mid-season class (entries 6-12), B5-150 had the highest dry weight in the entire trial (10.9% on Sep 15) followed by Kaitlin (7.5% on Sep 15) and B-2658 (7.4% on Sep 25). In the late class (entries 12-18) maturing varieties, Hinova (8.2% on Sep 25 and Oct 10) and B-2660 (8.0% on Oct 10) had the second and third highest dry weight, respectively, in the entire trial, followed by Mandy (7.9% on Oct 10). Ambrosia (6.5%, 5.7%) and Moreton (6.6%, 6.7%) had the lowest dry weights.

Internal Characteristics (Table 4). ***Internal Color:*** Hinova had the whitest internal color in the entire trial, followed by B-2635, Fresco, B-2646 and Puccini. Notably, B-2660 had a more greenish coloring, and the center of the heads were very yellow in Tobia and B5-152. ***Core Length:*** Puccini had the shortest core (2.9 inches) in the entire trial, followed by B5-150 (3.0 inches) and Kaitlin (3.2 inches). B-2635 and B-2660 had the longest cores in the entire trial at 4.3 inches, followed by Ambrosia (4.2 inches), Tobia, Moreton and Score (all 4.1 inches) and Rotunda (4.0 inches). ***Tipburn:*** Superkraut 86 (70%) and B5-152 (63.3%) notably had very high incidences of tipburn. Puccini (22.2%), B5-150 (20%), Bobcat (15.5%), Moreton (13.3%) and Hinova (6.7%) also had notable degrees of tipburn.

Pest Tolerance/Susceptibility (Table 4 & 5). ***Cabbage Maggot:*** B-2635 had the highest incidence of cabbage maggot damage (20%) in the heads at harvest in the trial, followed by Tobia (10%). B-2658 (3.3%), Rotunda (3.3%), Moreton (3.3%), B-2660 (2.2%) and Puccini (2.0%) also had low incidence of cabbage maggot damage. ***Worm Rating:*** On a scale of 0 to 3, B-2658 (0.0) was the only variety in the trial with no observable worm injury. Moreton and Hinova had the second lowest worm ratings in the trial at 0.3 each. Puccini (2.7) had significantly the most worm injury in the trial with damage occurring in the heads.

Onion Thrips Damage: Thrips damage was especially high in the early varieties at the first harvest on Sep 8 (average depth: 4.5; severity: 2.6). In the early class (entries 1-5), Fresco (depth = 2.6, 2.6; severity = 2.3, 1.4) had the least amount of thrips damage, while B-2635 (depth = 6.8; severity = 4.3) had the most, which may not have been as severe if this variety had been harvested sooner. Superkraut 86 had the lowest thrips damage severity (severity = 1.9, 1.8), but the damage went deep into the head (depth = 3.7, 4.6). Overall, Bobcat had the least thrips damage in the entire trial (depth = 0.3, 0.5, 0.0; severity = 0.4, 0.2, 0.0), followed by B5-152 (depth = 0.5, 0.1; severity = 0.1), Mandy (depth = 2.1, 1.3, 1.5; severity = 1.0, 0.6, 0.9), Ambrosia (depth = 0.8, 2.1; severity = 0.3, 1.2), B-2660 (depth = 2.3, 2.0; severity = 1.0, 0.7) and B5-150 (depth = 0.2, 1.9; severity = 1.8). In the mid-season class, Moreton (depth = 6.6, 4.7; severity = 2.5, 2.9) had the highest thrips damage, followed by Hinova (depth = 7.0; severity = 2.5) and Rotunda (depth = 5.0, 4.6; severity = 1.8, 3.3), the damage of which was at least 4 leaves deep. The thrips damage of Puccini tended to be more deep (depth = 4.4, 4.3, 3.8) than it was severe (severity = 1.4, 1.8, 1.7). For B-2646, thrips damage (depth = 2.7; severity = 1.2) was less than the trial average on Sep 25, but increased substantially after this time (depth = 4.0, 4.5; severity = 1.3, 2.5).

Varietal Summaries:

B-2635 YR (Bejo). ✸✸✸✸ Earliest variety in the trial - matured late-August/early September; over mature by Sept. 15 - probably should have been harvested at least 1 week sooner. ***Plant Characteristics:*** Dark green, medium-large sized plants with one of the most uniform growth habits in the trial with a rating of very good to excellent; slightly tipped growth habit. ***Head Weight and Marketable Yield:*** Largest head weight (13.6 lb) and third highest marketable yield (19.5 ton/acre on Sep 8) in the early maturity class. Notably, this variety had no rots or off-types, but it did have above the trial average incidence of total splits (44.4%), 11.1% of which were large and unmarketable. ***Head Characteristics:*** The most perfectly round head shape of all varieties in the trial. Whitish-yellow internal color and frilly/loose outside layers. Longest core length in the entire trial (4.3 inches). Dry weight was 5.5% on Sep 15. No tipburn was detected. ***Insect Damage:*** Had the most thrips damage (depth = 6.8; severity = 4.3) in the early maturity class, which may not have been as severe if this variety had been harvested sooner. Above trial average worm damage (rating = 1.8 out of 3). No cabbage maggot was detected. Notably, had the highest incidence of cabbage maggot infestation in the heads at harvest (20%) in the trial.

Fresco YR (Bejo – Early Standard). ✸✸✸✸ Mature on Sep 8 and barely held until Sep 15. ***Plant Characteristics:*** Green, medium sized plants - one of smallest in trial with very good to good uniformity and slightly tipped growth habit. ***Head Weight and Marketable Yield:*** Largest head weight (13.6 lb) and second highest marketable yield (19.9 ton/acre on Sep 8; 20.4 ton/acre on Sep 15) in the early class. Notably, no rots, but third highest incidence of off-types (8.3%) in the entire trial, which consisted of very small heads. ***Head Characteristics:*** One of the roundest head shapes in the trial. Whitish-yellow internal color, green on the outside; heads had very dense centers and were loose on the outside. Dry weight was below the trial average (6.5% on Sep 15). No tipburn detected. ***Insect Damage:*** Least amount of thrips damage (depth = 2.6, 2.6; severity = 2.3, 1.4) in the early class. Worm damage was above the trial average (rating = 1.7 out of 3). No cabbage maggot damage was detected.

Tobia/3196 not YR (Seminis). ✸✸✸½ Mature on Sep 8 and held until Sep 15. Note: Seeded 11 days later, transplanted at the same time. ***Plant Characteristics:*** Bright green, medium-large sized plants with very good uniformity and slightly tipped growth habit. ***Head Weight and Marketable Yield:*** Largest head weight (13.6 lb) and highest marketable yield (20.9 ton/acre on Sep 15) in the early maturity class. Notably, there were no rots. Below trial average incidence of total splits on Sep 8 (14.1%), but above trial average total splits on Sep 15 (36.5%). Highest incidence of off-types (10.2%) in the entire trial. Below average unmarketable heads. ***Head Characteristics:*** Round head shape that comes to a point at the top. Yellowish-white internal color with notably yellow centers and loose leaves at the base of the head. Third longest core length in the trial (4.1 inches), although narrow. Lowest dry weight (6.4% on Sep 15) in the early class. Dry weight was below the trial average at 6.4%. No tipburn was detected. ***Insect Damage:*** Above trial average thrips damage (depth = 5.3, 6.3; severity = 2.4, 2.9). Average worm damage (rating = 1.3 out of 3). Notably, had one of the highest incidences of cabbage maggot infestation in the heads at harvest (10%) in the trial.

B5-152 (Reed's Seeds). ½ Mature on Sep 8, over-mature by Sept. 15. ***Plant Characteristics:*** Blue-purplish-green large sized plant with basal buds and the most tipped growth habit in the trial with a rating of tipped to slightly tipped (tipping was in different directions). Notably, moderate downy mildew occurred on lower frame leaves. ***Head Weight and Marketable Yield:*** Smallest head weight in the early maturity class (12.1 lb) and slightly above trial average marketable yield

with notably no unmarketable heads due to splits, rots or off-types. ***Head Characteristics:*** One of the more flat head shapes in the trial. Yellowish-white internal color with notably yellow centers and some heads were loose on the outside. Highest dry weight (7.1% on Sep 15) in the early class. Second highest incidence of tipburn in the trial (63.3%). ***Insect Damage:*** Had the second lowest thrips damage in the entire trial (depth = 0.5, 0.1; severity = 0.1). Worm damage was slightly higher than the trial average (rating = 1.5 out of 3). No cabbage maggot damage was detected.

Superkraut 86/WC 01066 YR (Reed's Seeds). ½ Mature on Sep 8, slightly over-mature on Sep 15. ***Plant Characteristics:*** Silverish-green, medium-large sized plants with very good uniformity and upright to slightly tipped growth habit. Basal buds and minor Alternaria leaf spot on lower frame leaves. ***Head Weight and Marketable Yield:*** Had the lowest marketable yield (17.1 ton/acre on Sep 15) in the early maturity class, due to having the highest incidence of unmarketable heads (11% on Sep 8, 31.4% on Sep 15). Above trial average incidence of total splits (43.7%, 46.7%) and second highest incidence of off-types (8.5%) in the entire trial. 3.7% and 0% rots at harvest. ***Head Characteristics:*** Round-flat head shape with yellowish-white internal color, thick veins, thin leaves and a little loose on the outside. Average core length (3.6 inches). Highest incidence of tipburn in the trial (70%). ***Insect Damage:*** Low severity of thrips damage (rating = 1.9, 1.8), but the depth of damage was high (depth = 3.7, 4.6). Below trial average worm damage (rating = 0.8 out of 3). No cabbage maggot damage was detected.

B-2658 YR (Bejo). ✸✸ Mature on Sep 15 and held until Sep 25. ***Plant Characteristics:*** Dark green with a hint of red; medium sized plants - one of smallest in trial. Looks good in the field - one of the most uniform varieties in the trial with a rating of very good to excellent, and the most upright growth habit in the trial. ***Head Weight and Marketable Yield:*** Smallest head weight (8.6 lb on Sep 15, 9.7 lb on Sep 25) and lowest marketable yield (13.1 ton/acre on Sep 25) in the entire trial. Incidence of total splits increased significantly from Sep 15 and Sep 25 (15.9 to 41.9%). Above trial average off-types (5.2%) and notably, no rots. ***Head Characteristics:*** Round to round-flat head shape with yellowish-white interior. Outside loose on Sep 15 harvest and may shatter. Slightly above trial average core length (3.9 inches). One of highest dry weights (7.4% on Sep 25) in the mid-season maturity class. ***Insect Damage:*** Thrips damage was below the trial average on Sep 15, but slightly above trial average on Sep 25. Notably, the only variety in the trial with no observable worm damage. Had 3.3% cabbage maggot damage in the heads at harvest.

B5-150 (Reed's Seeds). ✸ Mature on Sep 15, small splits observed on Sep 25. ***Plant Characteristics:*** Blueish-green with a hint of red; medium sized plants - one of smallest in trial. Good uniformity and slightly tipped growth habit with basal buds and minor downy mildew on lower frame leaves. ***Head Weight and Marketable Yield:*** Second smallest head weight (9.2 lb on Sep 15; 10.1 lb on Sep 25) and second lowest marketable yield (16.1 ton/acre on Sep 25) in the entire trial. Incidence of total splits increased significantly from Sep 15 and Sep 25 (0 to 69.7%). Had 19% and 0% rots; above trial average off-types (5%). ***Head Characteristics:*** Flat-round head shape – flattest in the entire trial. Yellowish-white interior color with thick leaves and loose outside. Second shortest core in the entire trial (3.0 inches). Highest dry weight (10.9% on Sep 15) in the entire trial. Had 20% incidence of tipburn. ***Insect Damage:*** One of the lowest thrips damage in the entire trial (depth = 0.2, 1.9; severity = 1.8). Worm damage was slightly above the trial average (rating = 1.3 out of 3). No cabbage maggot was observed.

Rotunda YR (Bejo). ✸✸✸½ Mature on Sep15, small splits observed on Sep 25. ***Plant Characteristics:*** Silverish-green large sized plants with good to very good uniformity and upright to slightly tipped growth habit. Minor alternaria leaf spot on lower frame leaves. ***Head Weight and***

Marketable Yield: Third largest head weight (12.4 lb on Sep 25) and marketable yield (20.0 ton/acre on Sep 25) in the mid-maturity class. Notably, no unmarketable heads or rots at optimum harvests (Sep 15 and 25), but incidence of small splits increased significantly from Sep 15 and Sep 25 (16.7 to 63.3%). Above trial average incidence of off-types (4.6%), which consisted of very small heads. ***Head Characteristics:*** Round head shape that comes to a point at the top with whitish-yellow to yellowish-white interior color. Narrow cores, some of them slanted; one of the longest core lengths in the trial (4.0 inches). Solid head, looked good! Average dry weight (7%). No tipburn was observed. ***Insect Damage:*** Had one of the highest levels of thrips damage (depth = 5.0, 4.6; severity = 1.8, 3.3) in the trial, which was more deep than it was severe. Slightly above trial average worm damage (rating = 1.3 out of 3). Had 3.3% incidence of cabbage maggot infestation in the heads at harvest.

Kaitlin YR (Bejo). ✸✸✸✸ Mature on Sep 15 and Sep 25. ***Plant Characteristics:*** Grayish-green medium-large to large sized plants with good to very good uniformity and upright to slightly tipped growth habit. ***Head Weight and Marketable Yield:*** Average head weight (11.9 lb on Sep 25) and slightly above average marketable yield (18.0 ton/acre on Sep 15; 19.2 ton/acre on Sep 25). Notably, there were no unmarketable heads at optimum harvests (Sep 15 and 25), although minor rots (3%) started to occur on Sep 25. Below trial average splits (small) and highest incidence of off-types (6.5%) in the mid-maturity class. ***Head Characteristics:*** Roundish, solid heads with thin leaves and yellowish-white to whitish-yellow internal color. Tastes sweet. One of the shortest core lengths in the trial (3.2 inches). Second highest dry weight (7.5% on Sep 15) in the mid-season class. No tipburn was observed. Looks really good! ***Insect Damage:*** Generally had below trial average thrips damage (depth = 7.1 (deeper than average), 2.6; severity = 1.5, 1.0). Average worm damage (rating = 1.2 out of 3). No cabbage maggot damage found.

B-2646 YR (Bejo). ✸✸✸ Almost mature on Sep 15, mature on Sep 25 and Oct 10. ***Plant Characteristics:*** Bluish-green large sized plants with upright to slightly tipped growth habit and basal buds. ***Head Weight and Marketable Yield:*** Average or below average head weight (12.0 lb on Sep 25; 12.4 lb on Oct 10) and average marketable yield (17.1, 18.1, 19.6 ton/acre). Zero, 6.7% and 2.1% unmarketable heads, due to large splits. Incidence of total splits increased significantly between Sep 15 and Sep 25 (8.8 to 30.7%). Notably, had less than 2% off-types (1.9%), which were tiny heads. ***Head Characteristics:*** Round shaped, solid heads which had one of the whitest internal color (whitish-yellow) in the trial. Slightly below trial average core length (3.5 inches). Average or slightly below trial average dry weight (7.1%, 6.9%). No tipburn was observed. Looked good! ***Insect Damage:*** Thrips damage (density = 2.7; severity = 1.2) was less than the trial average on Sep 25, but increased substantially after this time (density = 4.0, 4.5; severity = 1.3, 2.5). Above trial average worm damage (1.7 out of 3). No cabbage maggot damage found.

Puccini/NIZ 698 YR? (Vilmorin). ✸✸ Optimum maturity on Sep 25, slightly past maturity on Oct 10. ***Plant Characteristics:*** Grayish-green, medium-large to large sized plants with upright to slightly tipped growth habit, which was tipped in different directions. Had the least uniform growth habit in the trial with a rating of good to fair. Minor Alternaria leaf spot and black rot on lower frame leaves. ***Head Weight and Marketable Yield:*** Second largest head weight (13.2 lb) on Sep 25 in the mid-maturity class and the largest head weight (14.9 lb) on Oct 10. Second highest marketable yield (22.1 ton/acre on Oct 10) in the mid-maturity class. Consistently, had higher incidence of rot (Fusarium spp., but not the one that causes YR) than the trial average (6.7%, 3.3%, 8.3%). Below average total splits (6.7%, 3.3%, 9.4%). Above trial average incidence of off-types (5.6%) due to very small heads. ***Head Characteristics:*** Round to egg-shaped heads with very dense centers and curly leaf pattern. Had one of the whitest internal colors (whitish-yellow) and the shortest core

length (2.9 inches) in the entire trial. Average or below average dry weight (6.4%, 7.0%, 6.8%). Notably, had 22.2% incidence of tipburn. ***Insect Damage:*** Thrips damage tended to be more deep (depth = 4.4, 4.3, 3.8) than it was severe (severity = 1.4, 1.8, 1.7) and was consistently higher than the trial averages. Had significantly the most worm damage in the trial (rating = 2.7 out of 3). Had 2.0% incidence of cabbage maggot infestation in the heads at harvest.

Bobcat YR (Reed's Seeds). ★★★½ Almost ready Sep 15, held until Oct 10. ***Plant Characteristics:*** Green medium-large sized plants with very good uniformity, slightly tipped growth habit, basal buds and head abrasions. ***Head Weight and Marketable Yield:*** Had the third largest head weight (15.4 lb on Sep 25) and the highest marketable yield (24.9 ton/acre on Sep 25) in the entire trial. Above trial average marketable yield (22.0 ton/acre on Oct 10) in late class. Notably, had no unmarketable heads on Sep 15 and 25, the lowest incidence of total splits (0%, 0%, 2.6%) in the entire trial, no rots, and less than 2% off-types (1.4%). ***Head Characteristics:*** Round to round-flat head shape with yellowish-white to whitish-yellow interior color. Tends to be loose on the outside and had a sweet flavor. Below trial average dry weight (5.8%, 6.5%, 6.7%). Had 15.5% incidence of tipburn. ***Insect Damage:*** Notably, had the least thrips damage in the entire trial (depth = 0.3, 0.5, 0.0; severity = 0.4, 0.2, 0.0). Average worm damage (rating = 2 out of 3). No cabbage maggot damage.

Ambrosia/3198 (Seminis). ★★★½ Mature on Sep 25 and Oct 10. Seeded 11 days later, transplanted on the same day as other varieties. ***Plant Characteristics:*** Greenish-blue large to medium-large sized plants with very good uniformity and slightly tipped to tipped growth habit. Tipping occurred in the same direction. Minor black rot, Alternaria leaf spot and white necrosis on lower frame leaves. ***Head Weight and Marketable Yield:*** Average head weight (11.7 lb, 13.1 lb) and above trial average marketable yield (21.1 ton/acre on Oct 10). Lowest incidence of total splits (0%) in the entire trial. Notably, no rots and less than 2% off-types (1.1%). ***Head Characteristics:*** Round head shaped that is tapered at the base and comes to a point at the top. Yellowish-white internal color, hot taste, air spaces beside the core at the base of the head. Second longest core length in the trial (4.2 inches), cores sometimes slanted. Lowest dry weight (6.5%, 5.7%) in the late class. No tipburn was observed. ***Insect Damage:*** One of the lowest thrips damage in the entire trial (depth = 0.8, 2.1; severity = 0.3, 1.2). Lower than trial average worm damage (rating = 1 out of 3). No cabbage maggot damage.

Moreton YR (Reed's Seeds). ★★½ Mature on Sep 25 and Oct 10, split and rotten heads increased on Oct 10. ***Plant Characteristics:*** Bright green, large to very large sized plants with very good uniformity, upright to slightly tipped growth habit and minor downy mildew on the lower frame leaves. ***Head Weight and Marketable Yield:*** Slightly below average head weight (11.8 lb, 12.9 lb), above and below average marketable yield on Sep 25 (19.1 ton/acre) and Oct 10 (17.3 ton/acre), respectively. Unmarketable heads increased from 0% to 16.9% from Sep 25 to Oct 10 due splits and rots (due to Fusarium spp., but not the one that causes YR). Average incidence of off-types (3.9%). ***Head Characteristics:*** Roundish head shape that is tapered at the base, yellowish-white internal color, solid - looks good! Tastes good. Third longest core length in the trial (4.1 inches). Second lowest dry weight (6.6%, 6.7%) in the late class. Had 13.3% tipburn. ***Insect Damage:*** Had the highest thrips damage of the mid and late season varieties (depth = 6.6, 4.7; severity = 2.5, 2.9). Second lowest worm damage in the trial (rating = 0.3 out of 3). Had 3.3% incidence of cabbage maggot infestation in the heads at harvest.

Mandy YR (Bejo). ★★★½ Mature on Sep 25, held until Oct 26. ***Plant Characteristics:*** Green very large sized plants - one of the largest in the trial. Very good uniformity and upright to slightly

tipped growth habit (tipped in different directions). ***Head Weight and Marketable Yield:*** Below trial average head weight (106 lb, 12.4 lb, 12.6 lb) and above trial average marketable yield (20.7 ton/acre) only on Oct 26. Notably, there were no unmarketable heads, rots or off-types. Had consistently lower total splits than the trial average (0%, 2%, 12.6%). ***Head Characteristics:*** Round to flat-round head shape with air spaces near the core at the base of the head, and big veins at the bottom. Yellowish-white to whitish-yellow internal color; bland taste. Slightly below average core length (3.5 inches), wide cores. Above trial average dry weight (7.9% on Oct 10). No tipburn was observed. ***Insect Damage:*** One of the lowest thrips damage in the entire trial (depth = 2.1, 1.3, 1.5; severity = 1.0, 0.6, 0.9). Below trial average worm damage (rating = 0.8). No cabbage maggot damage.

Score YR (Bejo). ★★★½ Mature on Sep 25 to Oct 26. ***Plant Characteristics:*** Bright green large sized plants with good to very good uniformity and upright to slightly tipped (in the same direction) growth habit. ***Head Weight and Marketable Yield:*** Largest head weight (16.6 lb on Oct 26) and the second highest marketable yield in the entire trial (23.1 ton/acre on Oct 26). Unmarketable heads doubled from 6.7% to 12.5% from Oct 10 to Oct 26 due to an increase in split and rotted heads. Above average off-types (4.3%), which were very small heads. ***Head Characteristics:*** Roundish head shape, a little bit frilly on the outside. Yellowish-white internal color, bland taste. Third longest core length in the trial (4.1 inches). Average dry weight (7.0%). No tipburn was observed. ***Insect Damage:*** Above average thrips damage (depth = 4.2, 4.1, 4.3; severity = 2.0, 2.1, 2.1). Worm damage was higher than the trial average (rating = 1.5 out of 3). No cabbage maggot damage.

Hinova YR (Bejo). ★★★ Matured Oct 10 and did not hold. ***Plant Characteristics:*** Green, large sized plants with good to very good uniformity and upright to slightly tipped growth habit. Minor Alternaria leaf spot and downy mildew on lower leaves. ***Head Weight and Marketable Yield:*** Smallest head weight (10.6 lb on Oct 10; 11.6 lb on Oct 26) and lowest marketable yield (17.1 ton/acre on Oct 10) in late maturity class. Notably, there were no unmarketable heads with no rots and less than 2% off-types (0.6%). Slightly above trial average total splits (15.5%). ***Head Characteristics:*** Round-flat head shape, very solid and very good headfill. Whitest internal color in the entire trial. Tastes hot. Slightly shorter than trial average core length (3.6 inches). Second highest dry weight (8.2% on Sep 25 & Oct 10) in the entire trial. Had 6.7% tipburn. ***Insect Damage:*** Had the second most thrips damage (depth = 7.0; severity = 2.5), which was especially deep. Second lowest amount of worm damage in the trial (rating = 0.3 out of 3). No cabbage maggot damage.

B-2660 YR (Bejo). ★★★ Mature on Oct 10 and Oct 26. ***Plant Characteristics:*** Grayish-green, very large sized plants - one of the largest in the trial. Good uniformity (variable head sizes) and upright to slightly tipped (in different directions) growth habit. ***Head Weight and Marketable Yield:*** Second largest head weight (15.7 lb on Oct 26), and the third highest marketable yield (22.7 ton/acre on Oct 26) in the entire trial. Highest incidence of rot (5.1%, 10.3%) due to Fusarium spp. (not the one that causes YR) and white mold, in the late maturity class. Below trial average total splits (6.5%, 12.7%) and one the higher incidences of off-types (8.2%) in the trial. ***Head Characteristics:*** Round head shape with air spaces near the base. The only variety in the trial with a yellowish-green internal color. Longest core length in entire trial (4.3 inches). Third highest dry weight (8.0% on Oct 10) in the entire trial. No tipburn observed. ***Insect Damage:*** One of the lowest thrips damage in the entire trial (depth = 2.3, 2.0; severity = 1.0, 0.7). Slightly below trial average worm damage (rating = 1 out of 3). Had 2.2% cabbage maggot damage in the at harvest.

Table 2. Head size and estimated marketable yield, kraut cabbage variety trial, 2006. Entries listed in approximate order of maturity.

	Average head weight (lbs)					% unmarketable[1]					Estimated Marketable Yield (ton/acre)[2]				
Entry	***Sep 8***	***Sep 15***	***Sep 25***	***Oct 10***	***Oct 26***	***Sep 8***	***Sep 15***	***Sep 25***	***Oct 10***	***Oct 26***	***Sep 8***	***Sep 15***	***Sep 25***	***Oct 10***	***Oct 26***
1. B-2635	**13.6 a**[3]	**15.7 a**				11.1	73.3 a				**19.5 ab**	6.7 c			
2. Fresco	**12.3 ab**	**13.6 b**				**0.0**	**6.7 c**				**19.9 a**	**20.4 a**			
3. Tobia	**11.5** b-d	**13.6 b**				**0.0**	**6.7 c**				**18.5 a-c**	**20.9 a**			
4. B5-152		11.2 d-f	**12.1 b-e**				**0.0 c**	**0.0 c**				**18.1 a**	**19.5** c-d		
5. Superkraut 86	**11.7** a-c	**12.7** b-d	**14.6 a-c**			11.1	31.4 b	38.2 a			16.9 a-c	17.1 ab	14.2 d-f		
6. B-2658		8.6 g	9.7 g-f				**6.7 c**	16.7 b				13.0 b	13.1 ef		
7. B5-150		9.2 fg	10.1 c-f				17.3 bc	**0.5 c**				15.2 ab	16.1 c-f		
8. Rotunda	10.0 cd	11.3 c-f	**12.4 b-e**			**3.7**	**0.0 c**	**0.0 c**			15.6 bc	**18.2 a**	**20.0** b-d		
9. Kaitlin	9.3 d	11.1 d-f	11.9 b-e	12.4 d			**0.0 c**	**0.0 c**	8.3		15.1 c	**18.0 a**	**19.2** c-d	18.5	
10. B-2646		10.6 ef	**12.0 b-f**	12.4 cd			**0.0 c**	6.7 bc	**2.1**			17.2 ab	18.1 d-e	19.6	
11. Puccini	10.7 b-d	**12.9 bc**	**13.2 b-d**	**14.9 a**		10.4	**6.7 c**	**3.3 c**	8.3		15.7 bc	**19.3 a**	**20.6 bc**	**22.1**	
12. Bobcat		**12.1** b-e	**15.4 a**	**14.0 a-c**	**14.6 a-c**		**0.0 c**	**0.0 c**	**2.6**	16.2 ab		**19.5 a**	**24.9 a**	**22.0**	**20.5 ab**
13. Ambrosia		10.6 ef	11.7 c-f	**13.1 b-d**			**0.6 c**	**0.0 c**	**0.0**			17.1 ab	**18.8** b-d	**21.1**	
14. Moreton			11.8 b-f	12.9 b-d	13.5 b-d			**0.0 c**	16.9	31.6 a			**19.1** b-d	17.3	14.8 b
15. Mandy			10.6 c-f	12.4 d	12.6 cd			**0.0 c**	**0.0**	**0.0 b**			17.0 b-e	19.9	**20.7 a**
16. Score		**12.4** b-d	**13.0 cd**	**14.1 ab**	**16.6 a**		**3.7 c**	**3.0 c**	6.7	12.5 ab		**19.3 a**	**20.4 bc**	**21.2**	**23.1 a**
17. Hinova			9.3 g-f	10.6 e	11.6 d			**0.0 c**	**0.0**	**5.4 b**			15.1 b-f	17.1	17.8 ab
18. B-2660		11.9 c-e	**12.4** b-e	**13.9 a-d**	**15.7 ab**		**0.0 c**	6.7 bc	5.1	**10.3 ab**		**19.2 a**	**18.6** c-d	**21.3**	**22.7 a**
P Value	***0.0150***	***0.0000***	***0.0000***	***0.0021***	***0.0102***	***NS***	***0.0000***	***.00013***	***NS***	***NS***	***NS***	***0.0005***	***0.0001***	***NS***	***NS***
Trial Average[4]	***11.3***	***12.0***	***12.0***	***13.1***	***14.1***	***5.2***	***8.8***	***3.6***	***5.0***	***12.2***	***17.3***	***17.3***	***18.6***	***20.1***	***19.9***

[1]**% unmarketable** includes rots, large splits and multiple heads. [2]**Estimated marketable yield** is extrapolated from total weight of 5 sound heads in an area 7.5 x 3 feet^2 minus the % unmarketable. [3]underlined values indicate the best result per column; values in a column followed by the same letter are not significantly different, Fisher's Protected LSD Test (p> 0.05). **Bolded** values indicate performance that is equal to or better than the trial average. [4]**Trial average**: the average of all replicates for all varieties per harvest. Highlights indicate harvest when variety was at maturity.

Table 3. Field information including splits, rots and off types at harvest, kraut cabbage evaluation, 2006. Entries listed in approximate order of maturity.

	% total (large + small) split heads[1]					% rotted heads					% off types
Entry	***Sep-8***	***Sep 15***	***Sep 25***	***Oct 10***	***Oct 26***	***Sep-8***	***Sep 15***	***Sep 25***	***Oct 10***	***Oct 26***	
1. B-2635	44.4	70.0 ef[3]	94.3 a			**0.0**	10.0 b	**0.0**			**0.0**
2. Fresco	51.1	60.0 d-f				**0.0**	**0.0 c**				8.3
3. Tobia	**14.1**[2]	36.7 a-e	61.9 bc			**0.0**	**0.0 c**	**0.0**			10.2
4. B5-152		**0.0 a-c**					**0.0 c**				**0.0**
5. Superkraut 86	43.7	46.7 fe	56.0 bc			3.7	**0.0 c**	**0.0**			8.5
6. B-2658		**15.9** a-e	41.9 cd					**0.0**			5.2
7. B5-150		**0.0 a-c**	69.7 ab				19.0 a	**0.0**			5.0
8. Rotunda	**0.0**	**16.7 a-e**	63.3 b			**0.0**	**0.0 c**	**0.0**			4.6
9. Kaitlin		**18.8 a-e**	**10.0 e**	23.7 ab			**0.0 c**	3.0	**0.0 c**		6.5
10. B-2646		**8.8 a-d**	30.7 d	36.9 a			**0.0 c**	**0.0**	**0.0 c**		**1.9**
11. Puccini	**6.7**	**6.7 a-c**	**3.3 e**	**9.4 b-f**		7.0	6.7 b	3.3	8.3 b		5.6
12. Bobcat		**0.0 a-c**	**0.0 e**	**2.6 d-f**	32.5		**0.0 c**	**0.0**	**0.0 c**	13.2	**1.4**
13. Ambrosia		**3.8 a-c**	**0.0 e**	**0.0 f**			**0.0 c**	**0.0**	**0.0 c**		**1.1**
14. Moreton			**0.0 e**	16.9 bc	**21.1**			**0.0**	16.9 a	31.6	**3.9**
15. Mandy			**0.0 e**	**2.0 ef**	**12.6**			**0.0**	**0.0 c**	**0.0**	**0.0**
16. Score		**14.6** a-d	**6.4 e**	16.7 b-d	**12.5**		**0.0 c**	**0.0**	**0.0 c**	12.5	4.3
17. Hinova			**10.0 e**	15.5 b-e	39.7				**0.0 c**	**5.3**	**0.6**
18. B-2660		**0.0 a-c**	**0.0 e**	**6.5 c-f**	**12.7**		**0.0 c**	3.3	5.1 bc	**10.3**	8.2
P Value	***NS***	***0.0002***	***0.0000***	***0.0009***	***NS***	***NS***	***0.0002***	***NS***	***0.0052***	***NS***	
Trial Average[4]	***30.1***	***19.6***	***21.6***	***13.0***	***27.8***	***1.6***	***1.6***	***0.7***	***3.0***	***12.2***	***3.9***

[1]**% split heads** at harvest includes small and large splits, only large splits are considered unmarketable. [2]underlined values indicate the best result per column. **Bolded** values indicate performance that is equal to or better than the trial average. [3]values in a column followed by the same letter are not significantly different, Fisher's Protected LSD Test (p> 0.05). [4]***Trial average:*** the average of all replicates for all varieties per harvest. Compare performance of individual varieties to trial average. Highlights indicate harvest when variety was mature.

Table 4. Plant, head and internal characteristics of kraut cabbage varieties, 2006. Entries listed in approximate order of maturity.

	Plant Characteristics			Head Characteristics		Internal Characteristics				% dry weight		
Entry	**Size[1]**	**Uniformity[2]**	**Growth Habit[3]**	**Head Shape[4]**	**Roundness[5] W-L (cm)**	**Core length[5] (inches)**	**% tipburn[6]**	**% cabbage maggot[6]**	**Internal color[7]**	**Sep 15**	**Sep 25**	**Oct 10**
1. B-2635	ML	VG-E*	ST	R	**(0.1) ab[8]**	4.3 a	0.0	20.0	WY	5.5 e		**7.2 a**
2. Fresco	M	VG-G	ST	R	**(0.2) a**	**3.5 de**	0.0	0.0	WY	6.5 b-d		
3. Tobia	ML	VG	ST	Rpt	**0.5 ab**	4.1 a	0.0	10.0	YW Yc	6.4 c-e		
4. B5-152	L	G	T-ST*	FR	3.2 fg	**3.6 cd**	63.3	0.0	YW Yc	**7.1 bc**	**7.5**	**8.3 a**
5. Superkraut 86	ML	VG	U-ST	RF	2.6 d-g	**3.6 b-d**	70.0	0.0	YW	**6.7 b-d**	6.7	
6. B-2658	M	VG-E	U	R-RF*	3.4 g	3.9 a-d	0.0	3.3	YW	**7.1 ab**	**7.4**	
7. B5-150	M	G	ST	FR	6.4 h	**3.0 ef**	20.0	0.0	YW	**10.9**	**7.3**	
8. Rotunda	L	G-VG	U-ST	R – Rpt	**0.4 ab**	4.0 a-c	0.0	3.3	WY-YW*	**7.0 bc**	**7.0**	
9. Kaitlin	ML-L	G-VG	U-ST	R	1.8 cd	**3.2 ef**	0.0	0.0	YW-WY	**7.5 b**	6.9	**7.4 a**
10. B-2646	L	G	U-ST	R	1.9 d	**3.5 de**	0.0	0.0	WY	6.5 b-e	**7.1**	6.9 ab
11. Puccini	ML-L	G-F	U-ST	R-RE	**(0.3) a**	**2.9 f**	22.2	2.0	WY	6.4 c-e	**7.0**	6.8 ab
12. Bobcat	ML	VG	ST	R-RF	2.9 eg	**3.6 b-d**	15.5	0.0	YW-WY	5.8 de	6.5	6.7 ab
13. Ambrosia	L-ML	VG	ST-T	Rpt	**0.5 ab**	4.2 a	0.0	0.0	YW	6.3 c-e	6.5	5.7 b
14. Moreton	L-VL	VG	U-ST	R	**0.8 bc**	4.1 a	13.3	3.3	YW		6.6	6.7 ab
15. Mandy	VL	VG	U-ST	R-RF	2.4 d-f	**3.5 de**	0.0	0.0	YW-WY		**7.1**	**7.9 a**
16. Score	L-VL	G-VG	ST	R	2.1 de	4.1 ab	0.0	0.0	YW	**7.1 bc**	**7.0**	
17. Hinova	L	G-VG	U-ST	RF	1.7 cd	**3.6 cd**	6.7	0.0	WWY		**8.2**	**8.2 a**
18. B-2660	VL	G	U-ST	R	**1.6 cd**	4.3 a	0.0	2.2	YW (YG)	**6.7 b-d**	6.9	**8.0 a**
P Value					***0.0000***	***0.0000***				***0.0001***	***NS***	***.0165***
Trial Average[9]					***1.6***	***3.7***				***6.7***	***7.0***	***7.2***

[1]**Plant Size: M** = medium; **ML** = medium-large; **L** = large; **VL** = very large. [2]**Uniformity**: **E** = excellent; **VG** = very good; **G** = good; **F** = fair; **P** = poor. [3]**Growth habit: U** = upright; **ST** = slightly tipped; **T** = tipped. [4]**Head shape: R** = round; **Rpt** = round with a point; **RF** = round-flat; **FR** = flat – round (i.e. more flat than round); **E** = egg shaped. [5]**Roundness:** width minus length. Values closest to zero are the most perfectly round, ( ) indicate that a head is taller than it is wide, all other values indicate heads are wider than they are tall. Roundness and **core length** reported from harvest with the highest marketable yield per variety. [6]**% tipburn and cabbage maggot** of all heads evaluated over multiple harvests. [7]**internal color: W** = white; **WY** = white-yellow; **YW** = yellow-white (i.e. more yellow than white); **YG** = yellow-green; **Yc** = yellow center. [8]values followed by the same letter in a column are not significantly different, Fisher's Protected LSD test (p>0.05). underlined values indicate the best result per column; **bolded** values indicate a result equal to or better than the trial average. [9]***trial average:*** the average of all replicates for all varieties per harvest. Compare performance of individual varieties to trial average. * For hyphenated descriptions, the first entry is more dominant (eg. ML-L means that plant size is more ML than L). Highlights indicate optimal harvest of variety.

Table 5. Onion thrips and worm damage at harvest, kraut cabbage variety evaluation, 2006. Entries listed in approximate order of maturity.

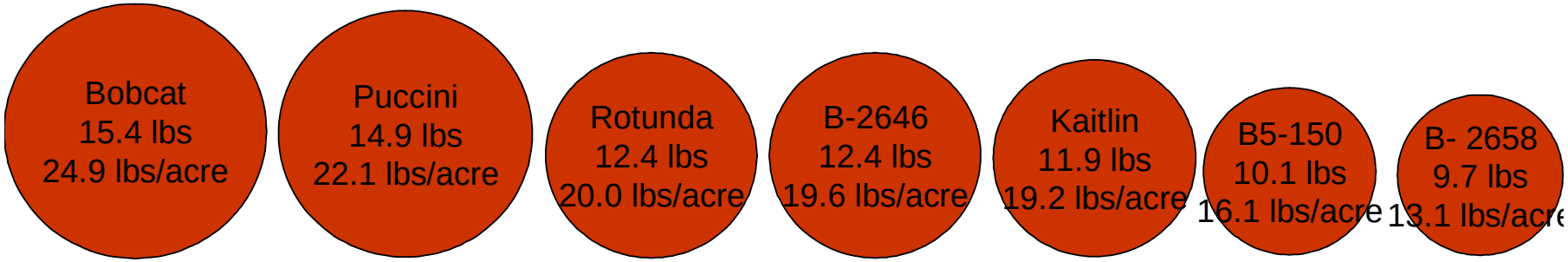
Entry	Sep 8		Sep 15			Sep 25		Oct 10		Oct 26	
	Depth[1]	*Severity*[2]	*depth*[1]	*severity*[2]	*Worm rating*[3]	*depth*[1]	*severity*[2]	*depth*[1]	*severity*[2]	*depth*[1]	*severity*[2]
1. B-2635	6.8	4.3	10.4 a	3.8 a	1.8 b						
2. Fresco	**2.6**	**2.3**	**2.6 d-h**[4]	**1.4 c-e**	1.7 bc						
3. Tobia	5.3	**2.4**	6.3 bc	2.9 b	1.3 b-d						
4. B5-152			**0.5 h**		1.5 b-d	**0.1 f**	**0.1 g**				
5. Superkraut 86	**3.7**	**1.9**	4.6 c-e	1.8 c	**0.8 de**	3.6 c	**0.9 ef**				
6. B-2658			**1.9 f-h**	**0.9 f-h**	**0.0 f**	3.1 cd	1.5 c-e				
7. B5-150			**0.2 h**		1.3 b-d	**1.8 de**	1.8 cd				
8. Rotunda	5.0	**2.6**	5.0 b-d	1.8 c	1.3 b-d	4.6 b	3.3 a				
9. Kaitlin			7.1 b	**1.5 cd**	**1.2 b-d**	**2.6 d**	**1.0 e**	4.5 b	1.9 bc		
10. B-2646			**2.7 d-g**	**1.2 d-g**	1.7 bc	4.0 bc	1.3 de	4.5 b	2.5 ab		
11. Puccini	**3.6**	**1.6**	4.4 c-e	**1.4 c-f**	2.7 a	4.3 b	1.8 cd	3.8 b	1.7 cd		
12. Bobcat			**0.3 h**	**0.4 h**	**1.2 b-d**	**0.5 f**	**0.2 g**	**0.0 d**	**0.0 f**	**0.6 c**	**0.9 b**
13. Ambrosia			**1.6 gh**	**0.9 e-g**	**1.0 c-e**	**0.8 f**	**0.3 g**	**2.1 c**	**1.2 de**		
14. Moreton					**0.3 ef**	6.6 a	2.5 b	4.7 b	2.9 a	5.5 a	2.4 a
15. Mandy					**0.8 de**	**2.1 de**	**1.0 ef**	**1.3 cd**	**0.6 ef**	**1.5 bc**	**0.9 b**
16. Score			4.2 c-f	1.7 cd	1.5 b-d	4.2 bc	2.0 bc	4.1 b	2.1 bc	4.3 a	2.1 a
17. Hinova					**0.3 ef**	4.2 bc	**0.9 ef**	7.0 a	2.5 ab	5.5 a	2.1 a
18. B-2660			**2.4 e-h**	**0.8 gh**	**1.0 c-e**	**1.0 ef**	**0.4 fg**	**2.3 c**	**1.0 e**	**2.0 b**	**0.7 b**
P Value	***na***	***na***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0003***
Trial Average[5]	***4.5***	***2.6***	***3.8***	***1.5***	***1.2***	***2.9***	***1.2***	***3.4***	***1.6***	***3.2***	***1.5***

[1]**depth of Onion thrips damage:** number of layers affected. [2]**severity of onion thrips damage:** scale of 0 - 5, 0 = no thrips, 1 = low; 3 = commercially acceptable, 5 = really bad. [3]**worm rating:** scale of 0 – 3; 0 = no worms, 1 = a few worm holes, 2 = moderate, 3 = a lot, including the head. [4]values followed by the same letter in a column are not significantly different, Fisher's Protected LSD test (p>0.05). underlined values indicate the best result per column; **bolded** values indicate a result equal to or better than the trial average. [5]***trial average:*** the average of all replicates for all varieties per harvest. Compare performance of individual varieties to trial average. Highlights indicate harvest when varieties are mature.

Scaled diagram of kraut cabbage varieties at optimum harvest (i.e. highest marketable yield), scaled to average head weight, in order of marketable yield per maturity class.

Early Class

Mid-Class



Late Class