

HORTICULTURE DIGEST

Department of Horticulture
University of Hawaii

Cooperative Extension Service
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HAWAIIAN SUPERSWEET NO. 9

A new supersweet corn was released to growers at the time of the 1976 Corn Field Day at the Waimanalo Research Station by Dr. J.L. Brewbaker. The new variety is an open-pollinated corn from which growers can save their own seeds, if desired, and has been named "Hawaiian Supersweet No. 9." It is the ninth in a series of supersweets released to growers, among about 40 varieties in breeding at HAES. It is based on a gene, brittle-1, heretofore unused in breeding sweet corns. When crossed to sweet or supersweet corns, or to any other type of corn, it becomes field corn, due to the recessive nature of the brittle gene.

Hawaiian Supersweet No. 9 remains sweet for a long time during maturity, and retains sweetness much longer following harvest than sweet corn; it is comparatively tender and uniform. Plants are 8 feet tall with ears at 3 feet, strongly rooted, with a field-corn appearance, and with no red color in plant, tassel or silk. Ears are large, to 7 inches, covered by many long husks and with good earworm resistance. Plants resist maize mosaic virus, rust, and common stalk and ear

rots in Hawaii, and yields and consumer acceptance have been among the best for supersweet varieties. Seeds are collapsed, yellow, and relatively large (3300 to a pound), and should be dried thoroughly and stored in moisture-free place, preferably cooled.

James L. Brewbaker, Horticulturist

CUCUMBER VARIETY TRIAL

Several new cucumber cultivars were evaluated in yield trials at the Waimanalo Research Station in September 1976. Testing of new cucumber cultivars from seed companies is an important part of Dr. J.C. Gilbert's cucumber breeding program. All the cultivars in this trial were described as mosaic resistant in seed catalogues, but many were found to be very susceptible to the mosaic viruses present in Hawaii. Since watermelon mosaic virus (WMV) is a serious problem affecting cucumber production in Hawaii, a trial was included to determine whether any of the cultivars were resistant to the virus. One trial was artificially inoculated with WMV and an identical trial was not inoculated. Comparative yields were taken from both trials. Two widely grown cultivars, Lehua Hybrid and Burpee Hybrid, were included in the trials as standards of comparison. Maile, and inbred line, was also included in the trials. Lehua and Maile are resistant to WMV and were developed by Dr. Gilbert. Sweet Slice and New Market No. 2 were found to be resistant to WMV in the inoculated trial. New Market No. 3 showed good tolerance to the virus. Lehua Hybrid was found to have tolerance instead of resistance to the virus. This may be due to faulty pollination control measures by the seed firm making this hybrid. All of the other hybrids were susceptible to WMV and their yields were greatly reduced by the presence of the virus. The harvest period for the inoculated trial was 1 month.

The un-inoculated trial provided yield and other information of the cucumber cultivars in absence of the virus. The yields of most of the cultivars were quite comparable to each other. New Market No. 3 and Sweet Slice were the top producers while Maile and Muncher were the low producers in this trial. Information on fruit color, taste, texture and other comments were also taken for each cultivar.

Dr. Gilbert intends to develop Maile into a hybrid. Generally, hybrids are more prolific than inbreds. This breeding program with Maile also involves resistance or tolerance to powdery mildew and other diseases as well as watermelon mosaic virus.

James C. Gilbert, Horticulturist
Kenneth Y. Takeda
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VOLCANO HEAD LETTUCE RESULTS

Results of 25 head lettuce trials were run at the Volcano Farm from 1963 to 1975 have been summarized and submitted for publication as Hawaii Agricultural Experiment Station Research Report No. 170. Many of the total of 66 cultivars perform well in the summer, or during relatively dry periods in the winter. However, very few if any cultivars produce well under the most severe rainfall conditions sometimes encountered in this area in the winter. The cultivars which yielded the most in at least 4 trials were Vanguard, Climax, Premier Great Lakes, Phoenix, Great Lakes 54, Valrio, Imperial 101, Emerald Great Lakes, Great Lakes Shippers Strain, Golden State D, Early Great Lakes, and Primavera. Vanguard was a cultivar which did quite well in one very poor winter trial and warrants further testing.

Richard W. Hartmann, Horticulturist
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TABLE 1. Performance of Commercial Cucumber Cultivars Inoculated with Watermelon Mosaic Virus (WMV) in a Replicated Yield Trial at the Waimanalo Research Station, September 1976.

| Cultivars | Seed Source | Reaction to WMV | No. of Off-Grade Fruit* | Wt. of Off-Grade Fruit* | No. of No. 1 Fruit* | Wt. of No. 1 Fruit* | Yield of Marketable Fruit/Acre |
|-----------------|-------------|-----------------|-------------------------|-------------------------|---------------------|---------------------|--------------------------------|
| Lehua | 1 | Tolerant | 101 | 58.0 | 177 | 120.3 | 21,574.3 |
| Victory | 2 | Susceptible | 154 | 87.4 | 54 | 35.4 | 14,858.8 |
| Muncher | 3 | Susceptible | 102 | 58.8 | 52 | 30.1 | 10,756.9 |
| Tenderflesh | 3 | Susceptible | 130 | 61.0 | 69 | 40.9 | 12,329.9 |
| Sweet Slice | 2 | Resistant | 125 | 87.4 | 185 | 153.0 | 29,088.4 |
| Slice Master | 2 | Susceptible | 120 | 63.0 | 58 | 40.2 | 12,487.2 |
| XP-80 | 4 | Susceptible | 103 | 56.8 | 52 | 35.1 | 11,119.9 |
| Belle Aire | 4 | Susceptible | 136 | 77.6 | 71 | 44.2 | 14,737.8 |
| Maile** | 1 | Resistant | 44 | 29.6 | 123 | 96.3 | 15,233.9 |
| Burpee Hybrid | 5 | Susceptible | 76 | 48.3 | 12 | 8.5 | 6,872.8 |
| New Market No.2 | 6 | Resistant | 72 | 53.9 | 135 | 115.4 | 20,485.3 |
| New Market No.3 | 6 | Tolerant | 76 | 55.1 | 173 | 157.8 | 25,760.9 |

*Fruit number and weight are from 3 replications of 30 foot rows spaced 4 feet apart. Harvest period was 1 month.

**One replicate was injured by herbicide residue.

- Seed:
1. Dept. of Horticulture
University of Hawaii
Honolulu, HI 96822
 2. Petoseed Co., Inc.
P.O. Box 4206
Saticoy, CA 93003
 3. Hollar & Co., Inc.
P.O. Box 106
Rocky Ford, CO 81067

4. Agway Inc. Seed Division
Box 1333
Syracuse, N.Y. 13201
5. W. Atlee Burpee Co.
Warminster, PA 18974
6. Known-You Nursery & Seed Prod. Co., Ltd.
154 Chung Shan 2nd Road
Kaohsiung, Taiwan
Republic of China

TABLE 2. Performance of Commercial Cucumber Cultivars Not Exposed fo Watermelon Mosaic Virus (WMV) in a Replicated Yield Trial at the Waimanalo Research Station, September 1976.

| Cultivar | Fruit Length | Taste | Color | Texture | Comments | No. of Off-Grade Fruit* | Wt. of Off-Grade Fruit* | No. of No. 1 Fruit* | Wt. of No. 1 Fruit* | Yield of Marketable Fruit/Acre |
|------------------|--------------|----------------------|-------|---------|----------|-------------------------|-------------------------|---------------------|---------------------|--------------------------------|
| Lehua | 8-10" | 3 | 3 | 1 | 1 | 146 | 88.6 | 465 | 331.2 | 50,795.8 |
| Victory | 6-8" | 4 | 1 | 1 | 2 | 125 | 88.4 | 418 | 291.7 | 45,992.1 |
| Muncher | 6-8" | 2 | 2 | 2 | 3 | 198 | 98.3 | 363 | 209.9 | 37,280.1 |
| Tenderflesh | 4-6" | 1 | 2 | 2 | 3 | 312 | 168.3 | 421 | 207.2 | 45,435.5 |
| Sweet Slice | 10-12" | 3 (unique flavor) | 2 | 4 | 1 | 123 | 116.4 | 443 | 386.1 | 60,802.5 |
| Slice Master | 8-10" | 4 | 1 | 1 | 2 | 135 | 78.2 | 569 | 374.7 | 54,800.9 |
| XP-80 | 8-10" | 2 | 3 | 1 | 2 | 180 | 102.5 | 541 | 365.9 | 56,555.4 |
| Belle Aire | 6-8" | 5 | 1 | 1 | 1 | 103 | 69.3 | 533 | 378.3 | 54,159.6 |
| Maile** | 8-10" | 5 | 3 | 3 | 4 | 151 | 88.6 | 304 | 220.5 | 37,401.1 |
| Burpee Hybrid | 8-10" | 6 | 1 | 4 | 1 | 148 | 107.5 | 389 | 308.7 | 50,360.2 |
| New Market No. 2 | 10-12" | 5 | 3 | 3 | 1 | 162 | 132.3 | 344 | 321.5 | 54,909.8 |
| New Market No. 3 | 12-14" | 5 | 2 | 3 | 1 | 137 | 117.4 | 472 | 413.2 | 64,202.6 |

* Fruit number and weight are from 3 replications of 30 foot rows spaced 4 feet apart. Harvest period was 6 weeks.

** Maile is an inbred line; all others are hybrids.

Taste

- 1. Bitter
- 2. Poor
- 3. Fair
- 4. Average
- 5. Good
- 6. Very Good

Color

- 1. Stippled (like Burpee)
- 2. Light green
- 3. Dark green

Texture

- 1. Soft
- 2. Fairly crisp
- 3. Crisp
- 4. Very crisp

Comments

- 1. Jumbos
- 2. Does not jumbo
- 3. Black spined
- 4. Some jumbo and some pollination problem

EVALUATION OF LETTUCE VARIETIES FOR RESISTANCE TO BACTERIAL SOFT ROT

Bacterial soft rot referred to by some as "butt rot" or "jelly butt" accounts for the major losses in head lettuce production in the state. Losses due to bacterial soft rot of 10-15% can occur during summer months and may be as high as 75% during the wet spring months.

A trial was initiated in February 1976, at the Maui Branch Station, to screen several crisphead type lettuce varieties for resistance to bacterial soft rot. A total of 35 varieties were evaluated for resistance and adaptability to the growing conditions in Kula. Diseased heads were incorporated in the soil prior to transplanting, in order to obtain a uniform infection in the test plot.

Results

Several head lettuce varieties appeared tolerant to bacterial soft rot. The results are summarized in the following table. The tolerant varieties included: Empire, Ithaca, Vanmax, Weslake, Vanguard, King Crown, Fulton, Minetto, and Vangara. Also Fordhook, a semihead type lettuce, was very tolerant to the soft rot. Two of the tolerant varieties, Minetto and Ithaca, were lower in average head weight compared to other tolerant varieties.

Calmar and Mesa 659 are currently planted as the major varieties on Maui. These varieties were included in this trial and will be included in subsequent trials as reference points to compare with new varieties in respect to rot and adaptability. Both Calmar and Mesa 659 were very susceptible to bacterial soft rot in this trial. Rot accounted for 63.4% loss in the case of Calmar and 55.8% for Mesa 659.

Evaluations were also made on the percentage of plants infected with lettuce mosaic. Lettuce mosaic is seed transmitted. These infected plants serve as a source of virus for aphid transmission to healthy plants. Mosaic tested seed is available through most seed companies upon request.

Future Work

The results of this trial looks very promising in respect to the control of the bacterial soft rot problem of head lettuce. Future trials will be conducted for evaluating rot incidence, adaptability to seasons, and market acceptability for those varieties which show tolerance. Also three lettuce mosaic resistant varieties, Salinas, Mon-

terey, and Vanguard 75, developed by Dr. E. Ryder, (USDA), will be evaluated for Hawaii's mosaic virus strains. Through the use of chemical applications, especially copper compounds (i.e., Kocide 101, and tribasic copper sulfate), in combination with growing varieties tolerant to bacterial soft rot, we hope to achieve acceptable disease control so that head lettuce production within the state can be increased to make Hawaii self sufficient.

John J. Cho
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NEW MULTIPLE RESISTANT TOMATO F₁ HYBRIDS N91 AND N93

Tomato hybrids N91 and N93 were developed at the Hawaii Agricultural Experiment Station specifically for improved resistance to tobacco mosaic virus, good fruit flavor, good fruit set at low or medium elevations, shorter internode length to allow fruit clusters closer together than N52 or 65 under some conditions, and retention of all the other types of disease resistant previously incorporated into hybrids N52, N57, N65 and N69. These include resistance to common strains of *Fusarium* wilt, spotted wilt virus (gene SW-9), grey leaf spot fungus (*Stemphylium solani*), southern root knot nematodes, *Cladosporium* leaf mold, some *Alternaria* diseases, and several others, in addition to the tobacco mosaic virus resistance. It is not claimed that *all* strains of the various pathogens are included in this list as it is quite rare for any disease resistant new variety to remain 100% safe from showing symptoms when attacked occasionally by an unusual or super-virulent new strain of any particular disease. However, the chances of escaping trouble from any of these diseases should be greatly improved by the use of either hybrid N91 or N93 under climatic conditions to which they are adapted. They are not recommended for cold, low light intensity areas, (at higher elevations).

Most of the disease resistance, including virus resistance, as well as the heavy fruit set and short internode characters were obtained by the tomato breeding project at the HAES in the parental lines Hawaii 7990 and 7992. These are determinate type plants and were crossed with STEP 390 from Florida to add leaf mold and *Alternaria* resistance plus the Sp__ gene for indeterminate plant habit so they would grow tall enough for

Comparison of head lettuce varieties in respect to tolerance to bacterial soft rot, incidence of mosaic, and size. The figures represent the average of 4 replications.

| Variety | Seed Source | Avg. % Butt Rot | Avg. % Mkt. | Avg. Hd. Wt. (lbs) | % Mosaic | Days to Harvest |
|---------------------|-----------------|-----------------|-------------|--------------------|----------|--------------------|
| Climax | Ferry-Morse | 79.0 | 15.4 | 2.02 | 15.4 | 40 ^a |
| Fairton | Ferry-Morse | 60.6 | 33.7 | 1.65 | 12.5 | 40 |
| Empire | Ferry-Morse | 11.5 | 67.0 | 2.01 | 20.4 | 40 |
| Ithaca | Ferry-Morse | 15.4 | 67.3 | 1.85 | 15.4 | 40 |
| Montemar | Ferry-Morse | 59.6 | 32.7 | 1.97 | 10.6 | 40 |
| Super 59 | Ferry-Morse | 66.4 | 23.1 | 1.79 | 14.4 | 40 |
| Vanmax | Ferry-Morse | 14.4 | 66.3 | 2.17 | 25.0 | 47 ^b |
| Weslake | Ferry-Morse | 23.1 | 65.4 | 2.17 | 18.5 | 47 |
| Fordhook | Burpee | 3.6 | 89.2 | 1.87 | 0 | 40 |
| Premier | Burpee | 43.3 | 41.4 | 2.12 | 20.2 | 47 |
| Great Lakes | Burpee | 62.5 | 27.9 | 2.07 | 20.2 | 47 |
| Vanguard | Asgrow | 14.8 | 52.9 | 2.22 | 30.8 | 47 |
| Great Lakes 659-700 | Asgrow | 61.6 | 33.7 | 1.74 | 9.6 | 40 |
| Belleverde | Keystone | 74.0 | 17.3 | 1.74 | 7.7 | 40 |
| Carmelo | Harris | 45.2 | 37.5 | 1.86 | 21.1 | 40-47 ^c |
| Mesa 659 | Harris | 55.8 | 35.6 | 1.72 | 14.4 | 40 |
| 533 Pennlake | Harris | 40.4 | 46.2 | 2.09 | 16.4 | 40 |
| Phoenix | Desert | 27.9 | 52.9 | 1.86 | 26.9 | 40 |
| Merit | Desert | 49.1 | 40.4 | 2.04 | 14.4 | 40-47 |
| Great Lakes 407 | Desert | 84.6 | 7.7 | 1.98 | 11.5 | 40 |
| Highland | Takii | 54.8 | 29.8 | 2.01 | 15.4 | 40 |
| Alpen | Takii | 56.7 | 33.7 | 2.10 | 16.4 | 40 |
| Mart Ace | Takii | 58.7 | 30.8 | 2.17 | 10.6 | 40-47 |
| Pennlake | Takii | 43.3 | 36.6 | 2.02 | 27.9 | 40 |
| King Crown | Sakata | 10.6 | 62.5 | 2.22 | 28.9 | 40 |
| Queen Crown | Sakata | 68.3 | 26.0 | 1.90 | 5.8 | 40 |
| Great Lakes B | Pieters Wheeler | 84.6 | 11.5 | 1.59 | 7.7 | 40 |
| Fulton | Holmes | 12.5 | 62.5 | 2.05 | 26.0 | 40 |
| Minetto | Holmes | 14.4 | 64.3 | 1.80 | 21.2 | 40 |
| Golden State D | USDA | 78.9 | 11.5 | 1.86 | 11.5 | 40 |
| Calmar | USDA | 63.4 | 25.0 | 2.27 | 14.4 | 40 |
| Great Lakes 54 | USDA | 76.0 | 16.3 | 2.17 | 15.4 | 40-47 |
| Great Lakes R200 | USDA | 66.3 | 26.9 | 1.80 | 10.6 | 40 |
| Great Lakes 65 | USDA | 93.3 | 4.5 | 1.80 | 4.8 | ? ^d |
| Vanagara | FMC | 26.0 | 50.5 | 2.13 | 22.4 | 47 |

- ^a Majority of heads maturing after 40 days
- ^b Majority of heads maturing after 47 days
- ^c Half maturing after 40 days and other half after 47 days
- ^d Too much rot to allow size evaluation

pruning and staking. The first hybrids of this type made in the Department of Horticulture here were all tall plants and true to type but a subsequent commercially increased hybrid seed lot has shown a mixture of tall and short (determinate) plants. We have now traced this variation in plant height to the STEP 390 stock used as one parent in making this particular lot of seed. All STEP 390 plants were originally indeterminate but this lot was found to contain some determinate plants, resulting in mixed plant height among the hybrids. This parental stock is now being re-selected for the *SpSp* indeterminate (dominant) gene so that a more uniform seed lot of these hybrids can be produced in the future. This whole process, including the seed increase work will take 2-3 years, but in the meantime, the present stock of these hybrids will continue to supply the disease resistance described since the 7990 and 7992 parents were uniform for these genes.

James C. Gilbert, Horticulturist

PROPER MANAGEMENT TO MAINTAIN THE RESISTANCE OF THE TOBACCO MOSAIC VIRUS (TMV) RESISTANT TOMATO

Dr. J.C. Gilbert, through many years of tomato breeding for multiple disease resistance has included tomatoes resistant to all the major strains of tobacco mosaic virus. TMV resistance is present in the N-91 and N-93 hybrids and other advanced tomato lines. A common practice that

many growers utilize in testing new tomato varieties is to interplant these in their tomato crop. This practice does provide excellent comparisons between the new and old varieties but it also increases the possibility that a breakdown of resistance will occur. For example, if TMV resistant varieties are planted among TMV infected tomato plants, there is a greater chance that new strains of the virus may develop through mutation. Dr. Gilbert reports that this has occurred once in his breeding nursery when TMV infected N-52 plants and TMV resistant plants were grown side by side. Fortunately, this new mutant or strain was isolated and discarded.

The best method to plant these new TMV resistant varieties and hybrids is to locate them in a section of the field or greenhouse and not grown together touching the non-resistant varieties. By using this procedure, the new TMV resistance should be good for many years.

The advantage of a high level of resistance to several strains of TMV lies in its protection against early infection of the crop which is very destructive to yield. A further advantage of this virus resistance shows up in old plantings where healthy plants can continue to bear marketable fruits in acceptable fashion. If infected with this virus, they become relatively unproductive. This applies particularly to pruning and staking types grown for longer harvest periods.

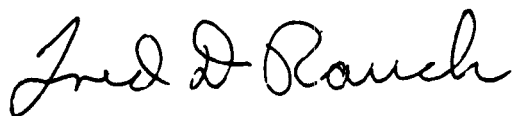
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Note

The use of trade names is for the convenience of readers only and does not constitute an endorsement of these products by the University of Hawaii, The College of Tropical Agriculture, the Hawaii Cooperative Extension Service, and their employees.



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