

# VEGETABLE CROPS UPDATE

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## Letters from Molokai

*Results from cultivar and cultural trials with vegetable crops conducted at the Molokai Applied Research and Demonstration Farm.*

*Alton Arakaki and Hector Valenzuela*

### Overview

Cultivar and cultural trials with horticultural crops are conducted on an ongoing basis at the Molokai Applied Research and Demonstration Farm by University of Hawaii Cooperative Extension Agents. Results are reported through field days and extension leaflets distributed to local producers. However, the results of some of these trials are applicable to producers state-wide, especially for those growing vegetables in areas with environmental conditions similar to those found in Molokai. For more information on any of these trials please contact Alton Arakaki, CES Molokai at 808-567-6833, or H. Valenzuela, UH Manoa at 808-956-7903.

### Cucumber variety trials in Molokai

Alton Arakaki and Hector Valenzuela

**Spring 1987.** Trials were conducted to evaluate slicing cucumber production during the Spring growing season in Molokai. All trials were conducted at the Molokai Applied Research and Demonstration Farm. For the first trial cucumber was seeded on Feb. 17, transplanted on March 9 and harvested from April 4 to May 12, 1987. Plant spacing was 1 ft between plants in the row and 5 ft between rows for a final 8,680 plants/Acre density. The crop received 1000 lbs/Acre 10-30-10 at pre-plant and was post-plant fertigated with 10-18 lbs/Acre of 12-26-26 every other week up to the 4th week of harvest. The trial consisted of three replications under trellis- and one replication under ground-culture. Varieties used are listed in Table Cu-1, and trial results in Tables Cu-2 (trellis) and Cu-3 (ground culture).

The top three yielding cultivars during the month long harvest for the trellised trials were 'AC #1810', the UH variety 'Ohia', and 'Slicenice'. All yielded over 75,000 lbs/Acre at populations of 8,680 plants/Acre. Percent Grade A Fruits were over 55% for these three varieties while percentage of OGs or culls was below 30% while this value for the lower yielders (Table Cu-2) was above 40%, with the

exception of 'NVH-829'. The top three yielding cultivars in the ground-culture trial were 'Slicenice', 'Ohia', and 'NVH 829'. Therefore 'Slicenice' and the UH variety 'Ohia' performed well under both trellis- and ground-cultures. Overall for the lower-yielding varieties yield was reduced by 45% and for the high yielding ones by 33% when grown in the ground compared to trellis-culture (Table Cu-3). Fruit quality was also higher for cucumbers grown under trellis with an average 52% of Grade A fruit compared to 36% for plants in ground culture. For commercial production growers thus have to evaluate the benefits of trellising including improved fruit quality, harvest efficiency, and easier pest management (by improving better aeration and possibly lower disease pressure, and by achieving better foliage coverage with pesticide applications), compared to the costs of placing the trellises.

**Spring 1990.** Plants were seeded on Jan. 18, transplanted on Feb. 5, and harvested for about 3 weeks from March 13 to April 9, 1990. Plant spacing was 1 ft between plants in the row and 5 ft between rows for a final 8,680 plants/Acre density. Total plants per cultivar in the trial were 210 with 15 plants per plot. The crop received 800 lbs/Acre 10-20-20 at pre-plant and was fertigated beginning 2 weeks after planting with 20 lbs/Acre of 20-20-20 every other week up to the 4th week of harvest. Vydate at 1 gal/Acre was applied 1 week prior to transplanting for nematode control. Poast was applied for weedy grass control. Bayleton was applied for powdery mildew, and benlate for anthracnose control. The pickling varieties tested mature at about 55 days after planting.

Results are shown in Table Cu-4. The top yielding varieties for this trial were 'Sweet Slice', 'Blitz', 'Burpeeana II', 'VGD-6054', and 'Raider'. Of the top varieties, the slicing type 'Sweet Slice' and the pickling-types 'Blitz', and 'Triplemech' had the higher percentage of high quality Grade A fruit at >50% of total yields (Table Cu-4). 'Slicenice'

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Standard cucumber varieties grown in Hawaii include 'Burpee Hybrid II', 'New Market #2', 'Sweet Slice Hybrid', 'Lani' and 'Hilo' UH hybrids, 'Dasher II', 'Sakata #69', and 'Slicemaster'. Other for-trial varieties which look promising include 'Genuine', 'Spring Swallow', 'Soarer', 'Southern Delight', 'Pegasus', 'Green Knight', 'Tokyo Slicer', 'Conquistador', and 'Brocade.'

Table Cu-1. Cucumber varieties evaluated for production in Molokai, Spring, 1987.

Variety	Disease tolerance	Seed source
AC #1810	1, 3, 4, 5, 6	Abbott
Spring 442/Pollinator	3, 4	Asgrow
XPH1187		Asgrow
Slice Nice	1,2,3,4,5,6	Arco
Castlehy 2512		Arco
Castlemaster		Arco
NVH 2100 (Monarch)	1,2,3,4,5,6	Northrup King
NVH 829	3,4	Northrup King
Ohia	7	U.H.
Milo	7	U.H.
1. Angular leaf spot		4. Cucumber Mosaic Virus
2. Anthracnose		5. Cucumber Scab
3. Powdery mildew		6. Downy mildew
		7. WMV II

Table Cu-2. Trellised cucumber cultivar yields in Molokai, Spring, 1987.

Cultivar	Total yields (lbs/Acre)	Marketable yields (lbs/Acre)	Percent Grade A Fruits	Percent Grade B Fruits	Percent Off-grade	Percent Culls
<b>Higher Yielders</b>						
AC #1810	106,722	84,361	68	11	20	1
Ohia	106,286	78,408	59	15	26	0
Slicenice	110,207	78,335	57	14	29	0
NVH 2100	102,511	72,454	54	16	29	0.4
Spring 442/Pollinator	103,891	71,583	49	20	31	.5
XPH11 87	108,392	71,075	52	13	34	0
<b>Lower Yielders</b>						
Castlemaster	90,968	52,635	45	13	42	0
Milo	94,598	51,909	43	11	45	0.5
NVH 829	78,858	51,197	50	15	35	0
Castlehy 2512	82,546	47,988	45	13	42	.2

Table Cu-3. Ground culture cucumber cultivar yields in Molokai, Spring, 1987.

Cultivar	Total yields (lbs/Acre)	Marketable yields (lbs/Acre)	Percent Grade A Fruits	Percent Grade B Fruits	Percent Off-grade	Percent Culls	Ground/Trellis (%)
<b>Higher Yielders</b>							
SliCenice	101,495	55,756	40	14	45	0	71
Ohia	107,152	50,529	39	8	52	1	64
NVH 829	89,734	44,866	32	18	49	1	88
NVH 2100	78,190	44,431	44	13	42	0.8	61
AC #1810	67,736	43,995	56	9	34	1	52
<b>Lower Yielders</b>							
XPH1187	89,734	41,599	36	10	52	1	58
Sprint 442	97,574	38,896	25	14	59	0.9	54
Castlemaster	70,132	34,630	36	14	49	1	66
Milo	82,546	26,136	24	8	66	2	50
CastlHy 2512	46,174	25,700	32	23	44	0	53

Table Cu-4. Ground culture cucumber cultivar yields in Molokai, Spring, 1990.

Cultivar	Source	Total yields (lbs/Acre)	Percent Grade A Fruits	Percent Grade B Fruits	Percent Off-grade	Percent Culls
<b>Higher Yielders</b>						
Sweet Slice	Peto	2,078	51	7	33	8
Blitz	Peto (pickling)	2,001	62	0	26	11
Burpeeana II	Burpee	1,970	39	6	53	3
VGD-6054	Asgrow	1,846	43	7	39	11
Raider	Harris	1,825	35	3	48	14
Slicenice	ARCO	1,773	37	7	47	8
Triplemech	Peto (pickling)	1,763	66	4	23	6
Maximore 102	Abbott	1,721	38	0	57	5
<b>Lower Yielders</b>						
Gemini 7	Peto	1,597	65	3	27	5
Lani	UH	1,587	45	0	47	8
Milo	UH	1,587	47	3	47	3
VGD-6165	Asgrow	1,555	46	3	51	0
Amira II	Peto	1,504	27	5	59	8
Supersett	Peto	1,441	39	6	52	4
Dasher II	Peto	1,358	29	11	46	14
Calypso	Abbott	1,286	52	10	28	10
Armada	Peto	1,255	67	0	33	0
Maximore 100	Abbott	1,244	56	9	35	0
Exp. Hybrid 474b	Harris	1,213	43	0	53	4
Cherokee	Sun	1,172	65	0	33	0
Dynasty	Peto	1,151	58	0	31	11

**Recommended Cultural Practices for Cucumber Production in Molokai.**

1. Seeding. Seed in trays, transplant just before the seedling roots fill the tray cell, approximately 14-16 days after seeding. Seeds can also be direct seeded, 2 seeds per hill. All seed should be treated with a fungicide but most commercial seed is pre-treated.
2. Mulch. Mulch rows with 3-4 feet plastic mulch.
3. Irrigation. Drip tube beneath the plastic mulch.
4. Trellis and netting. Use 6'6" metal tee, placed 10' apart in rows, and through mulch 11 gauge wire with nylon mesh net, 2 strands of wire are used to stretch the netting.
5. Plant spacing. 12-18 inches between plants, 5-6 feet between rows.
6. Fertilization. Preplant 800-1000 lbs/Acre 10-30-10 placed under mulch. Liquid feed through the irrigation system, 10-15 lbs/Acre 20-20-20 every other week.
7. Training vines on trellis. Vines should be placed or trained on trellis netting at least 3 times per week and daily during periods of vigorous growth.
8. Pest Control. Insecticide treatments may be required for leafminers, whiteflies, thrips and aphids. Inspect plants for presence of insects before spraying. Even if insects are present it does not mean they will cause economic damage. Try as much as possible to gauge their density, and spray

accordingly, to maintain an insect population density below economic damage levels.

**Remember:** there is a population of beneficial insects in the field most of the time, helping to control harmful insects. It has been documented that insects DO develop resistance to persistently applied chemicals. Some scholars believe that it is only a matter of time before insects build resistance to particular insecticides.

Fungicide treatments may be required for powdery mildew management.

9. Irrigation. When the first fruit has formed, water moisture in the soil must be maintained close to field capacity at all times. Cucumbers have high water demand during fruit production. Approximately 93-97 percent of the fruit is water plus transpiration rates are high during this active growing state.

10. Harvest. During peak periods pick daily. At other times harvest is conducted at no less than every other day. It is important to remove all mature and damaged fruits from the plants all the time, in order to maintain plant vigor.

## Broccoli Cultivar Trials in Molokai

Alton Arakaki and Hector Valenzuela

Most of the broccoli consumed in Hawaii is imported from the continental U.S. Five trials were conducted in Molokai to evaluate the yield of several commercial cultivars during the Spring, Summer, Fall, and Winter.

### Spring Experiment, 1986

Nine varieties were evaluated. The trial had 3 replications and 9 plants per replication. The crop was seeded in March 25 and transplanted on April 22, 1986. The planting arrangement was a double row-staggered planting with 2 ft between plants in the row, 2.5 feet between rows, and 3 ft between plots for a density of 5,787 plants/Acre. The plots received pre-plant 1000 lbs/Acre 10-30-10 and at post-planting side-dressed 640 lbs/Ac of calcium nitrate. Results are shown in Table B-1. In this trial all varieties were affected by hollow stem except 'Top Star', which showed the highest yield. 'Aux. 7901' heads were non uniform in size and shape. 'Cape Queen' heads varied in size and tended to be lumpy. 'DeCicco' had a long stem and small flat heads that were fluffy and uneven. 'Futura' had a dome-shaped head.

### Spring Experiment, 1991

Broccoli was seeded on Feb. 6 and transplanted on March 4, 1991. The trial consisted of three replications with 15 plants per replication. Planting distance was 0.75 ft between plants in the row and 3.5 ft between rows for a population of 16,596 plants/Acre. 1000 lbs/Acre of 10-30-30 were applied at preplant, and calcium nitrate at 640 lbs/Acre was side-dressed two weeks after planting. Herbicide treatment was with Dacthal, and the plots were also hand weeded as needed. Bravo and benlate were used as fungicides, and pydrin and sevin for insect control. Results are shown in Table B-2.

### Summer Experiment

Plants were seeded on April 5 and transplanted on May 2, 1989. Spacing was 0.75 ft between plants and 3.5 ft between rows for a density of 16,596 plants/Acre. Total number of plants per variety in the trial was 45. Land preparation included plow, disc, pre-plant fertilizer application, and drip line laying. Pre-plant fertilizer rates were 1000 lbs/Acre of 10-30-10, and calcium nitrate at 640 lb/Acre was side-dressed after planting. Insect control was with Pydrin and Sevin. Results are shown in Table B-3.

### Fall and Winter Trials.

For the Fall trial 'Premium Crop' was seeded on Oct. 22, 1993 and was harvested from Dec. 27 to Jan. 5, 1994. Spacing was 1 by 2.5 ft for a density of 17,425 plants/Acre. Yields at this density were 1.4 lbs per head or 19,864 lbs/Acre. For the winter trials broccoli was seeded on Oct. 27, 1986 and harvested from Jan. 9 to Feb. 5, 1987. Plant spacing was 1.5 feet between plants in the row and 5 ft between rows. Plants were fertilized with 1000 lbs/Acre of 10-30-10 and were fertigated with 80 lbs/Acre of 12-26-26 applied once a week for 4 weeks. Results are shown in Table B-4.

Table B.1. Broccoli cultivar yields in Molokai, Spring 1986.

Cultivar	Stem size (in)	Head size (in)	Yield (lb/Ac)	Weight per plant (lbs)	Side-shoots	Head Tightness <sup>1</sup>	1st harvest (date)	Last harvest (date)
<b>Higher Yielders</b>								
Top Star	1.6	7.9	7,744	1.3	No	1.0	Jun. 20	Jul. 11
Green Comet	2.0	8.0	5,929	1.0	Yes	2.7	Jun. 10	Jun. 20
Cape Queen	2.0	8.7	5,808	1.0	Yes	3.0	Jun. 13	Jun. 20
Citation	1.8	7.2	5,505	0.9	Yes	3.0	Jun. 3	Jun. 23
<b>Lower Yielders</b>								
Bonanza	1.8	8.0	4,840	0.8	Yes	3.0	Jun. 3	Jun. 13
Aux. 7901	1.5	7.2	4,598	0.8	No	2.7	Jun. 20	Jul. 2
Futura	2.0	6.0	2,783	0.5	No	3.0	Jun. 20	Jul. 11
De Cicco	1.7	6.0	2,420	0.4	No	4.0	Jun. 23	Jul. 11
Apollo	—	—	—	—	—	—	—	—

<sup>1</sup>Yield at 5,787 plants/Acre.

Table B.2. Broccoli cultivar yields in Molokai, Spring 1991

Cultivar	Source	Yield <sup>†</sup> (lbs/Acre)	Weight per plant (lbs/plant)
<b>Higher Yielders</b>			
Southern Crop	Takii	26,830	1.62
Premium Crop	Takii/Peto	23,787	1.43
Galaxy	Asgrow	23,511	1.41
<b>Lower Yielders</b>			
Cruiser	Takii	19,915	1.20
Green Duke	Takii	14,936	0.90
Green Comet	Abbott/Takii	10,787	0.65
Cape Queen	Takii	10,510	0.63

<sup>†</sup>Yield at 16,596 plants/Acre.

Table B.3. Broccoli cultivar yields in Molokai, Summer 1989

Cultivar	Percent Grade A	Percent Grade B	Percent Off-Grade	Yield <sup>†</sup> (lbs/Acre)	Weight per plant (lbs)
<b>Higher Yielders</b>					
Prominence	5	75	20	7,283	0.44
Zeus	100	0	0	7,283	0.44
Green Comet	100	0	0	7,283	0.44
Green Top	100	0	0	7,099	0.43
<b>Lower Yielders</b>					
Southern Commet	100	0	0	6,085	0.36
Premium Crop	100	0	0	5,716	0.34
Cape Queen	0	100	0	5,808	0.35
Pinnacle	0	77	22	5,347	0.32

<sup>†</sup> Yield at 16,596 plants/Acre.

Table B.4. Broccoli cultivar yields in Molokai, Winter 1993.

Cultivar	Date first harvest	Date last harvest	Yield <sup>†</sup> (lbs/Acre)	Weight per plant (lbs)
<b>Higher Yielders</b>				
XPH-852	Jan. 23	Feb. 5	8,334	1.44
Apollo	Jan. 23	Feb. 3	6,969	1.20
Citation	Jan. 23	Feb. 3	6,766	1.17
Gem	Jan. 20	Feb. 5	6,504	1.12
<b>Lower Yielders</b>				
Green Valiant	Jan. 20	Feb. 5	6,417	1.10
Galaxy	Jan. 9	Jan. 23	5,299	0.91
Packman	Jan. 9	Jan. 28	4,936	0.85
Baccus	Jan. 9	Jan. 23	3,107	0.54
So. Commet	Jan. 15	Jan. 26	6,185	1.07

<sup>†</sup> Yield at 16,596 plants/Acre.

## Results

The top yielding varieties in the Spring were 'Southern Crop', 'Premium Crop', and 'Galaxy'. In the Summer the higher yields were obtained by 'Prominence', 'Zeus', 'Green Comet', and 'Green Top'. In the Winter the higher yields were obtained by 'XPH-852', 'Apollo', 'Citation', and 'Gem'. Average overall yields were 4,953 in the Spring 1986 (low yields due to hollow-heart), 18,611 in the Spring 1991, 6,488 lbs/Acre in the Summer, 19,864 lbs/Acre in the Fall, and 6,057 lbs/Acre in the Winter. Yields for Premium were 23,787 in the Spring, 5,716 in the Summer, and 19,864 lbs/Acre in the Fall. Yields for Cape Queen were 10,510 in the Spring and 5,808 lbs/Acre in the Summer. Yields for Southern Comet were 6,080 in the Summer and 6,185 lbs/Acre in the Winter. These data indicate that yields are in general lower in the summer due to the higher temperatures, low during winter, perhaps due to more diseases, and that some varieties are adapted in Molokai for the specific growing seasons. The data also indicates the maturity date for some of the varieties tested, which is important to know for cultivar selection, and to schedule annual marketing and farming operations.

*Have a minute? Stop by and visit the several ongoing research activities around the state!!*

**Pomamoho Station:** Watermelon (with insectary borders), horens spinach, sweetpotato, and daikon variety trial.

**Waimanalo Station:** chili pepper, bell pepper, bulb onion, and taro variety trial, basil and vegetable compost trials. No-till trials planned by Dr. J. DeFrank; also, leafy green fertility calibration studies by Dr. Jim Silva

**Waimanalo:** Basil fusarium resistant study by Randy Hamasaki

**Pearl City:** sweetpotato variety trial, eggplant N rate study, soybean N fixation study, leafy green fertility study.

**Kunia (HSPA):** lettuce, cauliflower, broccoli, bulb onions, etc. by Dr. John McHugh

**Kamuela:** trap crop experiments for diamondback moth control in head cabbage

**Volcano:** daikon variety trial in the station and in on-farm trials.

**Molokai:** strawberry, taro, lettuce, etc. variety trials, cover crop trials for nematode resistance

**On and About**

# Carrot Cultivar Trials in Molokai

Alton Arakaki and Hector Valenzuela

Most of the carrot consumed in Hawaii is imported from the continental U.S. However as new ag land becomes more available the opportunity may exist for local production during specific market windows, or for the local production of specialty carrots. Cultivar trials with carrot were thus conducted in August and again in October 1986 to evaluate yields and adaptability to local Fall and Winter climatic conditions in Molokai. In the first trial carrot was direct-seeded on Sep. 15, and harvested on Dec. 6, 1986. The soil was treated with Vydate for nematode management. The trial had 3 replications. The plants received preplant 500 lb/Acre 10-30-10 and 500 lbs/Acre 10-30-10 side-dressed 4 weeks after seeding. Results shown in Table C-1 include yields obtained for both thinned and unthinned plots.

Table C-1. Carrot cultivar yields in Molokai, seeded Sept. 15, 1986.

Cultivar	Thinned yields (lbs/Acre)	Un-thinned yield (lbs/Acre)	Thinned Plots		
			Percent Grade A Fruits	Percent Grade B Roots	Percent culls
<b>Higher Yielders</b>					
Charger	6,978	6,978	58	0	52
Fanci Pak	6,385	27,299	65	0	34
Orlando Gold PS	9,874	16,844	69	0	31
Short in Sweet	28,338	28,918	8	50	40
<b>Lower Yielders</b>					
Toudo	18,455	0	67	0	33
Orlando Gold	12,197	15,682	35	0	65
Red Cored Chatney	18,455	0	0	100	0
PSX 6283	3,928	19,167	0	0	100
Nantes Half Long	871	0	0	0	100

<sup>†</sup> Yield at 69,440 plants/Acre.

Table C-2. Carrot variety yields in Molokai, seeded Oct. 23, 1987

Cultivar	Yield (lbs/Acre)	Weight per plant (lbs)
Apache	82,473	1.19
Crunchy	80,150	1.15
Dess Dan	45,305	0.65
Nantes Mexican Strain	31,365	0.45
Gold keeper	24,395	0.35
Orlando Gold	24,395	0.35
Golden State	22,652	0.33
Olympiad	20,910	0.30
Goldmine	17,425	0.25
Dominator	16,263	0.23

For the second trial the crop was seeded on Oct. 23 and harvested in 3 Feb., 1987. Spacing was 3 inches between plants in the row and 30 in between rows for a density of 69,440 plants/Acre. Plots received 500 lb/Acre of 10-30-10 pre-plant, and were post-plant side-dressed with 500 lbs/Ac 10-30-10. Results are shown in Table C-2. A major problem was experienced due to overseeding. The best varieties in terms of yields and marketability were 'Charger', 'Fanci Pak', and 'Orlando Gold PS' in the first trial and 'Apache' and 'Crunchy' in the follow-up trial. Cultivar differences were observed in their response to high density (un-thinned) plantings. The lower performance of 'Orlando Gold' in the first trial may indicate its lower adaptability to the warmer conditions experienced during the late Summer/early Fall in Molokai than in the cooler late Fall conditions.

## Biofumigation with Mustards

Isothiocyanates volatiles released from the roots of canola (*Brassica napus* L) and Indian mustard (*B. juncea* L. Czern and Coss.) inhibited growth of pure cultures of the disease take-all of wheat (*Gaeumannomyces graminis*). The low concentrations released during breakdown of these crops in the soil would effectively check the growth of the take-all fungus (Angus et al., *Plant & Soil* 162:107(1994)).

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## Head Cabbage Summer Cultivar Trial in Molokai

Alton Arakaki and Hector Valenzuela

A trial was conducted to evaluate the growth of 20 head cabbage varieties in Molokai during the Summer months. The crop was seeded on May 2, transplanted on June 2, and harvested 70 days later. The experiment had 3 replications per variety with 6 plants used per plot. Spacing was 1 ft between plants in the row and 5 feet between rows for a plant population of 8,713 plants per acre. Results are shown in Table Cab-1, including the projected yields at standard commercial plant populations of 14,460 used when plants are spaced 1.5 by 2 feet.

Table Cab-1. Yield of Head Cabbage in Molokai, Summer 1990

Cultivar	Weight per head (lb)	Yield at low density, 1 x 5 ft (lb/Acre)	Yield at high density, 1.5 x 2 ft (lb/Acre)
<b>Higher Yielders</b>			
Green Cup	2.50	22,145	36,752
Scarlet O'Hara <sup>2</sup>	1.50	13,069	21,690
Southern Treasure	1.48	12,948	21,489
Globe King	1.02	8,955	14,861
KK Cross	0.94	8,228	13,656
Resist Crown	0.91	7,986	13,255
KY Cross	0.90	7,856	13,054
Globe Master	0.83	7,260	12,050
Resist Top	0.80	7,018	11,648
Mighty Globe	0.80	7,018	11,648
<b>Lower Yielders</b>			
CG Cross	0.77	6,776	11,246
NS Cross	0.77	6,776	11,246
Green Commet <sup>1</sup>	0.69	6,050	10,041
Rapid Ball	0.67	5,808	9,640
YR Summer	0.67	5,808	9,640
Tight Globe	0.55	4,840	8,033
Heads Up <sup>3</sup>	0.30	2,420	4,016
Fortune	0.19	1,694	2,811
Green Stone	0.33	2,904	4,820
Sun Up <sup>3</sup>	0.37	3,267	5,422

<sup>1</sup> Takii  
<sup>2</sup> Shephards  
<sup>3</sup> Harris Moran

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## Research Highlights

### Verticillium wilt affected by N source

Verticillium wilt is an important disease in eggplant resulting in yields of up to 50%. No resistance is available to this disease, and the recommended 2-5 year rotation is often impractical. Researchers in Connecticut found that under low disease pressure conditions, ammonium-N may improve disease control compared to nitrate-N fertilizer sources. Ammonium-N sources resulted in greater nonstructural carbohydrate, N, P, and Mn concentrations in roots and leaves, and in 33-44% increased yields, compared to nitrate-N sources. (Elmer and Ferrandino, Pl. Dis. 78:811(1994)).

### Thrips chemical control in Citrus

Trials were conducted in Florida to evaluate several chemicals for flower thrips control in citrus. Treatments were made with an air-blast sprayer in water solution at 200 gallons per acre. When combined with fungicides, treatments with Lorsban, Cygon, and Carzol resulted in higher yields. In follow-up work effective treatments (at 125 gallons of water per acre) included 1) one application of Lorsban followed by Carzol, and 2) an application of Cygon followed by Carzol. The researchers are evaluating sticky traps in 6 ft poles for monitoring thrips populations (Fl. Grower and Rancher June 1994 pg. 14-15).

### Farmers, as an endangered species: factoids from Nebraska

- Number of farmers in Nebraska declined 13% from 1987 to 1994.
- Number of farmers under age 35 decreased by 30% over this period of time.
- Number of farmers under 60 declined by 5%.
- Number over 70 years old actually increased by 10%.
- Average age of farmer in Nebraska is 51 years old (Center Rural Affairs Newsl. Jan. 1995).

### Disease control with additives

Tomato seeds treated with chitosan, a derivative from crab-shell chitin, induced systemic resistance to Fusarium Crown and root rot in tomato. The chitosin apparently created a toxic environment that reduced pathogen growth (Benhamou et al, Phytopath. 84:1432(1994)).

Fungal isolates from the zosiagrass rhizosphere effectively induced resistance to anthracnose in cucumber, with the protection being less effective at high pathogen spore concentrations. Treatments of cucumber seeds with these inocula also resulted in increased plant height and biomass (Meera et al., Phytopath, 84:1399(1994)).

## Chinese Cabbage Trial in Molokai

Alton Arakaki and Hector Valenzuela

A trial was conducted to evaluate the growth of two Chinese cabbage varieties during the Winter in Molokai. The crop was seeded in Oct. 22, 1993 and harvested from Dec. 27 to Jan. 15, 1994. Spacing was 2.5 ft between rows and 1 ft between plants in the row, for a density of 17,426 plants/Acre. The yields obtained were:

Cultivar	Yield (lbs/Acre)	Weight per plant (lbs)
AS Veg #1	58,150	3.3
189 Miniture	43,565	2.5

## Dai kon cultivar trials in Poamoho

Hector Valenzuela

A trial was conducted in the Summer 1994 to evaluate the growth of 18 daikon varieties at the University of Hawaii Poamoho Experiment Station in Oahu. The station is located at 870 ft elevation and has 45 inches median annual rainfall. The red Wahiawa silt clay soil is derived from basalt that is kaolinitic with oxides of iron and manganese with pH of 5-6.5 and organic matter content of 2%. The crop was direct seeded on July 15, 1994. Standard protocols were followed for commercial daikon production. 'Chinese Improved Earliest', the earliest cultivar and the standard variety grown in Oahu was harvested on August 29 and on Sept. 11. The other varieties were harvested on Sept. 12 and 19th. The trial consisted of two replications, with 30 feet per replication. Plant spacing was 3-4 inches between plants, and two rows per bed. Distance between rows in the bed was 1 feet and distance between beds was 2 feet, for an estimated final population density of 115,733 plants per Acre. Results are shown in Table D-1. Yields of about 40 MT/Acre or greater were obtained by 'Chinese Improved Earliest', 'Kyoto Flash', 'April Cross', and 'SDA-0103'. 'High Snow' roots had similar desirable characteristics as the standard 'Chinese Improved Earliest', but yields were about 40% lower. This variety may thus be useful as a second choice if seed for 'Chinese Improved' is unavailable. Root dimensions were obtained from 3-4 roots per variety and were in general smaller than those values reported by the seed catalogs. 'Red Coat' had uniform roots and should be promising for salads and for pickled dishes. Follow-up trials are being conducted for winter production in Poamoho and Volcano and results will be reported as they become available.

<b>Seed Companies</b>	Marutane Co. Ltd.
Champion Seed	C.P.O. Box 65
529 Mercury Lane	Kyoto 600 Japan
Brea, CA 92621	
	Sakata Seed America Inc. (also see
Known-you seed Co., Ltd.	Champion Seed)
26, Chung Cheng 2nd	POB 880
Road	18905 Serene Dr.
Kaohsiung	Morgan Hill, CA 95037-0880
Taiwan	
	American Takii, Inc. (also see Cham-
Kyowa Seed Co., Ltd	pion)
15-13 Nanpeidai	301 Natividad Rd
Shibuya-ku	Salinas, CA 93906
Tokyo, Japan	

### Daikon Cultivar Descriptions

*Summer Mino Early* (Marutane). Japanese long white, heat resistant, root about 18 in long, and 2 in diameter, neck color is white, medium slow bolting, tolerant against virus, black rot and soft rot, grows well in subtropical areas, excellent uniformity and easy to grow.

*Kyoto flash* (Marutane). Japanese long white. About 13 in long and 3 in diameter, 2 lb each.. Neck color is green, good mild taste.

*Spring Joy* (Marutane). Japanese long white, Very slow bolting, about 12 in long, and 4 in diameter, neck color is green, Suitable for greenhouse production, easy growing and excellent taste.

*All Season* or *Tokinashi* (Marutane). Open pollinated. Japanese long white. Extra slow bolting. Root about 16 in long and 2 in diameter, white neck color.

*Omny* (Sakata). F-1 hybrid. More vigorous than All Season. Tolerant to premature bolting. Slightly green on neck end. Suitable for close planting. Root about 16 in long. Virus, black rot and soft rot tolerant.

*SDA 0102 and 0103* (Sakata)

Narumi (Mikado)

*April Cross* (Takii). Extra low bolting, vary late pithiness. White neck, 16 in long, 1.5-2 lb, excellent quality for cooking, pickling, salad.

*Minowase Summer Cross No. 3* (Takii). Resistant to virus, fusarium, and heat. Excellent quality, white neck, 16 in long, 1.5-2 lb, excellent quality for cooking, pickling, salad.

*Relish Cross* (Takii). Excellent quality, very late pithiness, green neck, 15 in long, 1.5-2 lb, good quality for cooking, pickling, salad. High tolerance to virus.

*Shariki* (Kyowa). Hybrid. Compact and erected leaves with green shoulder. Weighs about 3 lb and is 14 in long and 2.5 in diameter.

*Red Coat* (Know You). Plants are small, erect, vigorous, tolerant to TuMV, good for close planting. Straight roots are about 8 in long and 2 in diameter. Purple-red skin and flesh, suitable for salad.

*Kyoto Ball* (Marutane). Japanese ball type, Excellent uniformity. Root about 6 in length and 6 in diameter, and 4 lb each. Neck color light green. Flesh is white and texture is crisp and mild, good for boiling.

*Nova Shogoin* (Marutane). Japanese ball type, about 6 in long and 6 in diameter, weight per root is about 2 lbs, light green neck color.

*High Snow* (Know You). Hybrid. Plants are large, vigorous and early. Roots are 10 in long and 3 in diameter, about 2 lbs. Straight, white skin, and flesh, fine texture and high yielding. Good for warm season planting.





Table D-1. Yields and yield parameters of daikon cultivars grown in Poamoho, Summer 1994.

Cultivar	Total Marketable yields (lb/Ac)	Percent Grade A	Percent Grades A & B	Marketable Weight per 30 ft row (lbs)	Root diameter (in)	Root length (in)	Mean root weight (lb)
<b>Long Type, Higher Yields</b>							
SDA-0103	44,768	85	87	46	2.1	12.9	0.99
April Cross	41,798	87	89	43	2.1	15.0	0.98
Kyoto Flash	39,676	84	86	41	2.1	12.7	1.2
Chinese Improved	39,464	82	93	41			
Relish Cross	36,918	93	88	38	2.2	12.6	1.03
SDA-0102	35,221	92	98	36	2.5	12.7	1.24
<b>Long Type, Lower Yields</b>							
Marumi	32,675	87	87	34	2.1	10.6	0.78
Shariki	30,128	94	96	31	2.2	12.4	0.93
Minowase Summer	28,219	87	86	29	2.1	15.0	1.16
High Snow	24,612	94	94	25	2.9	10.9	1.4
Spring Joy	24,440	86	71	25	1.9	12.9	1.07
Red Coat	22,278	90	90	15	2.4	7.8	0.68
Summer Mino	22,066	87	76	23	2.2	16.3	1.10
Omny	21,005	92	91	22	2.2	14.7	1.35
All Season	11,457	60	79	12	1.6	10.5	0.42
<b>Ball Type</b>							
Nova Shogoin	23,339	51	82	24	3.3	5.8	0.85
Kyoto Ball	15,700	69	80	16	4.0	5.0	1.10

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## UPCOMING EVENTS

Marketing for Profit in Agriculture: Emerging Marketing Opportunities for Hawaii 24-25 March, 1995, Keauhou Beach Hotel, Kona, Hawaii. Pre-registration is \$40, on-site registration is \$65. Mail registration to HFBBF, 2343 Rose St., Honolulu, HI 96819. For more info contact Wendell Koga at 808-848-2074, Fax 808-848-1921.

Microirrigation for a Changing World: Conserving Resources/ Preserving the Environment, 2-6 April, 1995. Orlando, Florida. For information contact ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659.

1995 CTAHR Conference: Hawaii Ag Positioning for Growth. UH Campus Center, Honolulu, 5-6 April, 1995. Co sponsored by Hawaii Farm Bureau Federation and UH College of Tropical Ag. and Human Resources. For information contact: Lynn LeBeck at 808-956-9123

Aquatic Weed Control, Aquatic Plant Culture and Revegetation Short Course, 16-18 May 1995, Rolling Hills Hotel and Golf Resort, Ft. Lauderdale, early registration before 31 March is \$69. For info contact Aquatic Weed/IFAS Office of Conferences, POB 110750, Gainesville, FL 32611-0750, Tel. 904-392-5930, Fax. 904-392-9734.

Postharvest Horticulture Asia '95, International Conference, 23-24 Aug. 1995, Philippine Trade Training Center. Held concurrently with Agriculture Asia 1995 (23-26 Aug). For information contact: PHTRC, Univ. Philippines at Los Baños, College, Laguna, Philippines, Tel. (63-94) 2444, Fax (63-94) 3259.

Third National Symposium on New Crops: New opportunities, New technologies. 22-25 Oct. 1995, Adams Mark Hotel, Indianapolis, Indiana. For information contact: Center for New Crops and Plant Products, 1165 Horticulture Bldg., West Lafayette, IN 47907-1165, Tel. 317-494-1329, Fax 317-494-0391.

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