

Phosphorus Rate Experiment with 3 Brassica Crops  
Waimanalo and Poamoho Stations  
Summary of First set of experiments Oct-Dec. 2001



**Waimanalo**

Planting Date: October 3  
Measure Plant height: Oct. 24.  
First Mizuna Harvest Oct. 24.  
Final Harvest of all 3 crops: Nov. 7.

**Poamoho**

Planting Date: Oct. 9th  
Measure Plant Height: Oct. 30<sup>th</sup>.  
First Mizuna Harvest: Nov. 6<sup>th</sup>.  
Final Harvest of all 3 crops: Nov. 13<sup>th</sup>.

### Summary of Experiment Setup and Goals:

Concurrent experiments were established at Waimanalo and Poamoho UHM Stations to evaluate the response of 3 Brassica (mustard) crops to phosphorus fertilizer applications. The trials were established in sites with initial high soil P levels (>300 ppm). The goal is to tune up P recommendations for farmlands with historic high levels of annual P applications. For the first experiment (reporting here) P was applied at rates of 0-400 lbs/Acre. Two follow-up experiments will be conducted in the same plots, without any additional P applications. Here we summarize the results of the first experiment completed in Nov. 2001. Because Poamoho is at a higher elevation, these trials will allow us to evaluate P uptake and crop growth under both warm and cooler growing conditions. This research is necessary because local farmers believe that Brassica crops are responsive to P applications during the winter months, even in soils already high in P.

### General observations from first experiment

#### Yields

**Mizuna:** Early yields not affected by P treatment in Waimanalo. Early yields were greater with P applications of 100-300 lb/A in Poamoho.

**Mizuna:** Final yields not affected by P in Waimanalo, although a trend was observed for higher yields with 200 lbs P. Final yields were greater with 100 lb P in Poamoho. Plant height was also greater with P applications in Poamoho.

**Quing Choi (baby pak choy):** Yields not affected by P in Waimanalo but plant height was greatest with 400 lb/A P. Yields were also not affected by P in Poamoho, but a trend was observed for higher yields with 100 P.

**Jai Choi (larger pak choy):** Yields not affected by P in Waimanalo. Yields and plant height were greatest with 200 P in Poamoho.

#### Early Plant Height taken prior to harvest.

**Quing Choi and Joi Choi:** Height was unaffected by P in Waimanalo. Greatest plant height was obtained with 100 or 200-P in Poamoho.

**Mizuna:** Early Plant height was greatest with 100-300 lb/A P in Waimanalo and in Poamoho.

## **Tissue Levels**

Tissue nutrient contents (Tables 17 & 18) were above those levels recommended in the literature to obtain optimal yields for leafy crops such as cabbage and lettuce (target P levels are ca. 0.5%). Other values to note include potentially low levels of Mg in Poamoho, and also high levels of Mn in Poamoho, both of which may have contributed to the lower yields observed in Poamoho compared to Waimanalo (Table 16).

## **Index of tables**

### **A. Yield Data Analysis with Separate Analysis for each crop**

Table 1. First Harvest of Mizuna, Waimanalo October 24, 2001

Table 2. First Harvest of Mizuna, Poamoho Nov. 6, 2001

Table 3. Mizuna Yield in Waimanalo, Second Harvest Nov. 7, 2001.

Table 4. Mizuna Yield in Poamoho, Second Harvest Nov. 13, 2001.

Table 5. Quing Choi Yield in Poamoho, Nov. 13, 2001.

Table 6. Quing Choi Yield in Waimanalo, Nov. 7, 2001.

Table 7. Jai Choi Yield in Poamoho, Nov. 13, 2001.

Table 8. Jai Choi Yield in Waimanalo, Nov. 7, 2001.

### **B. EARLY PLANT HEIGHT**

Table 9. Early Plant Height for Quing Choi, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.

Table 10. Early Plant Height for Joi Choi, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.

Table 11. Early Plant Height for Mizuna, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.

### **C. POOLED DATA BY LOCATION AND CULTIVARS**

Table 12. Mean plant height of 3 brassica crops in response to Phosphorus fertilizer rates grown in Waimanalo and Poamoho Stations, Oahu.

Table 13. Mean plant weight of 3 brassica crops in response to Phosphorus fertilizer rates grown in Waimanalo and Poamoho Stations, Oahu.

Table 14. Pooled mean plant weight of plants grown in Poamoho and Waimanalo Oahu.

Table 15. Pooled mean plant height of plants grown in Poamoho and Waimanalo Oahu.

Table 16. Mean plant weight and yield of 3 brassica crops grown in Waimanalo and Poamoho, Oahu.

**D. TISSUE ANALYSIS**

TABLE 17. TISSUE ANALYSIS DATA WAIMANALO COLLECTED NOV. 5, 2001

TABLE 18. TISSUE ANALYSIS DATA POAMOHO COLLECTED NOV. 9, 2001

**Table 1. First Harvest of Mizuna, Waimanalo October 24, 2001**

**A. Waimanalo**

P Rate	Weight (grams)	Height (cm)
400	48.0 A	36.1 A
100	47.9 A	35.8 A
0	47.0 A	36.4 A
200	46.5 A	36.5 A
300	46.0 A	36.0 A
Thin	63.3 A	36.4 A
Unthinned	30.9 B	35.9 A

**Table 2. First Harvest of Mizuna, Poamoho Nov. 6, 2001**

P Rate	Weight (grams)	Height (cm)
100	37.7 A	34.6 B
300	37.1 A	37.2 A
200	32.9 AB	34.1 B
0	29.4 BC	32.0 C
400	25.4 C	30.6 C
Thin	36.7 A	32.5 B
Unthinned	27.8 B	34.8 A

**Yield Data Analysis with Separate Analysis for each crop**

**Table 3. Mizuna Yield in Waimanalo, Second Harvest Nov. 7, 2001.**

P Rate	Weight (grams)	Height (cm)
200	148.0 A	54.9 A
300	143.2 AB	50.0 A
100	142.4 AB	50.1 A
0	132.1 AB	49.4 A
400	126.3 B	48.4 A
Thin	183.3 A	50.9 A
Unthinned	93.5 B	50.2 A

**Table 4. Mizuna Yield in Poamoho, Second Harvest Nov. 13, 2001.**

P Rate	Weight (grams)	Height (cm)
100	107.9 A	48.4 A
200	88.9 B	48.3 A
400	87.8 B	42.3 C
300	83.7 B	47.5 A
0	79.9 B	45.3 B
Thin	109.0 A	46.4 A
Unthinned	70.8 B	46.2 A

**Table 5. Quing Choi Yield in Poamoho, Nov. 13, 2001.**

P Rate	Weight (grams)	Height (cm)
100	232.7 A	28.7 A
0	217.7 AB	28.7 A
300	213.7 BC	28.0 A
200	199.3 C	28.0 A
400	155.5 D	28.7 A

**Table 6. Quing Choi Yield in Waimanalo, Nov. 7, 2001.**

P Rate	Weight (grams)	Height (cm)
0	239.0 A	29.4 B
200	235.1 A	29.0 B
100	234.1 A	28.4 B
400	223.5 A	35.2 A
300	221.6 A	29.0 B

**Table 7. Jai Choi Yield in Poamoho, Nov. 13, 2001.**

P Rate	Weight (grams)	Height (cm)
200	309.2 A	36.3 A
100	280.0 B	34.8 B
0	273.0 BC	33.5 C
300	257.1 BC	33.4 C
400	252.1 C	35.3 AB

**Table 8. Jai Choi Yield in Waimanalo, Nov. 7, 2001.**

P Rate	Weight (grams)	Height (cm)
200	347.8 A	37.8 A
300	346.7 A	41.4 A
0	334.0 A	37.0 A
100	322.5 AB	36.3 A
400	295.3 B	38.8 A

## B. EARLY PLANT HEIGHT

**Table 9. Early Plant Height for Quing Choi, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.**

	Waimanalo	Poamoho
P Rate	Height (cm)	Height (cm)
0	10.8 A	10.2 B
100	10.8 A	10.9 A
400	10.7 A	9.0 D
200	10.4 A	9.5 C
300	9.8 B	9.2 CD

**Table 10. Early Plant Height for Joi Choi, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.**

	Waimanalo	Poamoho
P Rate	Height (cm)	Height (cm)
100	12.3 A	11.2 B
400	12.2 A	10.9 B
200	11.9 A	12.2 A
0	11.8 A	11.0 B
300	11.3 B	9.7 C

**Table 11. Early Plant Height for Mizuna, Waimanalo, Oct. 24, 2001 and Poamoho, Oct. 30<sup>th</sup>.**

	Waimanalo	Poamoho
P Rate	Height (cm)	Height (cm)
300	15.4 A	11.5 A
200	14.8 AB	11.6 A
100	14.5 AB	11.0 A
0	14.2 B	10.1 B
400	14.0 B	9.3 C

### C. POOLED DATA BY LOCATION AND CULTIVARS

**Table 12. Mean plant height of 3 brassica crops in response to Phosphorus fertilizer rates grown in Waimanalo and Poamoho Stations, Oahu.**

P Rate	Height (cm)
200	<b>39.0 A</b>
300	38.0 AB
100	37.7 AB
0	37.6 AB
400	37.1 B

**Table 13. Mean plant weight of 3 brassica crops in response to Phosphorus fertilizer rates grown in Waimanalo and Poamoho Stations, Oahu.**

P Rate	Weight (g)
200	221.6 A
100	220.4 A
300	214.7 A
400	214.9 A
0	212.4 A

**Table 14. Pooled mean plant weight of plants grown in Poamoho and Waimanalo Oahu.**

CUR	Weight (g)
JOI CHOI	<b>319.9 A</b>
Q CHOI	222.6 B
MIZUNA	116.5 C

**Table 15. Pooled mean plant height of plants grown in Poamoho and Waimanalo Oahu.**

CUR	Height (cm)
MIZUNA	48.9 A
JOI CHOI	36.3 B
Q CHOI	28.8 C



**Table 16. Mean plant weight and yield of 3 brassica crops grown in Waimanalo and Poamoho, Oahu.**

Location	Weight (g)	Height (cm)
Waimanalo	237.9 A	39.4 A
Poamoho	194.4 A	36.3 B

**TABLE 17. TISSUE ANALYSIS DATA WAIMANALO COLLECTED NOV. 5, 2001**

Trt	N	P	K	Ca	Mg	Na	Mn	Fe	Cu	Zn	B
<b>JOI-CHOI</b>											
J 0	7.21	0.77	6.69	2.49	0.58	0.18	38	302	12	49	26
J 100	6.94	0.69	8.11	2.34	0.51	0.26	35	222	12	43	26
J 200	7.14	0.78	5.84	2.57	0.54	0.19	49	260	12	52	30
J 300	7.16	0.73	7.24	2.41	0.55	0.26	44	256	14	49	29
J 400	7.17	0.73	6.73	2.4	0.51	0.2	37	260	14	48	24
Average	7.12	.74	6.92	2.44	.53	.21	40.6	260	12.8	48.2	27
<b>MIZUNA</b>											
M 0	6.87	0.54	4.71	3.15	0.62	0.25	42	207	12	35	24
M 100	7.06	0.73	4.95	2.94	0.59	0.22	43	234	16	40	24
M 200	6.93	0.64	5.51	2.68	0.49	0.26	47	256	16	36	26
M 300	7.09	0.66	4.54	3.19	0.59	0.3	50	291	19	38	24
M 400	7.08	0.67	4.96	2.55	0.45	0.23	43	254	27	43	24
Average	7.0	.65	4.93	2.9	.55	.25	45	248	18	38.4	24.4
<b>QUIN-CHOI</b>											
Q 0	6.61	0.59	6.77	2.95	0.53	0.25	35	325	23	39	26
Q 100	6.55	0.64	6.05	3.03	0.54	0.25	40	338	19	41	25
Q 200	6.84	0.84	6.44	2.81	0.52	0.3	47	437	28	52	30
Q 300	6.31	0.73	5.57	3.35	0.60	0.29	40	386	27	46	28
Q 400	6.46	0.82	7.03	3.18	0.54	0.25	43	270	32	46	28
Average	6.5	.72	6.4	3.1	.55	.27	41	351	25.8	44.8	27.4

**TABLE 18. TISSUE ANALYSIS DATA POAMOHO COLLECTED NOV. 9, 2001**

Trt	N	P	K	Ca	Mg	Na	Mn	Fe	Cu	Zn	B
<b>JOI-CHOI</b>											
J-0	7.59	0.65	8.53	3.24	0.40	0.22	103	345	18	44	24
J-100	7.27	0.64	8.48	2.95	0.37	0.26	89	336	17	64	25
J-200	7.30	0.71	8.44	2.89	0.36	0.21	103	204	15	39	26
J-300	7.40	0.62	8.34	3.09	0.40	0.18	106	248	16	41	28
J-400	7.33	0.65	9.09	3.07	0.38	0.26	99	219	16	47	28
Average	7.38	.65	8.6	3.0	.38	.23	100	270.4	16.4	47	26.2
<b>MIZUNA</b>											
M-0	7.28	0.53	5.26	3.89	0.42	0.26	147	180	17	35	21
M-100	7.21	0.62	5.72	3.91	0.43	0.21	145	161	15	36	24
M-200	7.23	0.56	5.48	3.80	0.39	0.18	175	159	15	35	22
M-300	7.03	0.50	5.38	3.81	0.38	0.18	182	139	17	30	23
M-400	7.19	0.53	5.24	3.58	0.37	0.20	182	259	16	39	21
Average	7.2	.55	5.4	3.8	.40	.21	166.2	179.6	16	35	22.2
<b>QUIN-CHOI</b>											
Q-0	6.95	0.68	7.34	2.89	0.31	0.16	93	345	15	40	23
Q-100	6.99	0.81	7.84	2.54	0.27	0.13	83	128	14	39	25
Q-200	6.83	0.65	7.46	3.12	0.31	0.16	81	204	13	31	24
Q-300	6.90	0.78	6.83	2.50	0.28	0.15	76	293	15	35	25
Q-400	6.98	0.73	7.49	2.58	0.32	0.17	74	165	15	40	23
Average	6.93	.73	7.4	2.7	.30	.15	81.4	227	14.4	37	24