Hawaii-Grown Hot Peppers
(\textit{Capsicum} spp.)

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It’s “Chile” in Hawai’i

- Hot peppers are important in Hawai’i.
- Hot sauces, Asian-Pacific & Latin Cuisine.
- Hawaii has done some breeding and selecting.
- TAMU has extensive chile breeding program.
- No data on capsaicinoid concentrations in peppers grown under Hawaii conditions.

‘Hawaiian’ type; C *frutescens*

‘Waialua’ Hot Pepper

TAMU Mild Habanero
Capsaicinoids

Capsaicin

6,7-dihydrocapsaicin

Nordihydrocapsaicin

Homocapsaicin

Homodihydrocapsaicin
Value-Addition
Reducing production costs

- Local sauces are produced almost exclusively from imported peppers.
- Import replacement = high-value specialty crop for local growers, better marketability for products.
- Small fruited peppers are preferred by Asian & Pacific market.
- Labor costs expected to be major component of production costs.
- Can genetic variability in fruit size within “types” be exploited to reduce labor costs?
Objectives

1. Determine variability in capsaicinoid content among multiple genotypes of peppers grown in Hawai’i.

2. Determine links between fruit size and labor requirements for hand harvest of multiple hot pepper cultivars grown at two locations in Hawai’i.
Methods

- 14 cultivars grown June-November 2009.
- Waimanalo and Molokai
- Jalapeno, Habanero and small fruited cultivars developed by TAMU.
- Harvests (90-120 days after transplanting) were timed.
- Market mature fruits analyzed for capsaicin content at TAMU
Variability in fruit weight

Weight of 10 fruits (g)

Thai hot Firecracker Hawaiian Italian Orange Spur Super chili Indian Peto Red Carib TAM Mild Hab TAM Waialua TAM Jal

Hawaiian/Thai Habanero Jalapeno
Fruit size vs. labor cost

<table>
<thead>
<tr>
<th>Fruit Variety</th>
<th>Location</th>
<th>Labor Cost per Pound ($10.50/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. annuum</td>
<td>Waimanalo</td>
<td>$0.00, $1.00, $2.00, $3.00, $4.00, $5.00, $6.00, $7.00</td>
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<tr>
<td>Hawaiian/Thai</td>
<td></td>
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<tr>
<td>Habanero</td>
<td></td>
<td></td>
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<tr>
<td>Jalapeno</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. frutescens</td>
<td>Waimanalo</td>
<td>$0.00, $1.00, $2.00, $3.00, $4.00, $5.00, $6.00, $7.00</td>
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<tr>
<td>Jalapeno</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. annuum</td>
<td>Molokai</td>
<td>$0.00, $1.00, $2.00, $3.00, $4.00, $5.00, $6.00, $7.00</td>
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</tbody>
</table>
Habanero

Total capsaicinoids µg*g⁻¹

- Approximately equal to 320,000 SHU
- 39 ppm

TAM Mild Habanero
- TAM Habanero
- Peto Orange
- Red Carib

Legend:
- a
- b
- c
- d
Jalapeno

Total capsaicinoids µg*g⁻¹

- TAM Mild Jalapeno
- Waialua
- TAM Jalapeno

The TAM Jalapeno variety has the highest total capsaicinoids, followed by Waialua, and then TAM Mild Jalapeno.
Hawaiian & Thai types

Total capsaicinoids $\mu g g^{-1}$

- Indian Rooster Spur: d
- Super Chili: d
- Thai Hot: cd
- Orange Thai: cd
- Thai Firecracker: c
- Hawaiian: a

C. annuum

C. frutescens

pungent Habanero average
~200,000 SHU

pungent Jalapeno average
~26,000 SHU

C. frutescens
To Conclude

- Selecting for varieties with large fruit within market type is expected to reduce labor costs.
- Labor costs also likely affected by plant characteristics, harvest crew, duration of harvest period etc.
- Capsaicinoid concentrations vary widely within and among pepper types.
To Conclude

- Opportunity exists to match capsaicinoid concentrations with agronomic and sensory traits to create and expand niche markets for small growers in Hawai‘i and elsewhere.

- Answering “How hot is it?” is expected to increase adoption of locally adapted germplasm by Hawai‘i growers.
Acknowledgements

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HATCH
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Capsaicinoid Analysis

HPLC conditions

- Column: Nova Pak C-18, 15 x 0.46 cm, with a guard
- Mobile phase: 45% acetonitrile
- Flow rate: 1 ml / min for 30 min
- Detection: 280 nm

(Modified from Collins, et al., 1995)
Chromatogram of Capsaicin Analysis

NC – nor-capsaicin
NDHC – nor-dihydro-capsaicin
C – capsaicin
DHC – dihydro-capsaicin
HC – homo-capsaicin
HDHC – homo-dihydro-capsaicin

Retention Time (min)