Hawaii’s ‘Awa Renaissance

Kava the drink of peace
Ancient crop of the western Pacific
Likely domesticated in the islands of Vanuatu.
Consumed as water-extract from macerated (traditionally pounded or finely cut) fresh, (also currently frozen) or dried root and stump
Various names kava (Tonga also official English common name, yaqona and grog(Fiji), ava (Samoa), ’awa (Hawaii), sakau (Pohnpei), many in Vanuatu.
Component of religious, political, and cultural life due to psychoactive effect. Fiji, Samoa, Tonga codified the use of kava to open important family, community, island meetings to encourage discussion and discourage anger and violence.
Medicinal, religious, cultural, social
Consumption was more egalitarian
Original *pau hana* drink of working people, *pupu* is the
word for morsel to chase the taste after drinking
particularly cooked banana or poke.
Missionaries associating kava with the disbanded
Hawaiian religion discouraged consumption.
Gov’t licensed the sale for revenues in 19th and early 20th
centuries.
Little use by mid 20th century, exports to Germany
ceased during WWII and did not resume until late 20th
century.
World production

2000
13000 ha in Pacific - world
Vanuatu 3000 ha
Fiji 4800 ha
Samoa 1000 ha
Tonga 1000 ha
Pohnpei 3000 ha
Hawaii > 50 ha
Vanuatu - the home of kava

Many varieties
3000 ha produce 10,000 MT/yr in 2000
7500 MT for domestic market
2500 MT exported
Farm gate price is $0.80/fresh kg - $8M/yr
250 kava bars with $30M sales per yr
>35 varieties noted from the past that are mutants of at least 3 different plants introduced by Polynesian explorers

Good drinking quality

Today we recognize 13: Hanakapi ai, Hiwa, Honokane Iki, Kumakua, Mahakea, Mapulehu, Mo i, Nene, Opihikao, Pana ewa, Papa ele ele, Papa ele ele pu upu u, Papa kea

2003 officially 20 ha, 10 ha harvested

Farm gate price $9.70/fresh kg, $0.1M / yr

2011 Price to buyer for fresh frozen, ground kava is $15/ lb.

5 registered kava bars (Oahu, Kona, Hilo, Maui) many informal kava circles
Piper methysticum
Herbaceous perennial shrub, multi-stemmed, heart-shaped leaves
Flowers but does not set fruit
Human selection from Piper wichmannii the progenitor of kava
Many cultivars
Morphotypes and chemotypes
Psychoactive substance, predominant kavalactones given ID number

Used to describe a chemotype by listing the Kls in order of their amount a sample, 425631 is a good drinking chemotype whereas 245631 is considered not good drinking chemotype or 2 day (Tudey) or hangover kava

1- DMY demethoxyyangonin
2- DHK dihydrokavain
3- Y Yangonin
4- K kavain
5- DHM dihydromethysticin
6- M methysticin
Getting ‘kava-fied’

Beverage
Taste is slightly pungent, distinct aroma of over-wintered carrot
Color gray to tan to greenish opaque

Effects
Tongue and lip numbing
Mildly talkative, euphoric
Calming, well-being, clear thinking
Relaxed muscles
Deep sustained sleep
No morning after with most cultivars
Rise of kava herbal supplement

1995 Nutraceutical Act by Congress permitted more aggressive marketing and less over-sight by the FDA. Kava ranked the 5th most popular herbal supplement in the late 1990s.

Rapid increase in demand of kava from Europe and later, from the US.

Important exporting item for S. Pacific countries such as Fiji, Vanuatu and W. Samoa.

Hawaii identified kava as a potential alternative crop and many farms planted kava from the mid-90s.
The sudden downfall of kava industry

90 adverse reaction cases of liver injury/death allegedly linked to kava use in Europe
Switzerland, Germany and France leading the ban on kava, followed by ca. a dozen of other countries
In US the FDA issued an “advisory” on kava use
Kava commerce collapsed since the ban
Are kavalactones hepatotoxic?
All published research work on the biological activities focused on kavalactones.
Several recent publications have been focused on the effects of kavalactones on liver. None has shown that the kava-liver controversy was due to kavalactones
Traditional kava drinkers may ingest much higher kavalactone levels than the users of kava pills or tablets without acute liver toxicity symptoms
1-8 = kavalactones, except 3: unidentified

co-elution of

8 = kavalactone DMY

and

9 = alkaloid pipermethysticine,
Hawaii’s ‘Awa Renaissance?

1980’s

Vincent Lebot sees kava return as drink of independence in Vanuatu, Fiji.

Postdocs with RA Manshardt establishes contact with core group in HI - Ron Fenstemacher, Jerry Konanui, Ed Johnston
1990’s

Nutraceutical legislation passed in US
Kava use in Hawaiian cultural events
Association of Hawaiian ‘Awa forms
Commercial planting begins ~ 100 acres
Feral stands harvested for roots & stump & prop
Visions of $10 lb fresh x 25 lb stumps in 18 months x 1800 plants/acre = $300,000/acre/year
more reasonable target is 20,000 lb/acre in 2 yr crop
Hawaii’ Awa Council forms
Hale Noa opens
AHA publishes ‘Awa Production Guide
2000

Nursery prices drop from $25 to < $5
Price declines to $1 lb fresh or less as first harvest nears
Thieves begin harvest early
Euros raise concern about kava affecting liver
Kava dieback (cucumber mosaic virus) becomes a problem
Cost of transplants becoming a problem
Cost of harvesting by hand will become a problem
Cost of drying will become problem
Nematodes on replant and new sites becoming problem
2001
Contracts canceled to nutraceutical and pharmaceutical companies
Price drops

2002-03
CTAHR scientists (CS Tang and K Dragull find the alkaloid pipermethysticine (PM) in leaves and bark (stem peelings)
They check national export statistics that shows peelings increased from the South Pacific.
CTAHR scientist Pratibha Nerurkar shows the alkaloid kills human liver cells at 0.001 concentration of kavalactones.

2005
But later her student Steve Lim showed that rat liver cell cultures were also killed BUT when fed to the rats there was no effect on the liver. Perhaps PM is destroyed before reaching the liver.
In early 2003 Hawaii industry decides to focus on increasing public awareness of kava as an ancient beverage— the drink of peace and promoting the beverage instead of extract-based capsules.

2003 First Hawaii Pacific Island Kava Festival. This year Oct 3.
Propagation

Vegetative only – no seed produced

Always use healthy stems, no disease.

Two HI styles for limited propagules:

>50% shade and mist

- Root 1-2 node stem pieces
- Transplant to pot
- Transplant to field

Low tech, 50% shade over sphagnum moss works very well

TPSS scientists Sagawa and Kunisaki develop a tissue culture method. This is used in Fiji to produce disease free plants.
Traditionally stems pieces are planted horizontally or at a slant. It's not as efficient in terms of plant material but fast and inexpensive.

Based upon HI experience, use 2-4 nodes, horizontal, bleach not needed to sanitized the pieces, generally one piece is adequate.
Field Production

Media
  Raised bed in soil
  Compost-cinder mound
  Basket with compost-cinder
+/- Irrigation, > 70 inch rainfall
+/- Shade
< 2500’ leeward side
Wind sensitive
Staggered planting dates

Since harvest is in 2-3 yrs, staggering to yearly is OK.
Sprinkler irrigation

2'x8' sprinklers
Mo’i 1 yr after transplanting
Ready for harvest after 2 yr

2 yr ready to harvest
7 varieties under Koa
Note pinched irrigation line due to growth habit of new stems spreading from center.
Virtually no pesticides, broad-labeled only
Weeds- nothing, ‘RoundUp’ preplant

Pests
   Most serious aphids (vector CMV), root knot nematodes, mites, slugs, white fly

Diseases – several root and leaf diseases
   Kava dieback (CMV-cucumber mosaic virus) very serious.
   Phoma sp. fungus that causes a shot hole, leaf drop, even stem death.
   Pythium- a root fungus disease
Kava Dieback

Cucumber mosaic virus spread by banana aphid most frequent in dry, hot areas.
Other major pest and disease

Shot hole disease is caused by a fungus *Phoma* sp. Occurs in rainy, cool weather. Leaves drop, stems can be infected.

Root knot nematode ruins the roots, plants have low vigor, wilt easily.
Export to kava extractors paid on minimum (6)% kavalactone content in the dry kava.

Yield parameters

Kilograms kavalactone/ hectare

= % kavalactone in root & stump (stems & leaves)

X kg of usable harvested plant part per acre

How to optimize sustainable kavalactone production?
Cultivars, light, and fertility

2 Varieties chemotype
- Papaeleele 462513
- Isa 245613

2 Light levels
- Full sun
- 50% shade

2 Fertilization levels
- 500 pounds of NPK / year/ acre
- 250 pounds of NPK

2 Pruning levels
- 30% stem removal in first year vs. no pruning

Higher fertility, full sun and adequate irrigation or rainfall is best.
Hydroponic

After 2 months
Traditionally:
roots - as much as feasible
‘stump’ amphorous storage stem
Stem base, 20 cm
Remove stems

Dig 30-35 cm from stump.

Back hoe for single plant

Modified sweet potato harvester, multiple plants
Processing

Dig
Wash
Chop and second wash
Separate into root and stump
Final wash
Freeze fresh or Dry < 100 F
Grinding dried roots
Ethanol extraction of dried pieces yields a 30% kavalactone extract. Supercritical carbon dioxide extraction yields up to 90% kavalactone extract. These extracts are sprayed onto starch for capsules or added directly into beverages such as Ozia or Mary Jane’s Relaxing Soda.
If dry powder add 10-13 parts water to 1 part powder.

If fresh or fresh frozen kava add 7-9 parts water to 1 part fresh or thawed ground kava.

If using finely ground fresh or dried, place into fine mesh bag, mix with water, massage and squeeze out the beverage. Press cake in bag should not feel oily.
CTAHR method of preparation based on % Kavalactones removed.

Research in my lab indicates that more kavalactones can be extracted with water using the following conditions.

Fresh material must be small pieces
Use a blender with as large a motor as possible.
Use warm water 45 to 50°C.
Divide water for dilution into 3 parts, add 1/3 of water, blend 1 minute, squeeze, repeat 2 times

E.g. For 10 people. Put 750 ml of 45°C water into large blender, add 500 g finely chopped fresh kava, run blender for 1 minute, pour blender contents through fine nylon netting (1 gal paint strainer bag, or silk screening) squeeze liquid into bowl, repeat 2 times but on the same kava. Finally pour beverage through the netting to catch any pieces.

If dry start with 100g added to 750 + 400 ml warm water (to replace water lost in drying), blend and squeeze, next 2 times use only 750 ml. If too strong use more water or dilute afterwards.
CTAHR method

Chop root or stump pieces to 1 by 2-3cm in powerful blender. If pieces too big and your blender will jam and burn out. If you see or smell smoke its too late, blender is damaged

We use a nylon painter strainer bag from hardware store with elastic top or fine silk screen fabric. Objective is squeeze liquid from kava, so no kava pieces in beverage.
Using 1 cup dry kava powder add 5 cups warm water stir with blender for 1 minute. Pour into net bag (paint strainer, old t-shirt, silk screen). Squeeze liquid into large bowl. Add 3 cups warm water to blender add the kava in net bag, stir with blender 1 minute, squeeze liquid into bowl. Add 3 cups warm water to blender add the kava in net bag, stir with blender 1 minute, squeeze liquid into bowl.

1 cup dry kava used 11 cups water.
2 cup fresh used 9 cups water.
Kava naturally contains spoilage bacteria. In 2005 Alvin Huang and I began project with industry to develop a shelf stable beverage product. Using pressurized CO$_2$, final product was too acidic in part due to a broken vacuum pump, if heat pasteurized beverage thickened and had flavor of cooked starch.

Still not there. Best today is frozen ground kava or frozen beverage.
Current Market

Export to nutraceuticals market
Export for pharmaceutical market
Domestic and export recreational beverage
Increasing due to:


Further potential on-going medical research

Addiction therapy. Cancer prophylaxis

Expanded recreational use:

Informal kava circles, gatherings, kava ‘bars’, negotiations, board meetings, anti-road rage pau hana drink