

Kava the drink of peace



Hawaii's 'Awa Renaissance ?



History

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.

In Hawai' i

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

Hawaii

>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

Biology

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

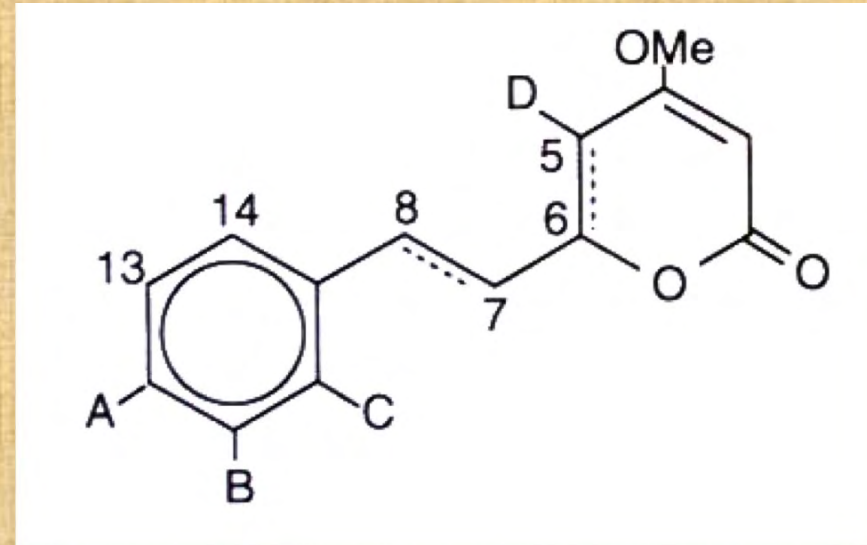


Kavalactone

Psychoactive substance, predominant kavalactones given ID number

Used to describe a chemotype by listing the KIs 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

Standard method of analysis hid a potential problem

HPLC (High pressure liquid chromatography) did not reveal presence of an alkaloid but GC (gas chromatography) did.

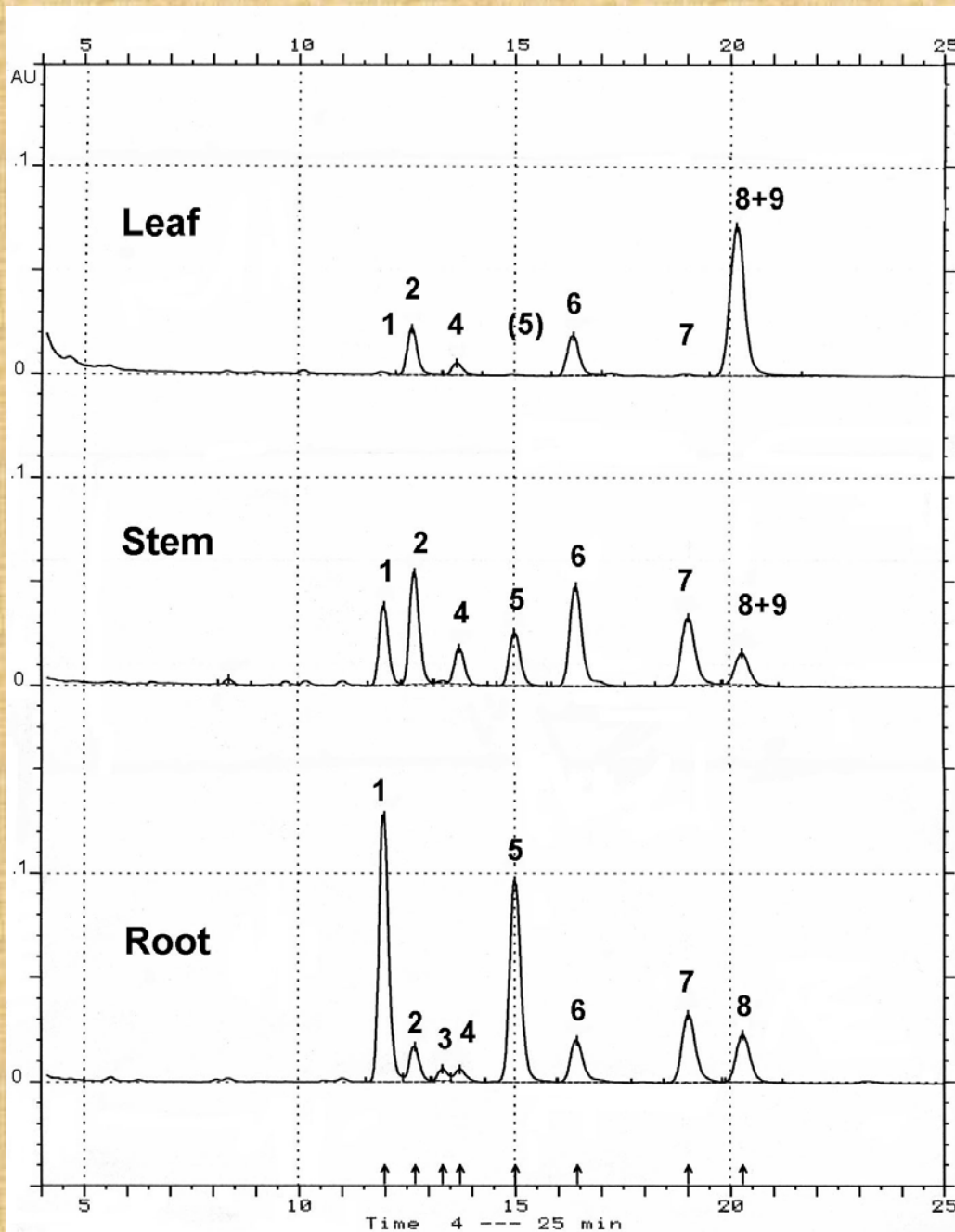
1-8 = kavalactones, except 3: unidentified

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 Fenstermacher, 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 & prod

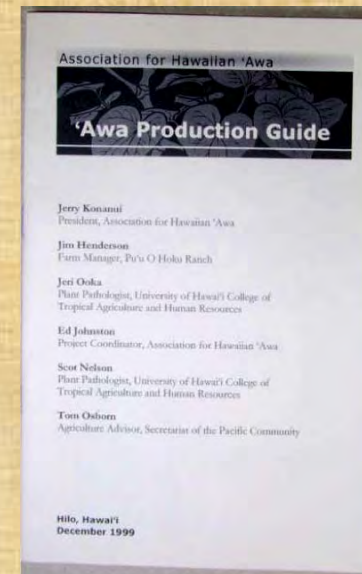
Visions of \$10 lb fresh x 25 lb stumps in 18 months x 1800 plants/
acre = \$300,000/ acre/ year

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

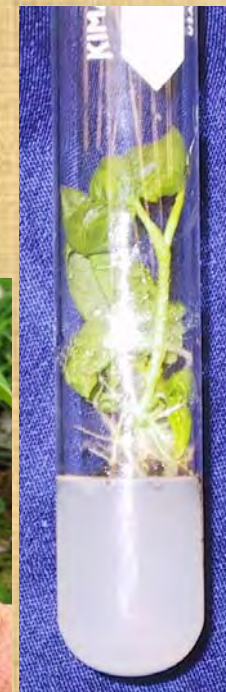
Always use healthy stems, no disease.

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

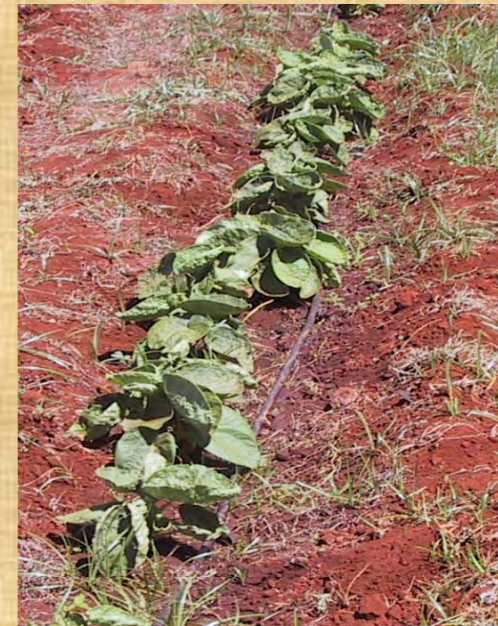


TPSS scientists Sagawa and Kunisaki develop a tissue culture method. This is used in Fiji to produce disease free plants.

Field propagation

Traditionally stems pieces are planted horizontally or at a slant. Its 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

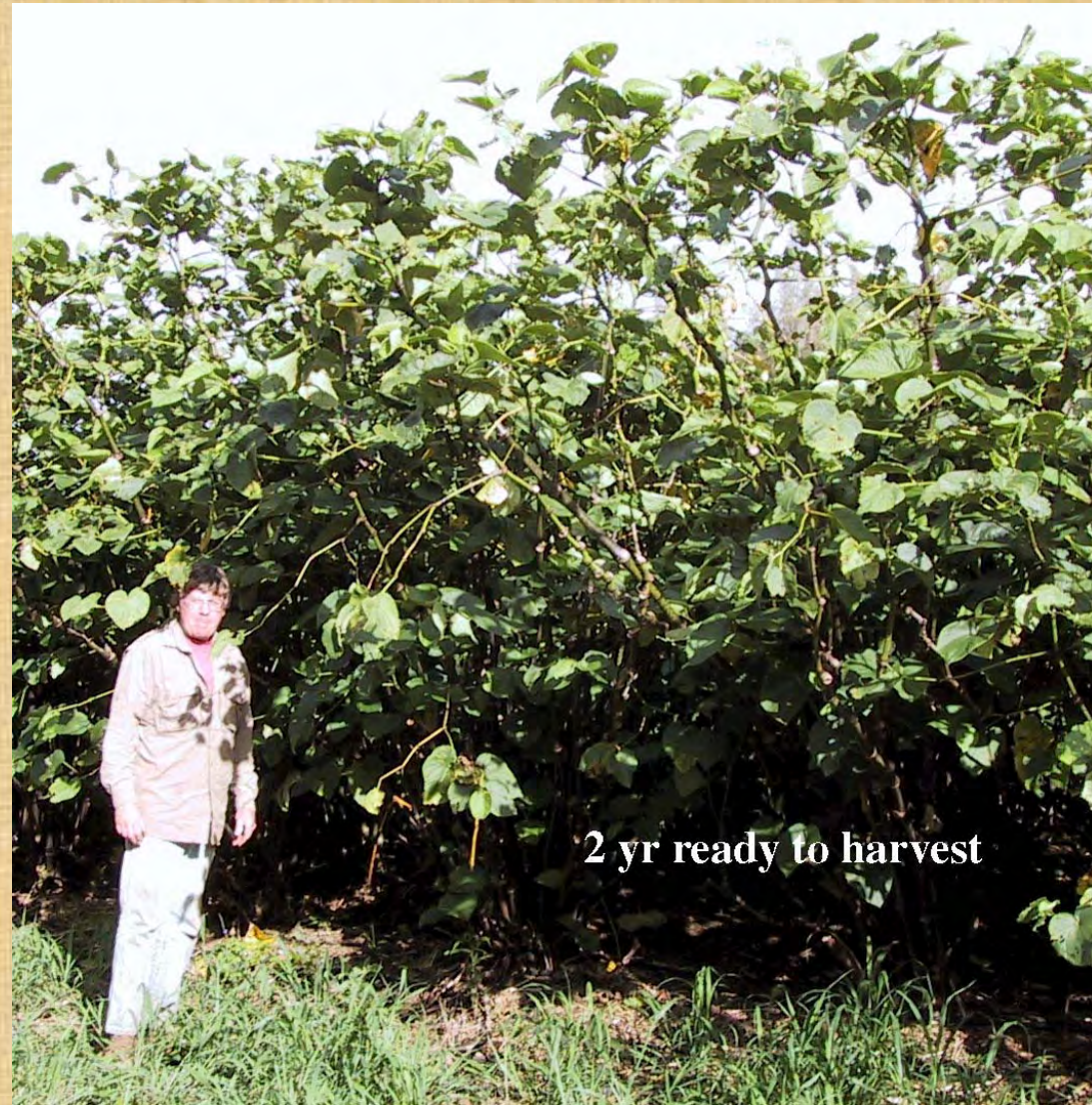


Mo'i 1 yr after transplanting

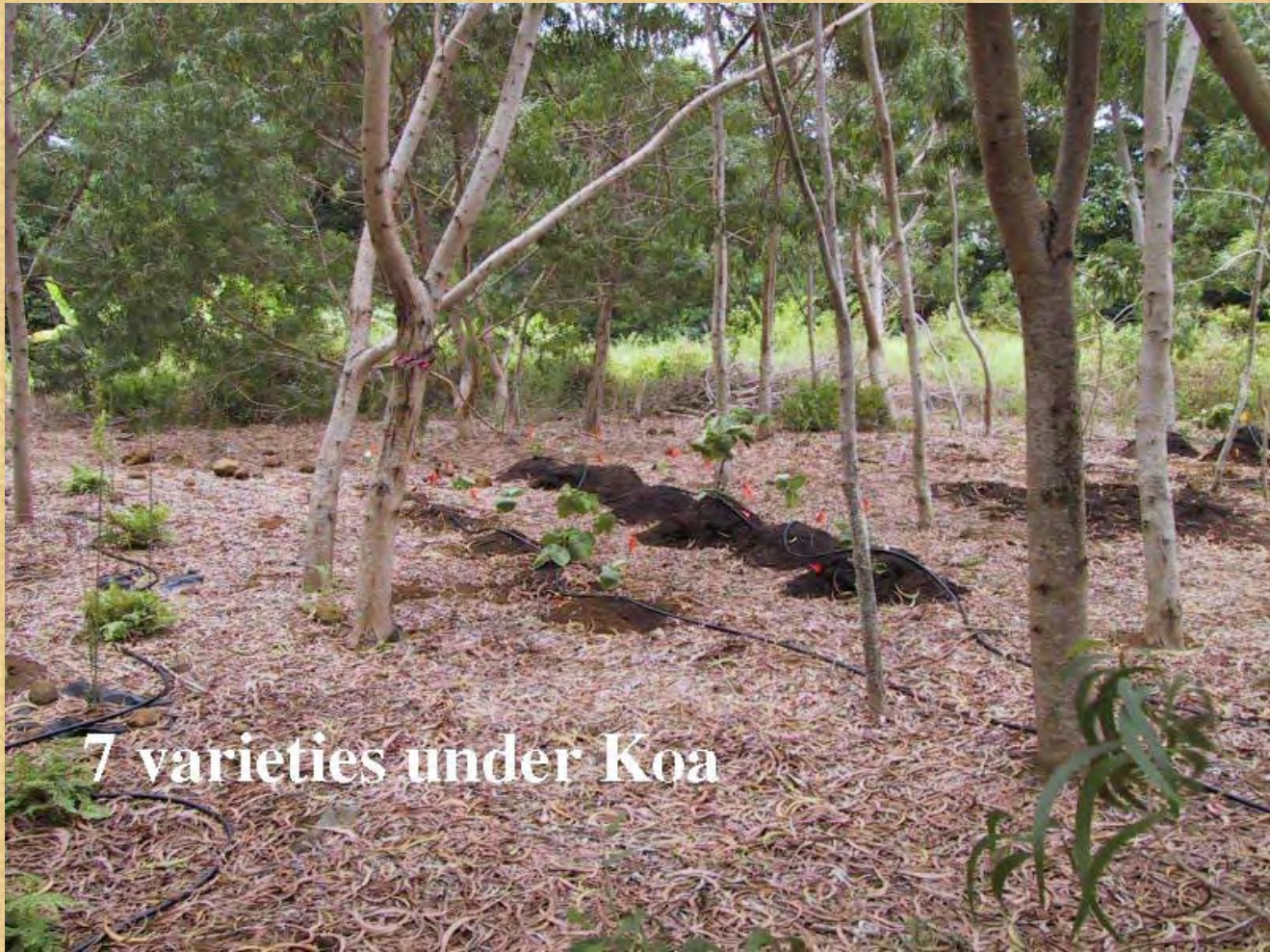


1 yr old

Ready for harvest after 2 yr



2 yr ready to harvest



7 varieties under Koa





At harvest 2 yrs old

Note pinched irrigation line due to growth habit of new stems spreading from center



Pests & Disease

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.



Production physiology

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

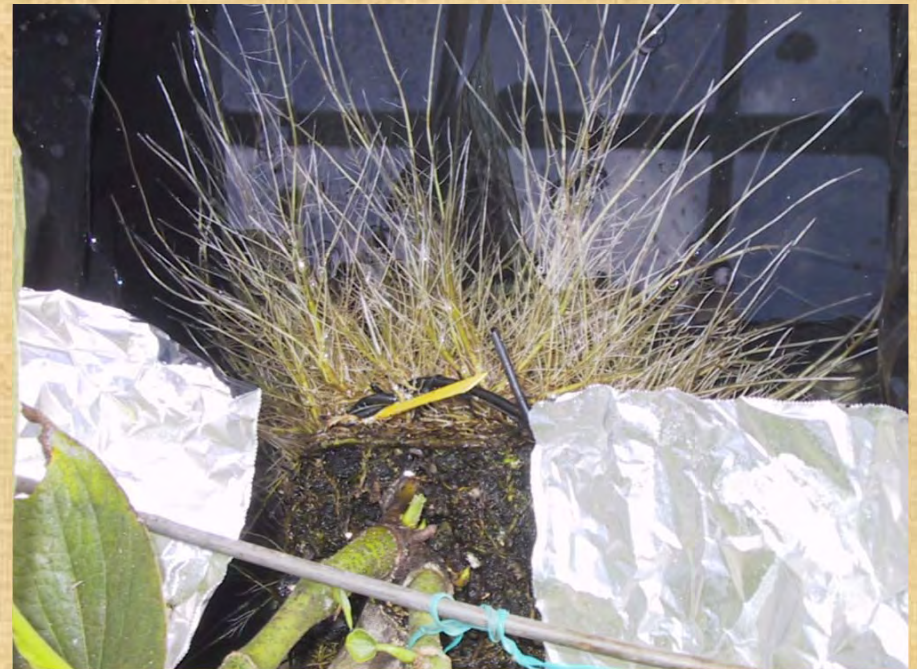
- 30 % stem removal in first year vs. no pruning



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

Hydroponic

After 2 months



Harvest

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



Garden shredder



Food chopper

Grinding dried roots



Industrial Processing

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.

Hawaii Beverage preparation



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.

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.



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 45C 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

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.

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



CTAHR method in cups

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 CO₂, 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

Market Potential

Increasing due to:

Public interest in plant-based medicines and Nutraceutical legislation (1995) but negatively impacted by European ban and kava extract tablets - liver controversy.

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



CTAHR Kava tasting table at KavaFest