KALAMANSI® PLG-4 EXTRACT

KALAMANSI® PLG-4 EXTRACT

DESCRIPTION:

KALAMANSI® PLG-4 EXTRACT is obtained from the fruit of *Citrus Madurensis*, a variety of citrus growing in the Philippine Islands.

INCI Name: Water (and) Citrus Madurensis Fruit Juice (and) Polyglycerin

INTEREST:

The kalamansi fruit is rich in citric acid and vitamin C.

It is used locally for hair care as it confers a silky and shiny appearance to the hair and acts as an anti-itching agent.

It is also used in skin lightening formulations and can find applications for greasy skin care.

CHARACTERISTICS:

Appearance:	Yellow liquid
pH:	2.5 - 4.5

SAFETY:

Information related to safety procedures can be found in the material safety data sheet.

PACKAGING AND STORAGE:

10kg container
Store at room temperature.

Issue 05/06

INTERNATIONAL DEVELOPMENT AND MANUFACTURING

KALAMANSI® PLG-4 EXTRACT

Citrofortunella mitis belongs to the Rutaceae family and is known locally as "Kalamansi" or "Calamondin." It is a small tree, originally native to China, which is now widely grown throughout southern Asia and Malaysia. It is a particularly important source of citrus in the Philippine Islands.

The kalamansi fruit is of small size (3-4cm wide). It does not resemble a lemon nor a lime, but was thought to be an hybrid of a lime and a mandarin orange or a kumquat. This is probably why it has been referred to as "Chinese orange." The fruit is best used when mature and still green but can also be used when fully ripe (yellow to orange in color). The extremely juicy and highly acid pulp has a particularly distinct, aromatic smell and taste. The fruit juice is an ingredient in numerous local beverages, cakes, sauces, and marmalades.

COMPOSITION

The whole kalamansi fruit contains a small level of carbohydrates (3%), minerals (1%), ascorbic acid (0.1%), and citric acid (3%).

The peel is rich in essential oils and ascorbic acid (0.15%).

The juice is very acidic and contains 5.5% citric acid. This is probably why it is used by the local population as a rinse product after shampooing for shiny hair as the acid juice smooths the hair, conferring a typically silky and healthy appearance.

APPLICATIONS

The crushed fruit is used for hair masks, or the juice is applied to the scalp after shampooing. It is also reported to eliminate itching.

The juice has been used to clear up acne vulgaris; and it should be noted that the essential oils from kalamansi have shown promising results against *Staphylococcus aureus*. It is often used in body deodorant applications.

Due to its richness in natural citric acid, the juice also has a lightening effect on the skin complexion and has been reported to bleach freckles and treat pigmentation problems.

FORMULATION

MMP INC. INTERNATIONAL DEVELOPMENT AND MANUFACTURING

Crystalcast Conditioner with Kalamansi (JAC-6-38)

Phase	Ingredient	INCI	%w/w
	DI Water	Water	80.80
	Disodium EDTA	Disodium	0.10
	Glycerin	Glycerin	1.00
A	Hydroxypropyl Methylcellulose	Hydroxypropyl Methylcellulose	0.10
	Polyquaternium 10	Polyquaternium 10	0.25
	Crystalcast™ MM (MMP)	Cetyl Alcohol (and) Stearyl Alcohol (and) Sucrose Distearate (and) Sucrose Stearate (and) Betasitosterol	3.00
	Cetrimonium Chloride	Cetrimonium Chloride	3.00
	Kalamansi® PLG-4 Ext. (MMP)	Water (and) Citrus Madurensis Fruit Juice (and) Polyglycerin	10.00
B	**Ulline® 46 (MMP)**	Oxidized Corn Oil	0.50
C	Germall Plus	Diazolidinyl Urea (and) Iodopropynyl Butylcarbamate	1.00
D	Fragrance	Fragrance	0.25
			100.00

Procedure:

Premix Phase A in main vessel, start heating to 80C. Add Phase B to main vessel with medium sweep mixing. Continue heating. When batch reaches 80C homogenize 5 minutes, start cooling with medium sweep mixing. When batch reaches 45 add Phase C and Phase D. Continue mixing and cooling. Shutdown at 34C.

PUBLICATIONS

Florida Food Fare

by Mary King
Program Assistant for Family & Consumer Sciences
Cooperative Extension Service for Sarasota County

Calamondin

as written for the Sarasota Herald-Tribune, Cuisine Section, March 3, 1999

Description: Calamondin is an acid fruit originating in China, which was introduced to Florida as an “acid orange” about 1900. It is often considered an ornamental citrus tree, and a small branch of calamondins is often put in shipped citrus packages for contrast and ornamentation. But indeed, the fruit is edible. The fruit is small and orange, about 1" in diameter, and resembles a small tangerine. The peel is thin and smooth, yellow to yellow-orange and easily separable. There are 5 to 9 segments around a small semi-hollow axis. The flesh is orange, juicy and acid. Calamondins are widely grown as an ornamental tree in California and Florida. Calamondins can be grown as a dooryard tree throughout the citrus belt and will do very well as a tub or container plant in colder locations in North Florida if protected from the cold.

Availability: The calamondin fruit takes nearly a year to ripen. Mature fruit can be produced year round but are most abundant from November to June. Calamondins are not sold in most grocery stores, but some Asian markets, produce stores and citrus stores carry it.

Nutritional Value: One calamondin is about 12 calories, with a very small trace of fat. It contains approximately 1.2 g fiber, 37 mg potassium, 7.3 mg vitamin C, 57.4 mg IU vitamin A, 8.4 mg calcium, 15.5 g water and 3.1 g carbohydrates.

Selection and Care: Calamondins are thin skinned and do not keep long. Choose firm, yellow to yellow-orange fruit. Avoid fruit that is soft and over ripe. If you are picking the fruit yourself, it is best to use clippers or scissors to get them off of the tree, rather than pulling them. This will keep the stem end of the fruit from tearing, which promotes deterioration. Calamondins are kept best in the refrigerator and should be used within a week.

Use & Preparation: The juice of the calamondin can be used like lemon or lime to make refreshing beverages, to flavor fish, to make cakes, marmalades, pies, preserves, sauces, and to use in soups and teas. Thin slices can be used to garnish punch bowls, noodle dishes, meat and fish. In Asia, calamondins are even used in hand washing bowls. The juice can be frozen in containers or in ice cube trays, then storing the frozen cubes in plastic freezer bags. Use a few cubes at a time to make calamondinade. The juice of the calamondin also makes an excellent hair conditioner. Pour 1 liter of boiling water over thinly sliced fruit. Let it steep. When water is cool, pour through the hair as a final rinse.

Morton, J. 1987. Calamondin. p. 176–178. In: Fruits of warm climates. Julia F. Morton, Miami, FL.

Calamondin

Prized for its ornamental value more widely than for its fruit, the calamondin was formerly identified as *Citrus mitis* Blanco (syn. C. *microcarpa* Bunge); more recently in *Citrus* circles, erroneously, as *C. madurensis* Lour.; now it has been given the hybrid name: X *Citrofortunella mitis* J. Ingram & H. E. Moore. Among alternate common names are: calamondin orange; Chinese, or China, orange; Panama orange; golden lime; scarlet lime; and, in the Philippines, *kalamondin, kalamunding, kalamansi, calamansi, limonsito,* or *agridulce.* Malayan names are *limau kesturi* (“musk lime”) and *limau chuit*. In Thailand it is *ma-nao-wan.*

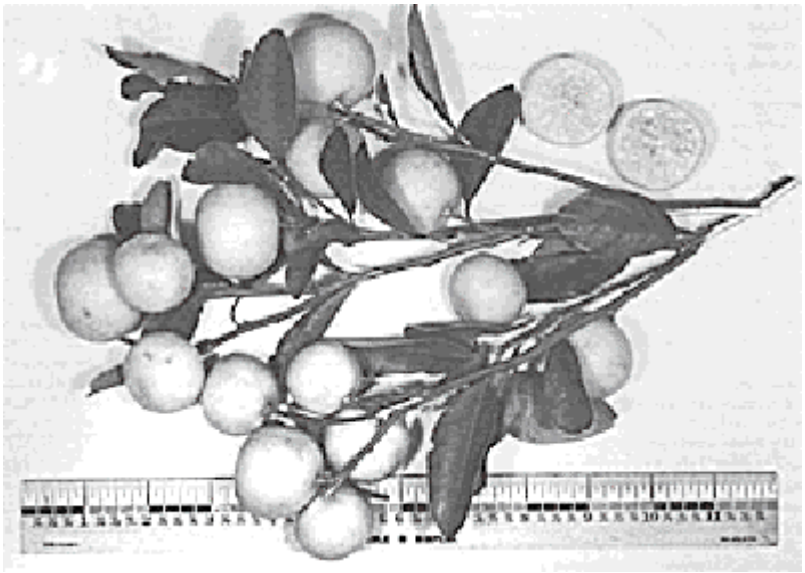

Fig. 44: The calamondin (X *Citrofortunella mitis),* a showy ornamental, makes excellent marmalade.

Description

The calamondin tree, ranging from 6 1/2 to 25 ft (2-7.5 m) high, is erect, slender, often quite cylindrical, densely branched beginning close to the ground, slightly thorny, and develops an extraordinarily deep taproot. The evergreen leaves (technically single leaflets) are alternate, aromatic, broad-oval, dark-green, glossy on the upper surface, yellowish-green beneath, 1 1/2 to 3 in (4-7.5 cm) long, faintly toothed at the apex, with short, narrowly-winged petioles. The richly and sweetly fragrant flowers, having 5 elliptic-oblong, pure-white petals, are about 1 in (2.5 cm) wide and borne singly or in 2’s or 3’s terminally or in the leaf

axils near the branch tips. The showy fruits are round or oblate and to 1 3/4 in (4.5 cm) wide, with very aromatic, orange-red peel, glossy, and dotted with numerous small oil glands; tender, thin, easily-removed, sweet, and edible. The pulp, in 6 to 10 segments, is orange, very juicy, highly acid, seedless or with 1 to 5 small, obovoid seeds, green within.

Origin and Distribution
The calamondin is believed native to China and thought to have been taken in early times to Indonesia and the Philippines. It became the most important *Citrus* juice source in the Philippine Islands and is widely grown in India and throughout southern Asia and Malaysia. It is a common ornamental dooryard tree in Hawaii, the Bahamas, some islands of the West Indies, and parts of Central America. Dr. David Fairchild introduced it into Florida from Panama in 1899. It quickly became popular in Florida and Texas. The California climate is not as favorable but a variegated form (‘Peters’) is cultivated there.

Since 1960, thousands of potted specimens have been shipped from southern Florida to all parts of the United States for use as house plants. Israel is now similarly raising such plants for the European market. The calamondin is also valued as a rootstock for the oval kumquat (q.v.) for pot culture.

At the Agricultural Experiment Station of the University of Florida in Gainesville, the calamondin is much utilized for greenhouse research on the various aspects of flowering and fruiting in Citrus.

Climate
The calamondin is as cold-hardy as the Satsuma orange and can be grown all along the Gulf Coast of the southern United States. It is moderately drought-tolerant.

Soil
The tree seems able to tolerate a wide range of soils from clay-loam in the Philippines to limestone or sand in Florida.

Propagation
Calamondin trees may be easily grown from seeds, which are polyembryonic with 3 to 5 embryos each. For commercial fruit production in the Philippines, the trees are budded onto calamondin seedlings. In Florida, propagation by cuttings rooted under constant mist is the more common commercial procedure for pot culture. Even leaf-cuttings will root readily.

Culture
Plants grown from cuttings fruit during the rooting period and will reach 18 to 24 in (45-60 cm) in height in 10 1/2 months. The flowers are self-fertile and require no cross-pollination. Transplanted into a large container and well cared for, a calamondin will grow at the rate of 1 ft (30 cm) per year; will produce an abundant crop of fruit at the age of 2 years and will continue to bear the year around. Potted plants for shipment can be stored in the dark for 2 weeks at 53.6º F (12º C) without loss of leaves or fruits in storage or in subsequent transit and marketing.

In orchard plantings, Philippine workers have established that a complete commercial fertilizer with a 1:1 nitrogen to potassium ratio gives the best growth. There are 2 applications: one prior to the onset of the rainy season and the second just before the cessation of rains. Adequate moisture is the principal factor in yield, size and quality of the fruit. Drought and dehydrating winds often lead to mesophyll collapse.

Harvesting
Calamondins are harvested by clipping the stems as they become fully colored throughout the year. In the Philippines the peak season is mid-August through October.

Storage
The fruits will keep in good condition for 2 weeks at 48º to 50º F (8.89º-10º C) and 90% relative humidity. Weight loss will be only 6.5%. Waxing retards ascorbic acid loss for 2 weeks in storage but not thereafter.

Pests and Diseases
The calamondin is a prime host of the Mediterranean and Caribbean fruit flies, and for this reason is much less planted in Florida than formerly. It may be attacked by other pests and diseases that affect the lemon and lime including the viruses: crinkly leaf, exocortis, psorosis, xyloporosis and tristeza, but it is immune to canker and scab.

Food Uses
Calamondin halves or quarters may be served with iced tea, seafood and meats, to be squeezed for the acid juice. They were commonly so used in Florida before limes became plentiful. Some people boil the sliced fruits with cranberries to make a tart sauce. Calamondins are also preserved whole in sugar sirup, or made into sweet pickles, or marmalade. A superior marmalade is made by using equal quantities of calamondins and kumquats. In Hawaii, a calamondin-papaya marmalade is popular. In Malaya, the calamondin is an ingredient in chutney. Whole fruits, fried in coconut oil with various seasonings, are eaten with curry. The preserved peel is added as flavoring to other fruits stewed or preserved.

The juice is primarily valued for making acid beverages. It is often employed like lime or lemon juice to make gelatin salads or desserts, custard pie or chiffon pie. In the Philippines, the extracted juice, with the addition of gum tragacanth as an emulsifier, is pasteurized and bottled commercially. This product must be stored at low temperature to keep well. Pectin is recovered from the peel as a by-product of juice production.

Food Value Per 100 g of Edible Portion*

Whole Fruit %	*Juice %*	
Calories/lb	173 (380/kg)	
Moisture	87.08-87.12	89.66
Protein	0.86	0.01
Fat	2.41	0.53
Carbohydrates	3.27	
Ash	0.54-0.64	0.62
Calcium	0.14	
Phosphorus	0.07	
Iron	0.003	
Citric Acid	2.81	5.52

Other Uses

The fruit juice is used in the Philippines to bleach ink stains from fabrics. It also serves as a body deodorant.

*The chemistry of the calamondin has received only moderate attention. Wester (1924) and Marañon (1935) reported the above constituents from Philippine analyses. Mustard found the ascorbic acid content of the *whole fruit* to be, 88.4-111.3 mg/100 g; of the *juice*, 30-31.5 mg; and of the *peel*, 130-173.9 mg.

Medicinal Uses

The fruits may be crushed with the saponaceous bark of *Entada Phaseoloides* Merr. for shampooing the hair, or the fruit juice applied to the scalp after shampooing. It eliminates itching and promotes hair growth. Rubbing calamondin juice on insect bites banishes the itching and irritation. It bleaches freckles and helps to clear up *acne vulgaris* and *pruritus vulvae.* It is taken orally as a cough remedy and antiphlogistic. Slightly diluted and drunk warm, it serves as a laxative. Combined with pepper, it is prescribed in Malaya to expel phlegm. The root enters into a treatment given at childbirth. The distilled oil of the leaves serves as a carminative with more potency than peppermint oil. The volatile oil content of the leaves is 0.90% to 1.06%.

QUALITY & SAFETY DATA

MVP INC. INTERNATIONAL DEVELOPMENT AND MANUFACTURING

SPECIFICATIONS

KALAMANSI PLG-4 EXTRACT

TEST	SPECIFICATION
Appearance	Clear pale yellow to yellow liquid
Color (Gardner)	3.5 - 5.5
Odor	Light
Refractive Index	1.310 - 1.350
pH	2 - 4
% Extract	35 - 45%
Total Aerobic Plate Count Including Yeast & Molds	≤ 1000 cfu/g
Gram Negative Microbes	Absence

INTERNATIONAL DEVELOPMENT AND MANUFACTURING

MATERIAL SAFETY DATA SHEET

MMP, Inc.
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908 561-4435

Date of Issue: 02/05
Rev: 05/06

SECTION I SUBSTANCE IDENTIFICATION

Product Name: Kalamansi® PLG-4 Extract

SECTION II COMPOSITION

INCI Name: Water (and) Citrus Madurensis Fruit Juice (and) Polyglycerin

SECTION III HAZARDOUS IDENTIFICATION

Emergency Overview: Minimal hazard to human health and the environment

Potential Health Effects:

Inhalation: Negligible

Eye Contact: Negligible

Skin Contact: Negligible

Ingestion: No data available for humans

SECTION IV FIRST AID MEASURES

Eye Contact: Flush eyes as soon as possible with running water for several minutes while keeping the eyelids wide open.

Skin Contact: Wash the affected skin area with soap and water. Remove contaminated clothing to clean before reuse.

Ingestion: Unknown symptoms. Consult with a physician for advice. If subject is completely conscious, rinse mouth and administer fresh water.

SECTION V FIRE FIGHTING MEASURES

Flash point: No data available

Flammability: Non-flammable

Auto-flammability: No data available

Danger of Explosion: Non-explosive

Oxidizing Properties: Non-oxidizing

Common Extinguishing Methods: Powder, foam, water spray, CO2

Inappropriate Extinguishing Methods: No restriction

Protective Measures in Case of Intervention: Evacuate all non-essential personnel if necessary. Wear self-contained breathing apparatus when in close proximity or in confined spaces.

Other Precautions: If necessary and safe to do so, remove exposed containers or cool with large quantities of water. Dilute product with water.

SECTION VI ACCIDENTAL RELEASE MEASURES

Precautions: Follow protective measures given in Section VIII.

Cleanup Methods: If possible, dam liquid with sand or earth. Collect product with suitable means. Place everything into a closed, labeled container compatible with the product. For disposal methods, please refer to Section XIII. Clean area with large quantities of water.

SECTION VII HANDLING AND STORAGE

Handling: Keep away from ignition and heat sources. Keep away from reactive products (see Section X).

Storage: Store in cool, dark place in original sealed container.

SECTION VIII EXPOSURE CONTROLS/PERSONAL PROTECTION

This material does not have established exposure limits.

Engineering Controls: Provide local ventilation. Follow protective measures delineated in Section VII.

Respiratory Protection: Not required

Hand Protection: Chemical resistant gloves

Eye Protection: If a risk of splashing exists, wear chemical proof goggles or a face shield.

Skin Protection: Wear coveralls

Other Precautions: Consult your industrial hygienist or safety manager for the selection of personal protective equipment suitable for the working conditions.

MATERIAL SAFETY DATA SHEET

SECTION IX PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Liquid
Color: Yellow
Odor: Light
pH: 2.5 - 4.5
Solubility: Water and alcohol

SECTION X STABILITY AND REACTIVITY

Stability: Stable under normal conditions of use
Conditions to avoid: Excessive temperature
Materials to avoid: Oxidizing agents
Hazardous Decomposition Products: No data available

SECTION XI TOXICOLOGICAL INFORMATION

No data available

SECTION XII ECOLOGICAL INFORMATION

Comments: Product is not significantly hazardous for the environment

SECTION XIII DISPOSAL CONSIDERATIONS

Waste Disposal Method: Consult current federal, state, and local regulations regarding the proper disposal of this material and its emptied container.
Packaging Treatment: Rinse the empty containers with plenty of water and treat the effluent in the same way as waste.

SECTION XIV TRANSPORT CONSIDERATIONS

D.O.T. Proper Shipping Name: Unregulated

SECTION XV REGULATORY INFORMATION

Non-regulated product

SECTION XVI OTHER INFORMATION

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