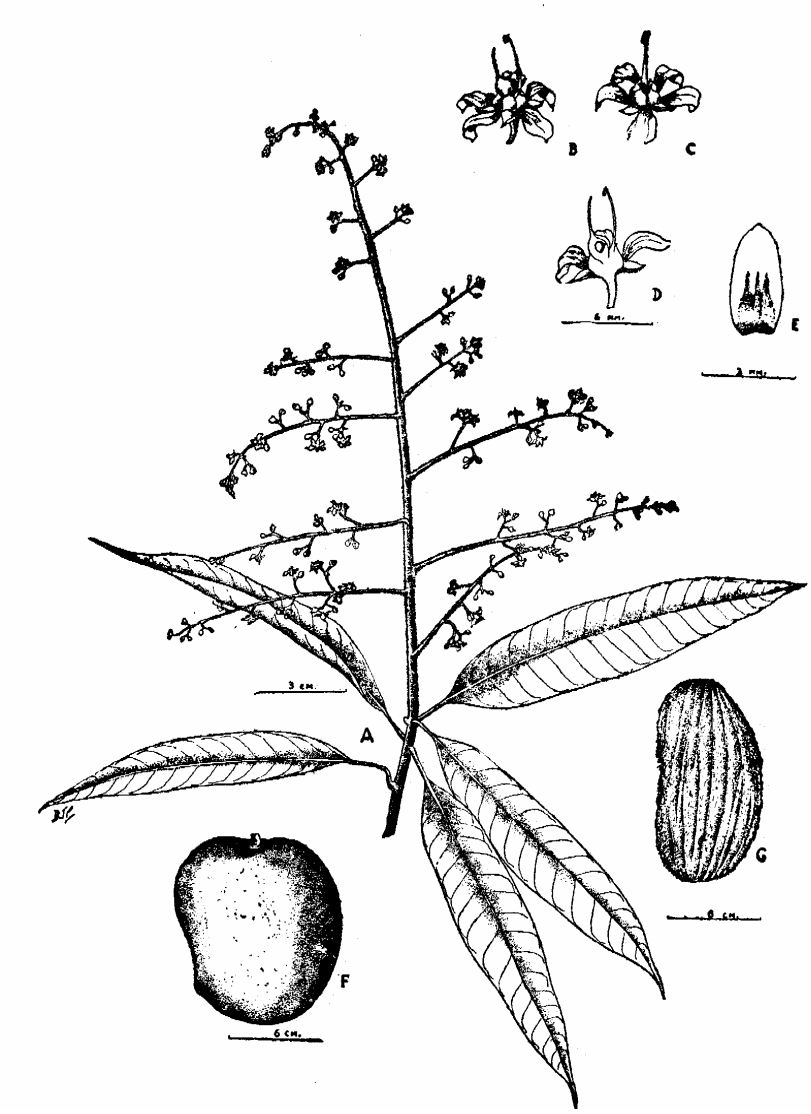
DWECK DATA

REFERENCES

MANGO
Mangifera indica

1. Leyel in her book (C.F.Leyel: Elixirs of Life. 1987 Faber and Faber. ISBN 0-571-14849-2) reports that Mangoes were eaten in India in the 15th century either in conserve of sugar, conserve of vinegar, in oil and salt; stuffed inside with green ginger and garlic; salted or boiled. The mango tree is regarded by homoeopaths as one of the best remedies for passive haemorrhages. It is a cure for the swellings of the lobes of the ear. The stones roasted were said to be good for the flux and the stone, and the kernel when green kills worms if taken internally.



Mythologically the mango tree derives its existence from the ashes of the Daughter of the Sun God. For Indian poets the tree has a peculiar significance. Its flowers are of great beauty and the fruit is much esteemed.

2. In a data sheet from Chesham Chemicals we read of mango butter from the fruit *Mangifera indica*, one of the most important and widely cultivated fruits of the world. The fruit has a yellow to pale green skin with a red blush, and a yellow to orange flesh with a large flat stone. The soft fat is extracted from the stone, neutralised and bleached, and then distilled to produce a soft pale coloured fat. The crop is collected from "wild trees" and so the pesticide level is low. Mango butter has a luxurious emollient feel.

The material is used as a food ingredient as a replacement for cocoa butter.

3. SPC December 1990, p.45, we read that mango kernel oil is derived from the kernels of *Mangifera indica*. It contains mostly oleic and stearic acids and has been designed for cosmetic applications.

4. In a leaflet from Tesco's we read that Mangoes were first cultivated some 4,000 years ago and are grown throughout the sub-tropical areas of the world. The colour of the skin varies by variety.

Mangoes are a good source of vitamin A and vitamin C. An average serving (100g) provides over a quarter of the RDA for vitamin A and all of the recommended RDA of vitamin C, as well as providing only 61 Calories (Kcal).

5. In a data sheet from Lipex on Mango Kernel oil (*Mangifera indica*) we read that India is the country of origin for mango. Mango makes out about half of the fruit production. There are about 41 mango varieties, but only a few of them are for commercial importance. The time for maturity is April to September and it differs from variety to variety.

Mango is a big fruit consisting of a pulp and a stone.

The stone which is the seed consists of a hard fibrous shell and an inner kernel from which the fat is obtained . The oil content of the kernel is about 10% (dry material). During the harvest season the stones are then further sun-dried to avoid hydrolytic splitting of the fat molecules and fatty acids. The mango kernels are brought from India and crushed by Karlshamns Trading and Crushing AB. The mango oil is then processed in several steps to obtain the material for cosmetic applications.

The Lipex 203 is a semi/solid product at room temperature. The Mango kernel fat is fractionated to obtain an unique product with lower melting point than traditional mango kernel oil. The crude mango kernel oil contains mainly triglycerides but also impurities which have to be removed. Through the refining process free fatty acids, peroxides, metal and phosphatides are removed. The result is a pure pale yellow, oxidation stable product free from odour.

It has a very pleasant feeling when applied as the pure oil to the skin. The main part of the oil consists of triglycerides and gives high emolliency to the skin. A very slight sweet scent gives the final touch of natural feeling.

Mango kernel oil is known to release a drug like salicylic acid at a much higher rate than standard paraffin base emollient. Mango kernel oil is known to be used in India for soap making and as an emollient in skin care products.

6. In a data sheet from Karlshamns (through Aston Chemicals) we read that Lipex 203 E-70 is derived from the kernel of the Mango fruit found in India. The Mango has rightly been called the King of Fruits in India. The mango fruit from the *Magnifera indica* (*Mangifera* ? - ACD) accounts for almost half of India's fruit production. There are 41 named Mango varieties but only a few are of commercial importance. The most widespread use of Mango Kernel fat is as a cocoa butter substitute in the chocolate and confectionery industries, although there has been reported

use in ointment bases.

Lipex 203 E-70 is the reaction product of Mango Kernel Oil and ethylene oxide. CTFA name PEG-70 Mango Kernel.

It has application in creams, lotions, shampoo, bath products and may add mildness to shaving gel products without reducing foaming. Hair care products also benefit from its mild yet relatively pH insensitive nature.

7. Bianchini et al (Bianchini F., Corbetta F,.: The Fruits of the Earth. Translated from the Italian by Mancinelli A.Bloomsbury Books, London. ISBN No. 1-870630-10-6) says that the mango comes from the East Indies, Malaya and southern Florida and California. It vaguely resembles a kidney-shaped peach, tapering at the top, with a fragrant and juicy pulp and a distinctive flavour, something between the apricot and the pineapple. The mango tree, *Mangifera indica* of the Anacardiaceae or cashew family, is one of the most productive plants of the tropical region.

8. Davidson and Knox (Beazley, M.: Fruit - A connoisseur's guide and cookbook. Alan Davidson and Charlotte Knox. 1991. Mitchell Beazley Publishers. ISBN NO. 0-85533-903-9.) say that the mango is one of the finest tropical fruits and has been cultivated in India for several thousand years. The Indian Mango, *Mangifera indica*, is only one of about 50 species of *Mangifera*, which grow naturally in the region from India east to the Philippines and Papua New Guinea, and of which nearly half have edible fruits.

The mango was first made known to the outside world, it is said, by the Chinese traveller Hwen T'sang who visited India in the 1st century AD. In succeeding centuries, cultivation of the fruit spread eastwards and also westwards, for it arrived in Persia by the 10th century.

On its home ground in India the mango became a status symbol. The Moghul ruler Akbar (1556-1605) planted an orchard of mango trees at Darbhanga in Bihar, called 'Lakj Bagh' because the number of trees was supposedly one lakh (one hundred thousand). And it was in Moghul India, during the same period, that the technique of vegetative reproduction was worked out, to avoid the problem that the tree does not always grow true from the seed.

Meanwhile, still in the 16th century; the Portuguese took the mango from India to Africa. It reached Brazil and the West Indies in the 18th century, and Hawaii, Florida and Mexico in the 19th century. India still remains the world's largest producer.

The fruit is highly aromatic. At its best the scent has a pleasant resinous quality; at worst it smells strongly of kerosene which it actually contains, giving rise to a description of it being like a 'ball of tow soaked in terpentine and molasses'.

There are scores, indeed hundreds, of varieties of mango being grown. In her survey of them, Morton (1987) makes the interesting point that in India most of the preferred varieties have yellow skins, while Europeans prefer yellow turning to red, and Americans (in Florida at least) go for red skins. Alphonso, an Indian cultivar, is the variety most often exported. The Haden variety is exceptionally large, and is suitable for cooking as well as eating fresh. In the Philippines, pride of place goes to the 'carabou' mango (known as Manila Super in international

trade), which is yellow outside and inside has a fine spicy aroma, besides having only short fibres attached to the stone.

9. Bastyra, J., et al: A gourmet's book of fruit. ISBN No.86101-421-9. Salamar Books. Refers to *Mangifera indica*. They vary in size and shape from the size of a plum to the size of a small melon weighing up to 1Kg. The skin may be green, yellow, orange, red or purple. The better the quality the smoother the flesh. Poor quality can have a turpentine flavour.

Mango flesh tastes juicy and sweet; its slightly perfumed flavour can best be described as acid-sweet.

Mangoes have been cultivated for 4,000 years and came originally from the Indo-Burmese region. They were farmed in India over 2,000 years ago and a great many Hindu legends are connected with the princely mango. The biggest exporter is India, though many come from Central and South America, Africa, the West Indies, Egypt and Israel.

The mango comes from the same family as the pistachio and cashew nut. There are an enormous number of varieties being cultivated, but the most popular are the Alphonso, which is grown in South Africa, south-east Asia and Florida. It is kidney-shaped and can range from green with a red bloom to yellow with red spots.

Another favourite variety is the Summer Mango, again orange and red-skinned with a similar juicy perfumed orange flesh. A West Indian variety which is coveted by the local people is the Julie Mango. It is a smaller fruit and ranges in colour from green to orange when very ripe. It has a distinctive aroma and tastes very sweet and juicy.

10. In a data sheet from Dragoco. The constituents of mango exhibit skin regenerating and skin protective properties and thus offer excellent possibilities for use in cosmetic products. They are particularly suitable for preparations for the care of normal and greasy skin; and for greasy and normal hair.
1 Kg mango extract corresponds to 400 g of the fresh mango fruits.

The amino acids detected are: asparaginic acid, glutamic acid, asparagine, serine, threonine, alanine, arginine, gamma-amino butyric acid, tyrosine, valine, isoleucine, phenylalanine, leucine.

Mangifera indica or mango has been cultivated for over 4,000 years - according to the results of research in India even for around 6,000 years. Mango is the national fruit of India. It is strongly bound to the history of the country and is an important religious symbol for both Hindus and Buddhists.

The giant mango tree stands for "power and strength"; the Sanskrit name "amra" was earlier often used as a prefix to give a person or thing the attribute of "honour" or "admiration".

Eastern India is considered to be the original home of the mango tree, which belongs to the family of the sumac plants (Anacardiaceae). Still today India is the only country with genuine native mango forests and remains unsurpassed in terms of its diversity of varieties.

The mango tree can be found under cultivation in practically all tropical regions. It is grown in

the sub-tropical zones of Florida, South Africa (Cape Province), Israel, Cyprus, and Egypt. The number of different varieties is now supposed to have climbed to over 1,000.

The first spreading of cultivation took place from India to Malaya and a little later (around 1400 AD) to the Philippines via Mohammedan missionaries and pirates. Thereafter the mango tree spread throughout the South Asian regions. The intercontinental expansion was brought about by the Portuguese.

At the beginning of the 16th century they carried the first fruits from Goa to east Africa, on to West Africa and finally to Brazil. From there seeds found their way to Barbados and Jamaica and reached Florida via Mexico around 1833. The mango was introduced in to Australia around 1870.

The fruits of mango contain protein, fat, carbohydrate, minerals, vitamins A, B and C.

In India the mango fruit is generally very popular, they are also used as a curative. The fruit flesh is supposed to encourage the digestion and have a mild laxative effect, whilst the stone can help against throat infections and cure hiccups. A resin from the tree bark, mixed with lime juice, is supposed to heal skin complaints. This resin is used in the leather industry as a tannin.

Mango seed fat ('dicafat'), which is derived from the stone, serves as a substitute for coconut oil in the soap industry and has a similarity to cocoa fat, such that it can be used in the manufacture of candles.

11. Milliken (Milliken,W., Miller, R.P., Pollard, S.R., and Wandelli, E.V.: The Ethnobotany of the Waimiri Atroari Indians of Brazil. Royal Botanic Gardens Kew. 1992. ISBN No. 0-947643-50-8) refer to *Mangifera indica* (Fam. Anacardiaceae) as a tree cultivated around villages. It is cultivated throughout the tropics and is a native of Asia.

Called "manga" by the Waimiri Atroari Indians, and in the local vernacular. It is better known as mango in English. The fruits are edible.

This species serves as an urban shade tree, the seed is a source of flour and the wood may be used for floor-boards, tea chests etc. The young leaves may be eaten, either raw or cooked. The Tikuna Indians of Colombia use a decoction of the leaves as a contraceptive or abortifacient. The Chacobo Indians of Bolivia drink a similar decoction for rheumatism, and the Créoles of French Guiana take it for diarrhoea and stomach ache. The Palikur Indians of French Guiana treat prickly heat (of babies) with plasters of the mashed leaves (which contain tannins), and the Créoles of the Antilles drink a decoction of the flowers for angina and asthma. The leaves also contain saponins, glycosides, unsaturated sterols and polyphenols, and are used by the Warao Indians to treat fevers, coughs and diarrhoea. They possess antibiotic properties.

12. In a file from Dr Stephen Greenburg (Lipo Chemicals Inc.) entitled "Ethnic Botanical Literature) author anon.

The Negritos of the Philippines utilise the gum resin of the tree mixed in with coconut oil to apply directly to scabies and other parasitic diseases of the skin. The gum resin and the fruit are also used for healing sores caused by herpes and venereal disease like syphilis. The ashes of the

leaves are a popular remedy for burns and scalds. The resin is also used for curing aphthae (white spots in the mouth). (ref. Eduardo Quisumbing. Medicinal Plants of the Phillipines. Manila: Dept of Agriculture and natural Resources, Bureau of Printing, 1951.)

The dark natives of India use the mango leaves to relieve the terrible pain of scorpion stings and the unripe fruit to help heal a wide variety of skin eruptions, ranging from leprosy and Oriental sores to boils and cysts. (ref. Colonel Sir R.N. Chopra, M.D., et al. Chopra's Indigenous Drugs of India. Calcutta: U.N. Dhur and Sons Ltd. 1958).

The natives of Samoa use the inner bark for treating mouth sores and similar lesions in and around the urinary-genital area of men and women. The pulp of the fruit is used in some parts when ripe as a poultice for tender breasts and sore nipples. (ref. George Uhe. "Medicinal plants of Samoa." Economic Botany 28:8 January-March 1974.)

Chemical constituents

All parts of the mango tree (bark, leaves, root fruit) are rich in tannins. The leaves of the West African spoecies have four anthocyanidins, leucoanthocyanins, catechic and gallic tannins, mangiferin, kaempferol, and quercetin have been reported. (ref. Bep Oliver-Bever. Medicinal Plants in Tropical West Africa. Cambridge University Press 1986)

Other like camphene, ethyl styrene, isolongifolene, alpha-bergamotene, aromadendrene, alpha-murolene, butyric and hexanoic acids, benxyl and furfuryl alcohols, 2-acetyl pyrrole and dihydroactinidiolide have been reported recently. Additionally, a sesquiterpenic hydrocarbon identified as eremophilene, first isolated from valerian oil has been reported. (ref. M.Sakho et al. "Volatile components of African Mango." Journal of Food Science 50:548-549 1985.)

The entire plant and the seeds also contain traces of hydrocyanic acid. (ref. Watt, J.M. amd M.G. Breyer-Brandwijk. The Medicinal and Poisonous Plants of Southern and Eastern Africa. London: E & S Livingstone Ltd, 1962.)

13. In a health and safety data sheet from Karlshamns on Lipex 203 E70, ethoxylated mango kernel glyceryl esters.

Health hazard data.

Skin: contact with skin not expected to cause serious irritation.
Eyes: contact with eyes not expected to cause serious irritation.
Ingestion: not intended for human consumption.

14. D.M.A. Jayaweera: Medicinal Plants used in Ceylon Part 1. National Science Council of Sri Lanka. Colombo 1981

Mangifera indica Linn.
Mangifera domestica Gaertn.

English: Mango

Sinhalese: Amba

Tamil: Adishelarayam, Ambiram, Amiram, Iradam, Kachakkar, Kilimukkuma, Kogilosavam, Kokku, Maa, Madi, Madududam, Manga, Magandam, Malai, Mamagam, Mandi, Manmadamganai, Mattiyagandam, Mirudalagam, Omai, Palashiratta, Palerbatti, Pigubandu, Shedaram, Shegaram, Shudam, Shulli, Tema, Tevam, Tidalam

Hindi: Am

Sanscrit: Aliprya, Amra, Atisairrabha, Bhramarapriva, Bhringabhishta, Chukralatamra, Chuta, Chutaka, Gandhabandhu, Kamanga, Kamaphala, Kamarasa, Kamashara, Kamavallabha, Kameshta, Keshavayudha, Kireshta, Kokilananda, Kokilavasa, Kokilotsava, Koshi, Madadhya, Madhavadruma, Madhutduta, Madhukara, Madhuli, Madhvakhya, Mrishalaka, Nilakapittha, Nriyapapriya, Parapushtamahotsava, Phalashreshtha, Phalotpatti, Pikapriya, Pikaraga, Pikavallabha, Priyambu, Rasala, Sahakara, Shatpadatilhi, Shareshta, Shukrapriya, Sidhurasa, Sripriva, Sumadana, Vanotsura, Vasantadru, Vasantaduta.

Distribution: Occurs in the Himalayas, Sikkim, Khasia, along Western Ghats, Burma and Ceylon. It is cultivated in South Africa and tropical America. In Ceylon, it is grown as a cultivated plant in almost every village garden, although it is not a native of Ceylon.

Composition: The leaves of this tree contain euxanthin acid, euxanthon, hippuric and benzoic acid, mangiferin and mangin, while the bark contains tannin and the exudation from it yields a resin and gum. The fruits, too, yield a resin which is said to contain mangiferene, mangiferic acid, resinol and maniferol. The fruits which are consumed contain saccharose, levulose, dextrose and citric, tartaric and malic acids, in additio to vitamins A, B and C, ascorbic acid and carotene. The seeds popssess a fixed oil with oleostearin, starch, gallic acid and tannin.

Uses: The juice of the leaves of this tree is given for bleeding dysentery, while an infusion of the young leaves is prescribed for chronic diseases of the lungs, coughs and asthma. An infusion or expressed juice of the bark is used in menorrhagia, leucorrhoea, bleeding piles and haemorrhages of the lungs and intestines. A cold infusion of the barks of *Mangifera indica, Syzygium cumini* and *terminalia arjuna* with bees' honey is given for bleeding from internal organs. A decoction of the dry flowers is used with beneficial effectrs on diarrhoea, chronic dysentery and gleet.

15. N.V. Bringi: Non-traditional oil seeds and oils of India. Oxford and IBH Publishing Co. PVT. Ltd., Bombay, New Delhi and Calcutta. Chapter 3. Mango (*Mangifera indica*), D.K. Bhattacharyya.

Ointment base

Mango kernel is being investigated for its suitability as an ointment base. It has been observed to release a drug like salicylic acid at a remarkably greater rate than the standard paraffin-base ointment formulation.

Biological evaluation

Three months feeding studies on rats were carried out to determine the essential parameters for a

scientific opinion on the edibility and wholesomeness of the fat. At 10% level of fat in a standard diet, the diet intake, gain in body weight and feed efficiency ratio were similar to a diet containing 10% hydrogenated vegetable oil as a control. The apparent digestibility was 65% compared to 88% of the control. The organ weights were comparable and no histopathologiocal abnormalities were noticed.

Multigeneration breeding studies on rats with diets containing 10% mango kernel fat and groundnut oil control have been carried out. The growth performance over three generations indicated similar gain in body weight. The organ weights were comparable and no histopathological abnormalities were noticed. These studies suggest that mango kernel fat has good nutritional value, and is toxicologically safe.

16. Kanny Lall Dey: The indigenous drugs of India - short descriptive notices of the principal medicinal plants met with in British India. 2nd edition. Thacker, Spink & Co. 1896. Calcutta. ISBN No. not available.

MANGIFERA INDICA.
THE MANGO TREE.
Vern.-Beng: *Am* ; Hind: *Am, Amb* ; Sans: *Amra, Chuta*; Bom: *Amba, Ambo* ; Bom: *Thayet*; Tam: *Mangas, Mangamaram* ; Tel: *Elamavi* ; Pers: *Amba, Naghzak*.

An elegant moderate-sized tree of the Anacardiaceae indigenous to India and cultivated in many varieties almost everywhere in the plains, yielding large crops annually of the familiar egg-shaped fruit. Mangos are exceedingly plentiful in all the bazaars from May to July, and are esteemed by both Europeans and Natives as the most delicious of Indian fruits. The ripe fruit is very wholesome, nourishing, and highly antiscorbutic; the unripe fruit is made into refreshing sherbets and custards, into pickles and preserves, as a sour ingredient in certain curries, and as the principal ingredient of the chutneys so popular in Indian cookery and exported to Europe. The kernel inside the large flattened 'stone' or seed contains about 10 per cent of tannic acid, of which an enormous quantity must be wasted each mango season, the seeds not being utilized.

The pulp of the ripe fruit contains a trace of gallic acid, with citric acid and gum: the unripe fruit contains about 20 percent of free acids, tartaric, citric and malic. The bark of the tree contains tannic acid and from it exudes a pink-coloured gum partly soluble in water. The fruit exudes just before ripening a resinous substance with an odour of turpentine. The blossom is regarded as astringent.

Medicinal uses.-The powdered kernel of the seed, called *amar kusi*, is used as an astringent in diarrhoea, and as a remedy in leucorrhoea, also as an anthelmintic. A fluid extract of the bark has been recommended in haemorrhages. The popular idea among Europeans in India that the mango fruit is productive of boils and skin eruptions is a fallacy, and has probably arisen through the coincidence of' the occurrence of those symptoms with the mango season the end of the hot season and beginning of the rains. On the contrary, as has been indicated, it is a valuable antiscorbutic, unless when used immoderately.

17. Drury, Colonel Heber: The useful plants of India; with notices of their chief medicinal value in commerce, medicine and the arts. Higginbotham and Co. Madras. 1873. ISBN No. not available

Mangifera indica (Linn.)

Desription: Tree; leaves alternate, lanceolate, acuminate glabrous ; calyx 5 - clef't ; petals 5 ; panicles terminal, much branched, pubescent, erect ; drupe obliquely-oblong or some what reniform ; seed solitary ; flower 5 small, greenish-yellowish.

Medicinal uses:-The kernel of the fruit is used in India as well as in Brazil as an anthelmintic. Dr Kirkpatrick states having used it in this character in doses of 20 to 30 grains, and found it most effectual in expelling lumbrici. It contains a large proportion of gallic acid, and has been successfully administered in bleeding pile and menorrhagia. - (Pharm. Of India). As the fruit contains much acid and turpentine, it acts as a diaphoretic and refrigerant -(Powell Punj. Prod.) From wounds in the bark issues a soft reddish-brown gum-resin, hardening by age, and much resembling bdellium. Burnt in the flame of a candle; it emits a smell like that of cashew-nuts when roasting. It softens in the mouth and adheres to the teeth, and in taste is somewhat pungent and bitter. It dissolves entirely in spirit, and partly so in water. Mixed with limejuice or oil, it is used externally in scabies and cutaneous affections. The bark of the tree is administered in infusion in menorrhagia and leucorrhoca; and the resinous juice, mixed with white of egg and a little opium, is considered a good specific on the Malabar coast for diarrhoea and dysentery.-Ainslie.

Economic Uses: The Mango is well known as the most delicious of Indian fruits. It is esteemed very wholesome, and when unripe is much used in tarts, preserves, and pickles. There are many varieties, all more or more less having a peculiar turpentine flavour, though the best kinds are generally free from it. The kernels of the nut seemingly contain much nourishment, but are only used in times of scarcity and famine, when they are boiled and eaten by the poorer classes. In the pulp of the fruit there is sugar, gum, and citric acid; gallic acid has also been procured from the seed, and also stearic acid. Interesting experiments were made some time ago, by a French chemist, upon the process of procuring the gallic acid, which he stated might be used in the preparation of ink instead of galls. Whenever the fruit is cut with a knife, a blue stain is seen on the blade, which is due to the presence of gallic acid. The timber is soft, of a dull-grey colour, porous, soon decaying if exposed to wet, but useful for common purposes. In large old trees the wood acquires a light chocolate colour towards the centre of the trunk and larger branches, and is then hard, close-grained and somewhat durable. The Mango-tree is best propagated by grafting, though it will readily grow from seeds. In the latter case the seed must be sown soon after it is taken from the fruit, but the produce is so inferior that it is hardly worth the trouble bestowed upon it. The wood, burnt with sandal-wood, is one of those used by the Hindus for burning corpses, and is reckoned sacred for this purpose. The natives use the leaves as tooth-brushes, and the stalks instead of betel for chewing: powdered and calcined, they employ the latter also to take away warts.-Roxb. Journ. of As. Soc.

18. From Medline

1. Geller M: Poison ivy, mangoes, cashews, and dermatitis [letter]. Ann Intern Med (1989 Jun

15) 110(12):1036-7. [No Abstract Available]

2. Miell J Papouchado M Marshall AJ: Anaphylactic reaction after eating a mango. BMJ (1988 Dec 24-31) 297(6664):1639-40. [No Abstract Available]

3. Horton GM: The effects of low-dose gamma-irradiation on the wholesomeness of mangoes (Mangifera indica) as determined by short-term feeding studies using rats. Br J Nutr (1976 Jan) 35(1):67-75.

A control diet and diets containing 150 g non-irradiated or 150 g irradiated mangopulp/kg were given to female rats from day 15 of the gestation period until weaning in trials 1 and 2, and from 40 d before mating until 28 d post weaning in trial 3. 2. Food intake and dry-matter digestibility were similar with all diets. 3. There were no significant differences between animals given the different dietary regimens in the daily body-weight changes of weanling males, pups, nursing females or females during the immediate postlactation period. 4. No differences in haematological or blood chemistry values were found which could be attributed to the ingestion of irradiated mangoes. There was no evidence for the presence of any toxic substances in the irradiated-mango-pulp diet. 5. Gross pathological observations revealed no aberrations which could be related to the ingestion of irradiated mangoes. 6. It may be concluded that the wholesomeness of mangoes was not affected by gamma-irradiation at a dose of 75 krd.

4.Carlier C Etchepare M Ceccon JF Mourey MS Amedee-Manesme O: Efficacy of massive oral doses of retinyl palmitate and mango (Mangifera indica L.) consumption to correct an existing vitamin A deficiency in Senegalese children. Br J Nutr (1992 Sep) 68(2):529-40.

Administration of large oral doses of retinyl palmitate has become the most widely practised vitamin A deficiency prevention strategy in developing countries. We conducted a follow-up study among 220 Senegalese children aged 2-7 years suffering from moderate undernutrition to determine the efficacy of vitamin A treatment on their vitamin A status assessed by biochemical and cytological (impression cytology with transfer) methods. The first examination (T = 0 m[onth]) was carried out during April 1989, before the mango (Mangifera indica L,) harvest. The second examination (T = 2 m) was carried out 2 months after vitamin A treatment during June 1989 when ripe mangoes become widely available. Conjunctival cells of the eyes of the children with or without ocular inflammation were responsive to vitamin A administration ($P < 0.01$). There was a significant increase ($P < 0.001$) in mean serum retinol and beta-carotene levels between T = 0 m and T = 2 m. Mean serum retinol-binding protein (RBP) and transthyretin (TTR) levels did not differ significantly ($P > 0.05$) at T = 0 m and T = 2 m. Despite the intake of vitamin A, 54% of the children who had abnormal cytology at T = 0 m remained abnormal at T = 2 m. This was due to inadequate levels of TTR and RBP, presumably due to the cereal diet eaten by the Senegalese population. children with abnormal eye cytology had lower serum retinol levels than those with normal eyes at T = 0 m, and beta-carotene values did not correlate with eye cytological abnormalities at T = 0 m. Children with normal cytology had higher serum retinol and also beta-carotene levels than those with abnormal cytology after massive oral doses of vitamin A and consumption of mangoes at T = 2 m. Retinyl palmitate may, therefore, only lead to partial cytological improvement due to a lack of retinol-carrier proteins but dietary beta-carotene may also be involved.

5. Murphy K: Planting mangoes for the future in Tibet. Br Med J (Clin Res Ed) (1986 Dec

20-27) 293(6562):1649-52. [No Abstract Available].

6. Wuthrich B Hofer T: [Food allergy: the celery-mugwort-spice syndrome. Association with mango allergy?]. Nahrungsmittelallergie: das "Sellerie-Beifuss-Gewurz-Syndrom". Assoziation mit einer Mangofrucht-Allergie? Dtsch Med Wochenschr (1984 Jun 22) 109(25):981-6. (Published in German).

Celery allergies are commonly observed in mugwort pollen-allergic patients. This situation is frequently associated with an allergy to spices of the umbelliferous family. Thus a "celery-mugwort-spice syndrome" has been established. In 31 patients (27 females, 4 males) allergy to celery was diagnosed between 1978 and 1982. They were followed up in 1983 and complementary tests (skin and RAST) with various raw vegetables, spices and mugwort pollen were done. For specific diagnosis of allergy to celery skin testing (scratch or prick) with fresh celery bulb was reliable. In contrast, RAST was not sufficiently sensitive, 87% of patients allergic to celery had pollinosis in the form of mugwort pollen sensitisation established by skin testing and RAST. Allergy to carrots was clinically and by testing currently associated in 52%. In contrast, a clinically relevant hypersensitivity to caraway (26%), parsley (16%), fennel (13%), green pepper (10%) and aniseed (3%) was found less frequently although these allergens showed a much larger positivity in skin testing. This signifies group sensitisation within the umbelliferous plants. The association of celery-mugwort allergy with allergy to mango fruit described here for the first time cannot be explained as group sensitisation within a botanic relation, as mango, and pistachio-nut, belong to the family of anacardiaceae.

7. Catalano PN: Mango sap and poison ivy dermatitis [letter]. J Am Acad Dermatol (1984 Mar) 10(3):522. [No Abstract. Available]

8. Bojorquez G Gomez-Lim MA: Peroxisomal thiolase mRNA is induced during mango fruit ripening. Plant Mol Biol (1995 Aug) 28(5):811-20.

Fruit ripening is a complex, developmentally regulated process. A series of genes have been isolated from various ripening fruits encoding enzymes mainly involved in ethylene and cell wall metabolism. In order to aid our understanding of the molecular basis of this process in a tropical fruit, a cDNA library was prepared from ripe mango (Mangifera indica L. cv. Manila). By differential screening with RNA poly(A)+ from unripe and ripe mesocarp a number of cDNAs expressing only in ripe fruit have been isolated. This paper reports the characterization of one such cDNA (pTHMF 1) from M. indica which codes for a protein highly homologous to cucumber, rat and human peroxisomal thiolase (EC 2.3.1.16), the catalyst for the last step in the beta-oxidation pathway. The cDNA for the peroxisomal mango thiolase is 1305 bp in length and codes for a protein of 432 amino acids with a predicted molecular mass of 45,532 Da. Mango thiolase is highly homologous to cucumber thiolase (80%), the only other plant thiolase whose cloning has been reported, and to rat and human thiolases (55% and 55% respectively). It is shown by northern analysis that during fruit ripening THMF 1 is up-regulated. A similar pattern of expression was detected in tomato fruit. Wounding and pathogen infection do not appear to affect THMF 1 expression. The possible involvement of thiolase in fatty acid metabolism during fruit ripening will be discussed. To our knowledge this is the first report cloning of a plant gene involved in fatty acid metabolism showing an induction during fruit ripening.

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Adv Food Res (1975) 21:223-305.
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Pulmonary function studies were conducted on 489 pesticide workers engaged in spraying operations on mango plantations. These workers were exposed to a variety of organochlorine and organophosphorus pesticides. A reference group consisting of 208 controls, belonging to the same socioeconomic stratum, was taken from the same area for purposes of comparison. The results of the study showed 36.5 and 41.5% prevalence of respiratory impairment in the exposed workers and in the controls, respectively. The most common pulmonary impairment among the exposed subjects (18.8%) and controls (16.9%) was of the restrictive type, followed by mixed ventilatory defect. Bronchial obstruction affected 2.5 and 3.7% of the exposed and control populations, respectively. In a comparison of the prevalence of total respiratory impairment in the pesticide workers and the controls, the nonsmokers did not show any significant difference in this study. The prevalence rate of respiratory impairment showed an increasing trend in different exposure groups (p less than 0.05), thereby clearly indicating a dose effect. The study revealed that occupational exposure to pesticides had a direct bearing on the respiratory impairment identified in the exposed workers.

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Palmitic acid stimulated the activity of mango peroxidase and reversed the inhibition due to the peroxidase inhibitor present in the preclimacteric fruit. The palmitic acid effect appeared to saturate in the range of 45 to 60 muM palmitic acid. Crude fatty acid extract of the mango exerted similar effect. The percentage stimulation was pH-dependent. Palmitic acid stimulated the enzyme by 18 percent at its optimum pH (5) but the stimulation was in excess of 63 percent at pH 2.5. At pH 2.5 the enzyme concentration versus velocity plot was non-linear and the

activation by palmitic acid appeared to saturate between 32 and 48 muM concentration of the effector. The inhibition of the enzyme at and above 0.86 muM concentration of substrate (H202) was not found in the presence of palmitic acid. The effector also changed the heat inactivation kinetics of the enzyme and activated only two out of the four peroxidase isoenzymes present in the climacteric fruit extracts. The results presented indicate the regulatory nature of the enzyme and support its significance in fruit ripening.

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A cross-sectional survey of 489 male subjects in the age group 15 to 65 years engaged directly or indirectly in mango cultivation along with 208 control subjects was carried out to find their socio-economic, environmental and health conditions. The conditions like high illiteracy rate (49.5%), poverty (PCI less than Rs 100 per month, 52.2%), poor housing (mud houses, 66.7%) unsafe water supply (78.6%) were prevailing in the surveyed population. The high respiratory morbidity may be attributed to high prevalence of smoking and prolonged inhalation of organic dusts during farming operation associated with illiteracy and poor socio-economic status. Gastrointestinal disorders were related to poor hygienic conditions, smoking and consumption of contaminated water. The symptoms pertaining to CNS, skin and eyes were found to be associated with exposure to pesticides.

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Eleven crystalline constituents have been isolated from the leaves of Mangifera persiciformis, of which five were identified as taraxerol, friedelin, beta-sitosterol, mangiferin and quercetin by comparing their physicochemical and spectroscopic data. They were isolated from this plant for the first time. Some observations on mango and mokihana dermatitis from Hawaii.

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The current status of research on the use of ionizing radiation for shelf life improvement and disinfestation of fresh tropical fruits like bananas, mangoes, and papayas are reviewed. The

aspects covered are influence of maturity and physiological state of the fruits on delayed ripening and tolerance to radiation; varietal responses; changes in chemical constituents, volatiles, respiration, and ethylene evolution; biochemical mechanisms of delayed ripening and browning of irradiated fruits; and organoleptic quality. The efficacy of the combination of hot water dip and radiation treatments for control of postharvest fungal diseases are considered. The immediate potential of radiation as a quarantine treatment, in place of the currently used chemical fumigants, for disinfestation of fruit flies and mango seed weevil are discussed. Future prospects for irradiation of tropical fruits are discussed in the light of experience gained from studies conducted in different countries.

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Rhizoctonia bataticola is responsible for the spoilage of mango fruits (Mangifera india) during post-harvest preservation and storage. Culture of R. bataticola exhibited significant pectinase and cellulase activity. In Rhizoctonia-infected fruits an increase of protease and cellulase activity, and a decrease in certain enzymes of carbohydrate metabolism, were observed in comparison to healthy fruits.

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The aims of this investigation were to enumerate coliforms in fresh mangoes, puree, cheeks, and cheeks-in-puree in order to determine the source of these organisms in the processed products, to

determine methods for their control, and to identify coliforms isolated from cheeks-in-puree to determine whether they have any public health significance. Product from four processors was tested on two occasions. The retail packs of cheeks-in-puree having the highest coliform counts were those in which raw puree was added to the cheeks. Coliform counts in these samples ranged between 1.4 x 10(3) and 5.4 x 10(4) cfu/g. Pasteurisation reduced the coliform count of raw puree to < 5 cfu/g. Forty-seven percent of the 73 colonies, isolated as coliforms on the basis of their colony morphology on violet red bile agar, were identified as Klebsiella pneumoniae using the ATB 32E Identification System. Klebsiella strains were tested for growth at 10 degrees C, faecal coliform response, and fermentation of D-melizitose, to differentiate the three phenotypically similar strains, K. pneumoniae, K. terrigena and K planticola. Results indicated that 41% of K. pneumoniae isolates gave reactions typical of K. pneumoniae. A further 44% of strains gave an atypical reaction pattern for these tests and were designed 'psychrotrophic' K. pneumoniae. Klebsiella pneumoniae counts of between 2.1 x 10(3) and 4.9 x 10(4) cfu/g were predicted to occur in the retail packs of mango cheeks-in-puree produced by the processors who constituted this product with raw puree. In view of the opportunistic pathogenic nature of K. pneumoniae, its presence in these products is considered undesirable and steps, such as pasteurisation of puree, should be taken in order to inactivate it.

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A strain of Leuconostoc oenos was isolated from a blown can of mango juice. Various tests to identify and characterize the bacterium suggested that it could be a strain of L. oenos. This is the first report of L. oenos as a spoilage organism in fruit products other than wine.

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agglutinin from Mangifera indica. J Clin Microbiol (1995 Mar) 33(3):772-4.

Agglutination of 271 strains of Yersinia enterocolitica and related species grown at 37 degrees C by a 0.01% dilution of the agglutinin from Mangifera indica was correlated with the presence of the virulence plasmid. The study of YadA mutants suggested that the YadA protein is the target of the plant agglutinin.

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Two new terpenoidal saponins, indicoside A [1] and indicoside B [2], were isolated from Mangifera indica. Their structures were determined as 28-hydroxylupa-12,20(29)-diene-3-O-[beta-glucopyranosyl-(1-->2)[-beta-glucopyranosyl-(1-->3)]-alpha-L-arabinopyranoside [1] and 28-hydroxylupa-12,20(29)-diene-3-O-[beta-glucopyranosyl-(1-->3)-alpha-L-rhamnopyranosyl-(1-->2)][beta-glucopyranosyl(1-->3)]-alp ha-L-arabinopyranoside [2] on the basis of chemical and spectroscopic studies.

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Trichosporonoides australiense sp. nov.: a basidiomycetous yeast-like fungus is described and illustrated with information on some physiological characteristics based on a single strain isolated from sweetened orange/mango in Australia. The differences between it and already described members of the genus are discussed. The new species may be distinguished principally by its inability to ferment sucrose and maltose. A dichotomous key to all described members of the genus is provided.

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The gross chemical composition, protein content and amino acid composition of mango stone kernels of four Egyptian varieties (Ewsi, Hendi, Fonso and Timour) were investigated. Carbohydrates are the main components of the seed. The protein content varies between 5.0 and 7.2% and the ether extract ranged from 10.8% to 13.6%. High glutamic acid, aspartic acid and leucine content and low concentration of sulfur-containing amino acids are characteristic for the

proteins of mango kernels. Lysine level is also low, the concentration of other essential amino acids is acceptable. Sulfur-containing amino acids are the first limiting ones followed by lysine and threonine.

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The fruit extracts of ripening cv. Harumanis mango contained a number of glycosidases and glycanases. Among the glycosidases, beta-D-galactosidase (EC 3.2.1.23) appeared to be the most significant. The enzyme activity increased in parallel with increase in tissue softness during ripening. Mango beta-galactosidase was fractionated into three isoforms, viz. beta-galactosidase I, II and III by a combination of chromatographic procedures on DEAE-Sepharose CL-6B, CM-Sepharose and Sephacryl S-200 columns. Apparent Km values for the respective beta-galactosidase isoforms for p-nitrophenyl beta-D-galactoside were 3.7, 3.3 and 2.7 mM, and their Vmax values were 209, 1024 and 62 nkat mg-1 protein. Optimum activity occurred at ca pH 3.2 for beta-galactosidase I and II, and pH 3.6 for beta-galactosidase III. Mango beta-galactosidase and its isoforms have galactanase activity, and the activity of the latter in the crude extracts generally increased during ripening. The close correlation between changes in beta-galactosidase activity, tissue softness, and increased pectin solubility and degradation suggests that beta-galactosidase might play an important role in cell wall pectin modification and softening of mango fruit during ripening.

47. Cruz-Hernandez A Gomez-Lim MA: Alternative oxidase from mango (Mangifera indica, L.) is differentially regulated during fruit ripening. Planta (1995) 197(4):569-76.

Alternative oxidase is a respiratory-chain component of higher plants and fungi that catalyzes cyanide-resistant oxygen consumption. The activity of a alternative oxidase has been detected during ripening in several climacteric fruit including mango (Mangifera indica L.). Synthetic oligonucleotides, corresponding to conserved regions of the Sauromatum guttatum and Arabidopsis thaliana nucleotide sequences, were used as primers for polymerase chain reaction to amplify genomic DNA extracted from mango leaves. The 623-bp fragment was found to encode an open reading frame of 207 amino acids showing high identity to the S. guttatum enzyme. Using this fragment to screen a ripe mango mesocarp cDNA library, one full-length cDNA clone, designated pAOMI.1, was obtained that contained an open reading frame encoding a polypeptide of 318 amino acids. The predicted amino-acid sequence exhibited 62, 64 and 68% identity to the S. guttatum, soybean, and A. thaliana enzymes respectively, indicating that this cDNA encodes a mango homologue of the alternative oxidase. Gel blot hybridization showed that pAOMI.1 is likely to be encoded by a single-copy gene. The 1.6 kb-transcript was induced during mango fruit ripening although the transcript was clearly detectable in unripe and developing fruit. Antibodies raised against the S. guttatum enzyme recognized three bands of approximately 27, approximately 33 and approximately 36 kDa from mitochondrial mango proteins. Two of the bands were detectable before ripening and increase in ripe fruit, the other band (27 kDa) was barely present in unripe fruit but accumulated during ripening. The clone pAOMI.1 was able to complement an Escherichia coli hemA mutant deficient in cytochrome-mediated aerobic respiration. This is the first report on the analysis of alternative

oxidase at the molecular level during the ripening of a climacteric fruit.

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49. el-Sissi H Ishak MS el-Wahid MS el-Ansari MA: The gallotannins of Rhus coriaria and Mangifera indica. Planta Med (1971 Apr) 19(4):342-51. [No Abstract Available].

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51. el-Sissi HI Saleh NA: Phenolic components, plant- and amino-acids of Mangifera indica. V. Planta Med (1970 Mar) 18(2):185-92. [No Abstract Available].

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53. Vargas Correa JB Sanchez Solis L Farfan Ale JA Noguchi H Moguel Banos MT Vargas de la Pena MI: [Allergological study of pollen of mango (Magnifera indica) and cross reactivity with pollen of piru (Schinus molle)]. Estudio alergologico del polen del mango (Magnifera indica) y reactividad cruzada con el polen del piru (Schinus molle). Rev Alerg (1991 Sep-Oct) 38(5):134-8 (Published in Spanish).

With immediate skin test, we studied hypersensitivity to pollen of mango (Magnifera indica), and its probability cross-sensitivity to pollen of piru (Schinus molle), from anacardaceae class. We have made one extract of Magnifera indica, with 0.485 mg per 100, of protein nitrogen. With this extract we carry out skin test on non-atopic subjects and atopic subjects with bronchial asthma and or allergy rhinitis and common stock of aerealergen. (Freeman stock). We studied seventy-one subjects, both sexes, from 14 to 40 years old. The prevalence of cutaneous sensitive to mango (Magnifera indica) were 66%, and sensitivity from Schinus molle were 31%. Those with sensitivity Schinus molle, were sensitivity from Magnifera, too. Statistical analyisis of correlation, with McNemar Test was p 0.001 under the conditions of the study we conclude that there are hypersensitivity to pollen of Magnifera, and there are cross-reactivity with Schinus molle. Therefore mangifera should be included within the stock of skin test in the areas were this anacardaceae is present.

55. Idstein H Bauer C Schreier P: [Volatile acids in tropical fruits: cherimoya (Annona cherimolia, Mill.), guava (psidium guajava, L.), mango (Mangifera indica, L., var. Alphonso), papaya (Carica papaya, L.)]. Fluchtige Sauren in Tropenfruchten: Cherimoya (Annona cherimolia, Mill.), Guava (Psidium guajava, L.), Mango (Mangifera indica, L., var. Alphonso), Papaya (Carica papaya, L.). Z Lebensm Unters Forsch (1985 May) 180(5):394-7. (Published in German).

The volatile acids extracted by pentane/dichloromethane (2 + 1) from tropical fruit pulps were identified and determined by capillary gas chromatography (HRGC) and combined capillary gas chromatography-mass spectrometry using EI- and CI mode (HRGC-EI/CIMS). In cherimoya (A. cherimolia, Mill.) fruit pulp 47 acids were characterized; major compounds were hexanoic (3 mg/kg) and octanoic (1 mg/kg) acid. Fifty one acids were identified in guava (P. guajava, L.), 54

in mango (M, indica, L., var. Alphonso) and 56 in papaya (C. papaya, L.). (E)- cinnamoic acid (0.4 mg/kg) and (Z)-3-hexenoic acid (0.2 mg/kg) were determined as major constituents in guava; in mango 5-hydroxy-(Z)-7- decenoic acid (2 mg/kg) and 3-hydroxyoctanoic acid (1.1 mg/kg) and in papaya pulp butanoic acid (1.2 mg/kg) were established as major constituents.

17. Roy Hayward reports two cases of irritation following a user trial of a product containing mango kernel oil. Dr. Ian White suggests that the presence of urushiol might be a factor.