MANGO KERNEL OIL

1. INTRODUCTION:

Mango oil is an oil fraction obtained during the processing of mango butter. Mango oil is seed oil extracted from the stone of the fruit of the Mangifera indica. Mango oil is extracted from mango seeds by pressure the oil is a soft yellow color with a melting point of 23-27°C. Although mango oil can sometimes be semi-soft at room temperature, mango oil has a nice, fluid consistency. It is semi-solid oil that melts readily onto the skin. It is antioxidant, vitamin and mineral rich. Using mango oil in any cosmetic application requiring miniaturization and revitalization of dry skin. Mango oil is good for baby creams, suncare balms, haircare products, and within other moisturizing products. Using mango oil at 3-10% in most formulations. Mango oil is moisturizing and revitalizing, and can be used in skin care products for dry to sensitive skins. An average mango kernel contains about 8% to 15% extract potential (butter and oil). This seed, which is usually discarded, can be used in cosmetics and beauty products. Up to 3% to 12% of mango kernel oil is generally used in the manufacturing of mango-based lotions, creams, balms, soaps and hair conditioners. Besides being an ingredient in the aforementioned products, the oil can also be used in its pure form. The pure form is typically tossed into bathing water, the aroma of which awakens all the senses, while the oil works its magic to rejuvenate the body.

2. PRODUCT & ITS APPLICATION:

Mango kernel oil is one of the by product from the mango fruit and mostly used in cosmetic and soap industry. Hydraulic pressing is one of the ways to extract the oil from mango kernel. The hydraulic pressing is more useful for small scale processors due to relatively lower initial and operating cost. Moreover, it gives uncontaminated oil and pure cake residue as compared to screw press or solvent extraction method. The present research work was undertaken to study the different process parameters responsible in obtaining better quality

mango kernels oil efficiently as well as better quality cake through hydraulic pressing. Hydraulic pressing of mango kernel was done using Universal Testing Machine and specially designed test cell. Mango kernels of kesar variety were used for the study. Before final experiments could be taken up, numbers of preliminary trials were conducted to standardize process of hydraulic pressing in context to the levels of pressing load and sample size of mango kernels. Based on preliminary trials and some earlier studies, efforts were made to study the effects of steaming of mango kernels on oil yield, oil recovery and quality of oil. Mango Butter (Mango Kernel Fat) is obtained from the seed kernels of mango (Mangifera indica). Mango trees are abundantly distributed throughout India, with innumerable and regional varieties of the fruit. The fruit is consumed both as a delicacy and as food. The estimated production of mangoes in India is around 7 million tones. Mango contains an ovoid oblique solitary seed, also called stone. The latter consists of a hard shell with a kernel inside. The potential availability of mango kernels in the country is around one million tones which can yield about 70,000 tones of mango kernel fat. Mango fat contains 8-12% oil. The contents of stone in mango fruit, kernel in stone and fat in kernel vary with the variety of fruits. On dry basis, stone comprises 4-14% of fruit, kernels: 61-83% of stone and fat: 7-11 % of kernels. The mango kernel meal can be used as cattle feed, manure, and for production of starch, with good export potential. Mango kernels contain 7-11% grayish-white colored fat which is suitable for edible purpose after refining. The fat is solid, closely resembling cocoa butter in physical and chemical characteristics and is therefore used as a substitute or extender. It has a good potential as edible oil. The raw fat is used in soap making. Refined fat is suitable as an edible fat, and in cosmetics formulations.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

The technology is not simple. Main features are controlling temperature, humidity and qualities of air and water. The promoter with good technical background is the basic requirements.

4. INDUSTRY LOOKOUT AND TRENDS

Mango kernel fat is the oil obtained during the processing of mango seed. The seed oil is obtained from the kernel or stone of the mango fruit. The oil or butter exists in a semi-solid form and melts when it is applied on the skin. The melting point of the mango oil is in the range of 90 F-109 F. It has nearly 45% of saturated fat and a high amount of unsaturated fat, making it not suitable for consumption. There are several drivers contributing to the growth of the global mango seed oil and butter market. The major factors that are fueling the growth of the market are the growing awareness about the health benefits of mango fats and their rising use in the cosmetic and beauty industry. However, one of the main challenges is the increasing competition from other specialty oils. The price of mango seed oil and butter is higher when compared with other products such as cocoa butter, jojoba oil, coconut oil, and others.

5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:

About 3 Lakhs tons of dry mango kernel would be available annually in India from which 30,000 tons of mango fat currently valued at 200 million rupees (Indian currency) could be obtained. Mango processing yields about 40-50% of by-products. These include cull fruits, mango seeds which represent from 20-60% of the whole fruit (depending on variety), mango seed kernels which represent from 45-75% of the whole seed, de-oiled mango kernel meal which is the by-product of the extraction of mango oil from the kernels, and mango peels which represent 7-24% of the whole. These by-products can be used to feed livestock and potential sources of pectin's and phenolic. The mango kernel contains 7-12% of oil rich in stearic (24-57%) and oleic (34-56%) acids that can be used in chocolate production as a replace for cocoa butter in some countries and at the European Union. Due to its high stearic acid content, it is also desirable for soap making, other products have fat, cattle feed and soil enrichment. With an estimated yield of 150,000 to 400,000 tons of wastes worldwide from mango processing, which may cause environmental problems in the vicinity of the plants? The use of these wastes in livestock feeding and in the aforementioned applications is a way of reducing environmental concerns. Yet, this is not an adequate way of using mango-processing waste.

6. RAW MATERIAL REQUIREMENTS:

The main raw materials are mango waste. Mango is one of the most important tropical fruits around the globe and has been grown and cultivated over 100 countries with tropical or subtropical climate. The majority of mango production is consumed fresh and about 1-2% of the production is processed to make products such as juices, concentrates, nectars, jams, fruit bars, jelly powders, flakes and dried fruits.

7. MANUFACTURING PROCESS:

In a study conducted by Kittiphoom and Sutasinee (2013), mango seed kernel oil was extracted using soxhlet method with different organic solvents, namely, petroleum ether, ethanol, and hexane, and evaluated for their characterization and quality analysis. The study examined the physicochemical properties (acid value, iodine value, peroxide value and saponification value), the fatty acid composition and phenolic contents of mango seed kernel oil. Based on the results, mango seed kernel oil extracted with hexane has better overall quality. Its acid, peroxide, iodine saponification values and phenolic content were 0.10 mg KOH/g oil, 8.72 mg/g oil, 38.50 mg/100 g oil, 207.5 mg KOH/g oil and 98.7 mg/g, respectively. Mango seed kernel oil has been shown to be rich in oleic acid and stearic acid, indicating that they are stable and tolerant to rancidity. The results suggested that mango seed kernel oil is a good source of the unsaturated fatty acid and phenolic compounds and has the potential to be used as nutrient rich food oil or as ingredients for functional or enriched foods. Results of this study can provide useful information for the essential oil and food industry.

8. MANPOWER REQUIREMENT :

The enterprise requires 6 employees as detailed below**:**

Sr. No.	Designation	Salary	Salary ₹	Number of Employees				
	Working Staff		**Per Annum**	**Year-1**	**Year-2**	**Year-3**	**Year-4**	**Year-5**
1	Operators	12000	12000	1	1	1	1	1
2	Helpers	10000	20000	2	2	2	2	2
			32000	3	3	3	3	3
	Fixed Staff:							
1	Admin Manager	15000	15000	1	1	1	1	1
2	Office Boy	9000	9000	1	1	1	1	1
	Sub-Total		24000	3	3	3	3	3
	Total		56000	6	6	6	6	6

9. IMPLEMENTATION SCHEDULE:

The project can be implemented in 3 months' time as detailed below:

Sr. No.	Activity	Time Required *(in months)*
1	Acquisition of premises	2.00
2	Construction (if applicable)	2.50
3	Procurement & installation of Plant & Machinery	2.50
4	Arrangement of Finance	1.00
5	Recruitment of required manpower	1.00
	Total time required *(some activities shall run concurrently)*	3.00

10. COST OF PROJECT:

The project shall cost ₹ 14.10 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land	0.00
2	Building	0.00
3	Plant & Machinery	7.00

4	Furniture, other Misc. Equipments	1.00
5	Other Assets including Preliminary / Pre-operative expenses	0.70
6	Margin for Working Capital	5.40
	Total	**14.10**

11. MEANS OF FINANCE:

The margin is considered at 25 % and bank finance at 75 %.

	Particulars	₹ in Lacs
1	Promoter's contribution	3.53
2	Bank Finance	10.58
	Total	**14.10**

12. WORKING CAPITAL CALCULATION:

The project requires working capital of ₹ 5.40 lacs as detailed below:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	2.70	0.25	0.68	2.03
2	Receivables	1.35	0.25	0.34	1.01
3	Overheads	1.35	100%	1.35	0.00
4	Creditors	-		0.00	0.00
	Total	5.40		2.36	3.04

13. LIST OF MACHINERY REQUIRED:

Sr. No.	Particulars	UOM	Qtty	Rate (₹)	Value (₹ in Lacs)
	Plant & Machinery / equipments				**7.00**
a)	**Furniture / Electrical installations**				

b)	Office furniture	LS	1	50000	0.00
c)	Stores Cupboard	LS	1	50,000	0.50
	Computer & Printer	LS	1	50000	0.50
	sub total				**1.00**
a)	**Other Assets**				
	Preliminary and preoperative				0.70
	sub-total Other Assets				0.70
	Total				**8.70**

All the machines and equipments are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

1. Fry-Tech Food Equipments Private Limited
   S. No. 4, Raviraj Industrial Estate,
   Bhikhubhai Mukhi Ka Kuwa Bharwadvash,
   Ramol, Ahmedabad - 380024,
   Gujarat, India

2. Hindustan Vibrotech Pvt. Ltd.
Office No. 2, Ground Floor,
   Vrindavan Building, Vile Parle East,
Mumbai – 400057,
   Maharashtra, India

3. Electrons cooling systems Pvt. Ltd.

S-27, SIDCO Industrial Estate
Kakkalur Industrial Estate
Tiruvallur – 602003,
Tamil Nadu, India

4. Springboard Enterprises India Ltd.
1st, 2nd & 3rd Floor,
Plot No. 7, 8 & 9,
Garg Shopping Mall,
Service Centre, Rohini Sector 2
New Delhi – 110085,
Delhi, India

5. Flour Tech Engineers Private Limited
Plot No. 182, Sector 24,
Faridabad - 121005,
Haryana, India

6. P Square Technologies
3, Swami Mahal,
Gurunanak Nagar,
Off. Shankarsheth Road Bhavani Peth,
Pune - 411002,
Maharashtra, India

7. Ricon Engineers
10 To 13, Bhagwati Estate,
Near Amraiwadi Torrent Power,
Behind Uttam Dairy,
Rakhial, Ahmedabad - 380023,
Gujarat, India

8. Kamdhenu Agro Machinery

Plot No. 6, Near Power House,
Wathoda Road Wathoda,
Nagpur - 440035,
Maharashtra, India

14. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%
2	Sales	₹. In Lacs	16.20	18.90	21.60	24.30	27.00
3	Raw Materials & Other direct inputs	₹. In Lacs	7.82	9.13	10.43	11.74	13.04
4	Gross Margin	₹. In Lacs	8.38	9.77	11.17	12.56	13.96
5	Overheads except interest	₹. In Lacs	6.66	7.07	7.90	8.15	8.32
6	Interest @ 10 %	₹. In Lacs	1.06	1.06	0.71	0.53	0.42
7	Depreciation @ 30 %	₹. In Lacs	2.10	1.47	1.07	0.84	0.63
8	**Net Profit before tax**	₹. In Lacs	**-1.44**	**0.17**	**1.49**	**3.04**	**4.59**

The basis of profitability calculation:
This unit will have 3000 KGS/Annum capacity. The growth of selling capacity will be increased 10% per year. (This is assumed by various analysis and study; it can be increased according to the selling strategy.)
Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per litre. The depreciation of plant is taken at 10-12 % and Interest costs are taken at 14 -15 % depending on type of industry.

15. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 62.63 % of projected capacity

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	27.00
2	Variable costs	₹. In Lacs	13.04
3	Fixed costs incl. interest	₹. In Lacs	8.74
4	BEP = FC/(SR-VC) x 100 =	% of capacity	62.63%

16. STATUTORY / GOVERNMENT APPROVALS

The Ministry of Food Processing Industries has been operating several plan schemes for the development of processed food sector in the country during the 10th Plan. One of the schemes relates to the Technology Up-gradation/ Establishment/ Modernization of food processing industries.

The Indian food processing industry is regulated by several laws which govern the aspects of sanitation, licensing and other necessary permits that are required to start up and run a food business. The legislation that dealt with food safety in India was the Prevention of Food Adulteration Act, 1954 (hereinafter referred to as "**PFA**"). The PFA had been in place for over five decades and there was a need for change due to varied reasons which include the changing requirements of our food industry. The act brought into force in place of the PFA is the Food Safety and Standards Act, 2006 (hereinafter referred to as "**FSSA**") that overrides all other food related laws.

FSSA initiates harmonization of India's food regulations as per international standards. It establishes a new national regulatory body, the Food Safety and Standards Authority of India (hereinafter referred to as "**FSSAI**"), to develop science based standards for food and to regulate and monitor the manufacture, processing, storage, distribution, sale and import of food so as to ensure the availability of safe and wholesome food for human consumption. Entrepreneur may contact State Pollution Control Board where ever it is applicable.

All food imports will therefore be subject to the provisions of the FSSA and rules and regulations which as notified by the Government on 5th of August 2011 will be applicable.

Key Regulations of FSSA

A. Packaging and Labelling

B. Signage and Customer Notices

C. Licensing Registration and Health and Sanitary Permits

17. BACKWARD AND FORWARD INTEGRATIONS

The objective of the scheme is to provide effective and seamless backward and forward integration for processed food industry by plugging the gaps in supply chain in terms of availability of raw material and linkages with the market. Under the scheme, financial assistance is provided for setting up of primary processing centers/ collection centers at farm gate and modern retail outlets at the front end along with connectivity through insulated/ refrigerated transport.

The Scheme is applicable to perishable horticulture and non-horticulture produce such as, fruits, vegetables, dairy products, meat, poultry, fish, Ready to Cook Food Products, Honey, Coconut, Spices, Mushroom, Retails Shops for Perishable Food Products etc. The Scheme would enable linking of farmers to processors and the market for ensuring remunerative prices for agri produce.

The scheme is implemented by agencies/ organizations such as Govt. / PSUs/ Joint Ventures/ NGOs/ Cooperatives/ SHGs / FPOs / Private Sector / individuals etc.

Backward Linkage:

- Integrated Pack-house(s) (with mechanized sorting & grading line/ packing line/ waxing line/ staging cold rooms/cold storage, etc.)
- Pre Cooling Unit(s)/ Chillers
- Reefer boats

- Machinery & equipment for minimal processing and/or value addition such as cutting, dicing, slicing, pickling, drying, pulping, canning, waxing, etc.
- Machinery & equipment for packing/ packaging.

Forward Linkage:

- Retail chain of outlets including facilities such as frozen storage/ deep freezers/ refrigerated display cabinets/cold room/ chillers/ packing/ packaging, etc.
- Distribution centre associated with the retail chain of outlets with facilities like cold room/ cold storage/ ripening chamber.

18. TRAINING CENTERS AND COURSES

There are few specialised Institutes provide degree certification in Food Technology, few most famous and authenticate Institutions are as follows:

1. Indian Institute of Food Science & Technology,
   Plot No.1, Near Maa-Baap ki Dargah,Opp to Nath Seeds,
   Paithan Road Aurangabad
   Aurangabad - 431005
   Maharashtra, India

2. MIT College of Food Technology, Pune
   Gate.No.140, Raj Baugh Educational Complex,
   Pune Solapur Highway,
   Loni Kalbhor, Pune – 412201
   Maharashtra, India

3. CSIR - Central Food Technological Research Institute (CFTRI)
   Cheluvamba Mansion, Opp. Railway Museum,
   Devaraja Mohalla, CFTRI Campus, Kajjihundi, Mysuru
   Karnataka – 570020

Udyamimitra portal (link : www.udyamimitra.in) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

Disclaimer:

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.