

PAPAIN FROM PAPAYA

1. INTRODUCTION:

Papain is a proteolytic enzyme from the cysteine proteinase family. It is manufactured from the latex of raw papaya fruits as papaya is very rich in papain. A milky fluid known as latex containing papain oozes out of the green papaya. The greener the fruit, more active is the papain. Papain enzyme results in high value-addition. Ideally, some progressive papaya grower should undertake this venture as a measure of forward integration.

2. PRODUCT & ITS APPLICATION:

It has high protein hydrolyzing capacity. Papain is used in many industries. At present, the food industries are the biggest users of papain, primarily for chill proofing of beer, tenderizing of meat and freeing of food proteins. Other applications are in tanning of leather and hides, degumming of silk, cheese manufacture, treatment of vegetable proteins, as fish hydrolyzates, in treatment of fish protein concentrate and fish meals, in pharmaceuticals, aroma and perfume industries and in effluent treatment etc.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Successful running this project does not require any specific qualification.

4. INDUSTRY LOOKOUT AND TRENDS

Papain is a natural cysteine proteolytic enzyme present in mountain papaya (*Vasconcellea cundinamarzensis*) and papaya (*Carica papaya*). It is native to Latin America and is also called as papaya proteinase I. It is used to tenderize meat eaten as it breaks down tough meat fibers. Papain is an active component in powder form for meat tenderizers and has a huge demand in the global market.

Papain also used in chemo-mechanical dental caries removal gel known as Papacarie, as a tooth whitener in mint sweets and toothpaste, to clean up dead tissue in chronic wounds, as a component of many enzymatic debriding preparations, and cell dissociation in cell culture preparations. The end-use industries of the papain include leather, food & beverages, detergents, cosmetic, tanning, optical, photographic, textile, and pharmaceutical. The North America papain market accounts for relatively high revenue share, followed by Western Europe papain market over the forecast period, attributed to relatively strong demand for papain and broad availability of raw material in the regions.

Global Papain Market: Dynamics

Some of the important factor fueling the growth of global papain market include rising health concern among the consumers, high demand for meat tenderizers, and increasing demand for natural enzymes. To counter the same, papain market players are investing in research and development and production of papain to meet the regulatory specification with increasing demand. Some macroeconomic factors making a positive impact on global papain market includes increasing population, the rapid rate of urbanization, and growing domestic income. The trend identified in the global papain market is mergers and acquisitions between papain producers and papaya suppliers. The company manufacturing papain products has a significant opportunity in regions such as North America, Europe, and Asia Pacific, attributed to high demand for natural enzymes and growing health consciousness among a large number of population. Companies have a significant opportunity in global papain market through collaboration with raw material supplier i.e. papaya vendor and through backward integration in the market as a raw material is a key factor for the market.

5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:

Papain is used in many industries for variety of reasons. Some of the end-users are breweries, pharmaceuticals, food, leather, detergents, meat and fish processing etc. Thus, the end use segments are many. Most of these industries are growing. The total estimated production of papain in India is around 150

tonnes per year. About 35% is BPC grade papain and the rest is purified papain, 55% of the BPC grade papain is consumed internally and the rest is exported, while 90% of the purified papain is exported. In spite of very good domestic as well as export demand, papain manufacturing has not yet picked up in the North-East and hence there are good prospects for new entrants.

6. RAW MATERIAL REQUIREMENTS:

The basic raw material is raw papaya. Potassium Metabisulphate or other preservatives can be used to preserve papain. Apart from this, packing materials of food grade quality will be required as per need.

7. MANUFACTURING PROCESS:

White milky latex of green and fully grown papaya fruits is collected in the early morning by making deep longitudinal cuts by stainless steel or wooden sharp knives. Latex is collected in stainless steel trays while latex coagulated in the surface of the fruits is scrapped and collected in the trays. A fruit is tapped about 6 times in the course of 16 days. This latex is passed through 50 mesh sieves to remove dirt and then it is mixed with potassium metabisulphate and spread on trays and dried in a vacuum shield drier at a temperature of about 550 C for 4-5 hours. The dried product is packed in air-tight containers and stored in a cool, dry place. It should be kept in flake form as powdering decreases the stability of the product during storage. Dried flakes are powdered and diluted with lactose powder to get BPC grade papain. Plastic containers should be used to pack crude papain flakes or powder as metal containers would result in loss of enzyme activity. Transportation is also very critical as papain has to be kept below 200 C temperature or else its shelf life is reduced.

With proper storage and handling, its shelf life is 5-6 months. Recovery of BPC grade papain is in the range of 25% to 30%. In other words, 100 kgs of good quality latex is required to produce 25-30 kgs of BPC grade papain. CFTRI, Mysore, has developed the technical knowhow for the product.

8. MANPOWER REQUIREMENT:

The enterprise requires 7 employees as detailed below:

Sr. No.	Designation of Employees	Salary Per Person	Monthly Salary ₹	Number of employees required				
				Year-1	Year-2	Year-3	Year-4	Year-5
	Variable Labour: Workers							
1	Operator	₹ 10,000.00	₹ 10,000.00	1	1	1	2	2
2	Un Skilled Workers	₹ 8,000.00	₹ 24,000.00	2	2	2	3	3
	<i>sub-total</i>		₹ 34,000.00	3	3	3	5	5
	Fixed Staff:							
1	Accountant	₹ 12,000.00	₹ 12,000.00	1	1	1	1	1
2	Store Keeper	₹ 8,000.00	₹ 8,000.00	1	1	1	2	2
3	Sales Staff	₹ 12,000.00	₹ 24,000.00	2	2	2	2	2
	<i>sub-total</i>		₹ 44,000.00	4	4	4	5	5
	Total		₹ 78,000.00	7	7	7	10	10

9. IMPLEMENTATION SCHEDULE:

The project can be implemented in 6 - 8 months' time as detailed below:

Sr. No.	Activity	Time Required (in months)
1	Acquisition of premises	1.00
2	Construction (if applicable)	2.50
3	Procurement & installation of	2.50

	Plant & Machinery	
4	Arrangement of Finance	1.00
5	Recruitment of required manpower	1.00
	Total time required (<i>some activities shall run concurrently</i>)	6.0 - 8.00

10. COST OF PROJECT:

The project shall cost ₹ 87.12 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land	10.00
2	Building	8.50
3	Plant & Machinery	9.85
4	Furniture, other Misc. Equipments	0.95
5	Other Assets including Preliminary / Pre-operative expenses	0.99
6	Margin for Working Capital	56.83
	Total	87.12

11. MEANS OF FINANCE:

Bank term loans are assumed @ 60% of fixed assets. The proposed funding pattern is as under:

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	21.78
2	Bank Finance	65.34
	Total	87.12

12. WORKING CAPITAL CALCULATION:

The project requires working capital of ₹ 56.83 lacs as detailed below:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	28.42	0.25	7.10	21.31
2	Receivables	14.21	0.25	3.55	10.66
3	Overheads	14.21	100%	14.21	0.00
4	Creditors	-		0.00	0.00
	Total	56.83		24.86	31.97

13. LIST OF MACHINERY REQUIRED:

A detail of important machinery is given below:

Sr. No.	Particulars	UOM	Qty	Rate (₹ in Lacs)	Value (₹ in Lacs)
	Plant & Machinery / equipments				
1	Vacuum Shelf Drier	Nos	1	₹ 2.80	₹ 2.80
2	De-humidifier	Nos	1	₹ 1.05	₹ 1.05
3	Hammer mill	Nos	1	₹ 1.40	₹ 1.40
4	Blender	Nos	1	₹ 1.25	₹ 1.25
5	Packing Machine	Nos	1	₹ 0.80	₹ 0.80
6	Storage Tanks	Nos	5	₹ 0.27	₹ 1.35
7	Material Handling Equipment	Nos	LS	₹ 0.55	₹ 0.55
8	Misc. Tools	Nos	LS	₹ 0.65	₹ 0.65
	<i>sub-total Plant & Machinery</i>				₹ 9.85
	Furniture / Electrical installations				
1	Office furniture and Laboratory Setup	LS	1	₹ 0.95	₹ 0.95
	<i>sub total</i>				₹ 0.95
	Other Assets				
1	preliminary and preoperative	LS		0.99	₹ 0.99
	<i>sub-total Other Assets</i>				₹ 0.99

	Total				₹ 11.79
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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. Electronics 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	162.00	189.00	216.00	243.00	270.00

3	Raw Materials & Other direct inputs	₹. In Lacs	138.78	161.91	185.04	208.17	231.30
4	Gross Margin	₹. In Lacs	23.22	27.09	30.96	34.83	38.71
5	Overheads except interest	₹. In Lacs	7.72	8.20	9.17	9.46	9.65
6	Interest @ 10 %	₹. In Lacs	6.53	6.53	4.36	3.27	2.61
7	Depreciation @ 30 %	₹. In Lacs	2.96	2.22	1.77	1.18	0.89
8	Net Profit before tax	₹. In Lacs	6.01	10.14	15.67	20.93	25.56

The basis of profitability calculation:

This unit will have 430-450 MT/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 liter. 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 31.68% of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	270.00
2	Variable costs	₹. In Lacs	231.30
3	Fixed costs incl. interest	₹. In Lacs	12.26
4	$BEP = FC/(SR-VC) \times 100 =$	% of capacity	31.68%

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, Retail 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 center associated with the retail chain of outlets with facilities like cold room/ cold storage/ ripening chamber.

18. TRAINING CENTERS AND COURSES

There are few specialized 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.

Source:- Udyami Mitra/Sidbi