

PAPAIN ENZYME



1.0 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. papaya is grown in large quantities in the North-East region including Assam. Papain enzyme results in high value-addition. Hence this product can be manufactured in Assam. It is also possible to produce papain enzyme in many other states like Gujarat, Maharashtra, UP, AP and so on. Ideally, some progressive papaya grower should undertake this venture as a measure of forward integration.

2.0 PRODUCT

2.1 Applications

Dry powder made from the latex of raw papaya is commonly known as crude papain. Dried papain is stored in powder or flakes form. They are diluted with lactose powder to get BPC grade papain. There is a market for raw as well as BPC grade papain. This note considers production of BPC grade papain.

2.2 Availability of know-how and compliances

CFTRI, Mysore, has developed the technical know-how. Compliance with FPO is necessary.

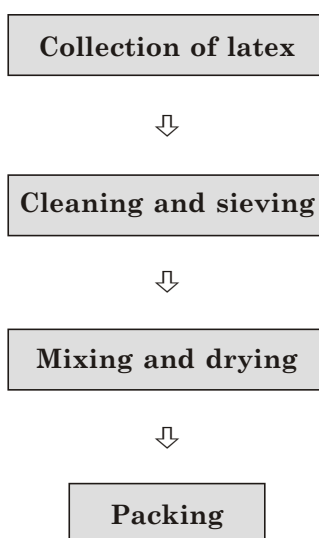
3.0 MARKET POTENTIAL

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. Good quality papain has export demand as well. 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.

4.0 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 55° 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 20° 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 know-how for the product. The process flow chart is as under:



5.0 CAPITAL INPUTS

5.1 Land and Building

As indicated earlier, this project should preferably be started by or with the help of existing papaya growers. For production capacity of 6 tonnes of BPC grade papain every year, about 66 kgs. of latex would be required every day considering 30% recovery and 300 working days every year. For 66 kgs. of latex per day, there is a need for cultivation on 30-32 acres of land. This land has to be divided into 3 sections and plantation is done in one section at a time in a cycle of 3-4 months to ensure availability of papaya round the year. If the promoters are not papaya growers then they should have adequate agricultural land on which papaya

cultivation could be started instead of some other item. Or else land can be taken on long term lease. But buying of 30-32 acres of land for this project would be an economically unviable proposition.

Total constructed area would be around 150 sq.mtrs. which has to be in the same farm. Main processing area would occupy around 60 sq.mtrs. whereas latex, papain and other storage area would be around 50 sq.mtrs. Laboratory, office and packing area can be accommodated in the balance 40 sq.mtrs.

It is envisaged that the processing will be done in the farm itself. Even then for a piece of land of about 250 sq.mtrs. on which factory building shall be constructed, price is taken @ Rs.300/- per sq.mtr. to arrive at a realistic picture. Thus, cost of land is taken at Rs. 75,000/- whereas construction cost is assumed to be Rs. 3, 75,000/-.

5.2 Plant and Machinery

For processing capacity of around 20 tonnes per year considering 300 working days and one shift working following machines will be required.

Item	Qty.	Price (Rs.)
Aluminium and SS trays, Weighing Scales & Measuring cans, knives, sieves, etc.	--	60,000
5 HP Pump-set with hose pipe	2	30,000
Vacuum Shield Drier	1	1,50,000
De-humidifier	1	50,000
Hammer Mill	1	80,000
Blender	1	60,000
Laboratory Equipments	--	30,000
Packing Machine	1	30,000
	Total	4,90,000

5.3 Miscellaneous Assets

Some other assets like furniture and fixtures, working tables, storage racks and bins etc. would cost about Rs.50,000/-.

5.4 Utilities

Power requirement shall be 30 HP whereas per day water requirement for processing and potable and sanitation purposes will be 1,500 litres. Annual cost of utilities at 100% utilisation will be Rs. 1.20 lac.

5.5 Raw and Packing Materials

The most important raw material will be raw or unripe and fully grown papaya which will be cultivated by the promoters. papaya, after extraction of latex, is sold in the market for about Rs.500-600 per ton. Hence, price of Papaya as input material is taken at Rs. 5,000/- per ton. Other materials like potassium metabisulphate, lactose powder etc. shall be required in small quantity. Plastic containers and corrugated boxes shall be required for packing of finished product.

6.0 MANPOWER REQUIREMENTS

It is a labour intensive activity and a number of contract or casual workers are hired from time to time depending upon need.

Particulars	Nos.	Monthly Salary (Rs.)	Total Monthly Salary (Rs.)
Skilled Workers	3	2,250	6,750
Unskilled Workers	6	1,250	7,500
Laboratory Chemist	1	3,000	3,000
Casual Labour	--	--	15,000
		Total	32,250

7.0 TENTATIVE IMPLEMENTATION SCHEDULE

Activity	Period (in months)
Application and sanction of loan	2
Site selection and commencement of civil work	1
Completion of civil work and placement of orders for machinery	4
Erection, installation and trial runs	1

8.0 DETAILS OF THE PROPOSED PROJECT

8.1 Land and Building

Particulars	Area (Sq.Mtrs)	Cost (Rs.)
Land	250	75,000
Building	150	3,75,000
	Total	4,50,000

8.2 Machinery

Total cost would be Rs.4.90 lacs as spelt out earlier.

8.3 Miscellaneous Assets

A provision of Rs.50,000/- is adequate as explained earlier.

8.4 Preliminary & Pre-operative Expenses

There will be many pre-production expenses like registration, establishment & administrative & travelling expenses, interest during implementation, trial run expenses, etc. for which a provision of Rs.60,000/- is made.

8.5 Working Capital Requirements

Capacity utilisation in the first year is expected to be 60% for which working capital needs would be as under.

(Rs. in lacs)

Particulars	Period	Margin	Total	Bank	Promoters
Stock of Finished Goods	½ Month	25%	0.40	0.30	0.10
Receivables	½ Month	25%	0.50	0.38	0.12
Working Expenses	1 Month	100%	0.40	--	0.40
		Total	1.30	0.68	0.62

8.6 Cost of the Project & Means of Financing

(Rs. in lacs)

Item	Amount
Land and Building	4.50
Machinery	4.90
Miscellaneous Assets	0.50
P&P Expenses	0.60
Contingencies @ 10% on Land and Building & Plant & Machinery	0.95
Working Capital Margin	0.62
Total	12.07
Means of Finance	
Promoters' Contribution	3.62
Term Loan from Bank/FI	8.45
Total	12.07
Debt Equity Ratio	2.33 : 1
Promoters' Contribution	30%

Financial assistance in the form of grant is available from the Ministry of Food Processing Industries, Govt. of India, towards expenditure on technical civil works and plant and machinery for eligible projects subject to certain terms and conditions.

9.0 PROFITABILITY CALCULATIONS

9.1 Production Capacity & Build-up

As against rated production capacity of 20 tonnes per year, actual utilisation is expected to be 60% in the first year and 75% thereafter.

9.2 Sales Revenue at 100%

Assuming selling price of Rs .3,75,000/- per ton, total sales income of 6 tonnes would be Rs. 22.50 lacs.

9.3 Raw and Packing Materials Required at 100%

(Rs. in lacs)

Product	Qty. (Tonnes)	Price/Ton (Rs.)	Value
Raw/Unripe Papaya	20	5,000	1.00
Chemicals	--	--	0.60
Packing Materials	--	--	1.20
		Total	2.80

9.4 Utilities

Yearly cost of utilities at 100% activity level would be Rs.1.20 lacs.

9.5 Selling Expenses

Bulk of the sales will be outside the North-Eastern states. Hence, a provision of 12.5% of the sales value is made towards transportation, selling commission etc.

9.6 Interest

Interest on term loan of Rs. 8.45 lacs is calculated @ 12% per annum assuming repayment in 4 years including a moratorium period of 6 months. Interest on working capital loan is considered to be 14% per annum.

9.7 Depreciation

It is calculated @ 10% on building and 20% on machinery and miscellaneous assets on WDV basis.

10.0 PROJECTED PROFITABILITY

(Rs. in lacs)

No.	Particulars	1st Year	2nd Year
A	Installed Capacity	--- 20 Tonnes ---	
	Capacity Utilisation	60%	75%
	Sales Realisation	13.50	16.90
B	Cost of Production		
	Raw and Packing Materials	1.68	2.10
	Utilities	0.72	0.90
	Salaries	3.87	4.40
	Stores and Spares	0.30	0.42
	Repairs & Maintenance	0.36	0.48
	Selling Expenses @ 12.5%	1.68	2.11
	Administrative Expenses	0.30	0.42
	Total	8.91	10.83
C	Profit before Interest & Depreciation	4.59	6.07
	Interest on Term Loan	0.87	0.62
	Interest on Working Capital	0.10	0.13
	Depreciation	1.46	1.20
	Profit before Tax	2.16	4.12
	Income-tax @ 20%	0.43	0.82
	Profit after Tax	1.73	3.30
	Cash Accruals	3.19	4.50
	Repayment of Term Loan	1.10	2.20

11.0 BREAK-EVEN ANALYSIS

(Rs. in lacs)

No	Particulars	Amount	
[A]	Sales		13.50
[B]	Variable Costs		
	Raw and Packing Materials	1.68	
	Utilities (65%)	0.47	
	Salaries (75%)	2.90	
	Stores & Spares	0.30	
	Selling Expenses (70%)	1.18	
	Admn. Expenses (50%)	0.15	
	Interest on WC	0.10	6.78
[C]	Contribution [A] - [B]		6.72
[D]	Fixed Cost		4.06
[E]	Break-Even Point [D] ÷ [C]		60%

12.0 [A] LEVERAGES

Financial Leverage

$$\begin{aligned} &= \text{EBIT/EBT} \\ &= 3.13 \div 2.16 \\ &= 1.45 \end{aligned}$$

Operating Leverage

$$\begin{aligned} &= \text{Contribution/EBT} \\ &= 6.72 \div 2.16 \\ &= 3.11 \end{aligned}$$

Degree of Total Leverage

$$\begin{aligned} &= \text{FL/OL} \\ &= 1.45 \div 3.11 \\ &= 0.47 \end{aligned}$$

[B] Debt Service Coverage Ratio (DSCR)

(Rs. in lacs)

Particulars	1st Yr	2nd Yr	3rd Yr	4th Yr
Cash Accruals	3.19	4.50	5.12	5.76
Interest on TL	0.87	0.62	0.37	0.18
Total [A]	4.06	5.12	5.49	5.94
Interest on TL	0.87	0.62	0.37	0.18
Repayment of TL	1.20	2.40	2.40	2.45
Total [B]	2.07	3.02	2.77	2.63
DSCR [A] ÷ [B]	1.96	1.69	1.98	2.25
Average DSCR	----- 1.97 -----			

[C] Internal Rate of Return (IRR)

Cost of the project is Rs. 12.07 lacs.

(Rs. in lacs)

Year	Cash Accruals	16%	18%	20%	24%
1	3.19	2.75	2.70	2.66	2.57
2	4.50	3.34	3.23	3.12	2.93
3	5.12	3.28	3.12	2.96	2.68
4	5.76	3.18	2.97	2.78	2.44
5	6.14	2.92	2.68	2.47	2.09
	24.71	15.47	14.70	13.99	12.71

The IRR is around 26%.

Some of the machinery suppliers are:

1. Jyoti Inds; Pumpa Mahakavai Road, Bangalore
2. Punjab Engg. Works, Ram Krishna Samadhi Road, Kolkata
3. Engineer's (Overseas) Corpn. Pvt Ltd, Kolkata
4. Container Industries, C/299, Ghatkopar Industrial, 72, LBS Marg, Mumbai 400080
5. SS Engineering, B/25, Khanpur Extn., New Delhi 110062. Tel. No.: 26081475