APPENDICES

Appendix A

Cost Economics of developed Hydrodynamic Cavitation (HC) reactor system

Cost of machineries		
Cost of developed Hydrodynamic Cavitation (HC) reactor system	=	Rs. 93,000/-
Building cost (100 m^2)	=	Rs. 2,00,000/-
Total Cost	=	Rs. 2,93,000/-

Cost of raw materials and processing for the production 1 Litre cocoa mucilage wine

Cost of cocoa mucilage	=	Rs. 310/L
Sugar and fermentation aids	=	Rs. 40/Kg
Yeast culture (wine-grade)	=	Rs. 325/Kg
Processing & Fermentation Charge	=	Rs. 20/L
Premium packaging bottle and labelling & transportation	=	Rs. 55/L
Total production (1 litre mucilage + 1.5 litre water & 10 gram yeast) and packaging cost per litre	=	Rs. 143/L

Assumptions for conventional ageing of cocoa mucilage wine

Barrel aging or inert container (Glass, stainless steel, or oak cask)	=	Rs. 15/L
Storage cost (space + care) ₹1000–1500/year/m^2 → allocated per liter for 10 years	=	Rs. 40/L
Evaporation (Assume 8–12% volume loss over 10 years)	=	Rs. 10/L
Labor & quality control (10 yrs) Monitoring, SO_2 addition, testing, re-racking	=	Rs. 15/L
Opportunity cost (capital) ROI on locked stock (5–8% annual return loss)	=	Rs. 25/L
Total cost for conventional ageing of cocoa mucilage wine	=	Rs. 105/L

Assumptions for HC system

Life span (L)	=	10 years
Annual working hours (H)	=	275 days (per day 8 hours) = 2,200 hours
Salvage value (S)	=	10% of initial cost
Interest on initial cost (i)	=	15% annually
Repair and maintenance	=	8% of initial cost
Insurance and taxes	=	2% of initial cost
Electricity charges	=	Rs. 7/unit
Labour wages per person	=	Rs. 350/day

I. Total Fixed cost per day		
i. Depreciation	=	$\frac{C-S}{L \times H} = \frac{2{,}93{,}000 - 29{,}300}{10 \times 2200} = Rs.11.98/h$
ii. Interest	=	$\frac{C+S}{2} \times \frac{i}{H} = \frac{2{,}93{,}000 + 29300}{2} \times \frac{15}{100 \times 2200} = Rs.10.98/h$
iii. Insurance & taxes	=	$\frac{2}{100 \times 2200} \times 2{,}93{,}000 = 2.66/h$
Total Fixed Cost	=	$i + ii + iii = \frac{25.62}{h} = 204.96/day$
II. Total Variable Cost per day		
i. Repair & maintenance	=	$\frac{8}{100 \times 2200} \times 2{,}93{,}00 = Rs.10.65/h$
ii. Electricity cost a) Energy consumed by 1.5 Hp Pump b) Cost of energy consumption per day	=	2.24 kWh $Power \times duration \times cost\ of\ one\ unit = 2.24 \times 8 \times 7 = 125.44/day$
iii. Labour cost (1 person)	=	$Rs.500/day$
Total variable cost	=	$i + ii + iii += 10.65 + 125.44 + 500 + = Rs.636.09/-$
Therefore, total cost for production of 10 L of cocoa wine/day Processing cost of 1 L of cocoa wine	= =	Fixed Cost + Variable cost = $204.96 + 636.09$ = Rs. 841.05/day Rs. 84.105/L

Cost of conventionally aged cocoa mucilage wine = Rs. 248/L

Cost of HC treated cocoa mucilage wine = 227.105/L

$$Benefit\ cost\ ratio = \frac{248}{227.105} = 1.09$$