PRE-FEASIBILITY REPORT FOR THE PRODUCTION OF SEABUCKTHORN POWDER DRINK

Name of the R&D Organization:	PCSIR Laboratories, Complex Peshawar
Name of contact person:	Arshad Hussain
Designation:	Senior Scientific Officer
Address	PCSIR Laboratories, Complex Jamrud Road, Peshawar
Phone:	091-9216240-42
Fax:	091-9216232
Mobile:	0300-5990839
Email	arshad_402003@yahoo.com

1. Introduction of Technology/Process/Product

i. Name of Technology/Process/Product:

Production of Sea buckthorn Powder Drink

ii. Summary:

The pulp of sea buckthorn (*Hippophae rhamnoides* L) fruit was processed to obtain different concentrations (11.8°, 33°, 66° & 75° brix) used for the preparation of sea buckthorn powder drinks. Various parameters of the process such as concentration of the pulp, temperature, time of drying and addition of different food grade ingredients have been standardized for product development. The final product in a form of orange color powder prepared from the concentrated pulp (66° brix) at 50 °C and dried in cabinet shelf dryer for 6 hour. Physiochemical properties, like color, flavor, taste, acceptability, moisture, total ash, total acidity, ascorbic acid, crude fat, fiber, protein, tannin, ß-carotene, total sugars, some micro and macro minerals were evaluated in fresh pulp (11.8° brix) and the product prepared. The pulp and the product in powder form contain all the nutrients, when mixed with suitable amount of water provides good homogeneous, natural fruit flavoring drink having good taste.

iii. Project brief (*Local/International Perspective*)

The *H. rhamnoides* sub species *Hippophae rhamnoides Turkistania* is found in Chitral and Northern Areas of Pakistan. Normally, it is spread throughout the Karakuram

and Himalayan ranges. According to Chinese *H. rhamnoides* expert, Professor Rongsen, there are about 3000 hectares of *H. rhamnoides* forests in Pakistan, annually producing 1200-2500 tons of sea buckthorn, and various industries producing james, jellies, chocolates and capsules at small scale and exporting the berries abroad.

To develop value added food product based on *H. rhamnoides* pulp without losing its natural flavor and nutrients. The functional food and nutraceutical markets, collectively estimated as a multi-billion dollar global industry has been gaining popularity. Traditional products from the berries include juices, liqueurs, wine, jams, candy and ice cream. However, the berry's unique chemical and nutritional composition has offered economic potential as a health food. The obvious benefits of instant powder drink are to reduce bulk of berries and weight convenience in carriage, freedom from costly glass and tin containers, as powder can be packed in suitable polyethylene bags. An appropriate new process was developed for the preservation and transformation of the fruit into exportable product, which will contribute to our export earning from the non-conventional source.

2. Main Parameters of Technology/Process/Product

i. Main Feature:

Appearance	Powder
Color	Orange Yellow
Solubility	Soluble in water
Acidity	2.8 %
Stability	Stable under ordinary conditions. In use and storage, gain some moisture on exposure to air at room temperature

ii. Input (*Raw materials with specifications*)

Fresh Sea buckthorn (*H. rhamnoides*) pulp (11.8° brix)

Food Grade Additives

Stabilizers

Thickener

Emulsifier

Sugar

iii. Output (Products, byproducts with specification)

Product Sea buckthorn powder drink

Appearance	Powder
Color	Orange Yellow
Solubility	Soluble in water
Stability	Stable under ordinary conditions

Parameters	Product
Moisture (%)	5.30
Total Ash (%)	0.50
Total Acidity (%)	2.85
Crude Fat (%)	1.48
Crude Fiber (%)	0.35
Crude Protein (%)	0.65
Total sugars (%)	34.8
Ascorbic acid (mg/ 100g)	45.4
ß -Carotene (mg/ 100g)	2.80

Byproducts Seeds and Seed's oil

iv. Application/Uses

The sea buckthorn (*H. rhamnoides*) pulp and product prepared in powder form are the valuable nutritional / medicinal source for the human, which will contribute to the improvement of quality and choice of the food offered to consumers that are beneficial to health and well being. Sea buckthorn (*Hippophae rhamnoides* L) has been reported to contain more then 190 compounds in seed, pulp and juice. These compounds include fat soluble vitamins (A, E, K) B_1, B_2, folic acid, 22 fatty acids, 42 lipids, α-tocopherol (generically referred to as vitamin E), phenolic compounds (flavonoids and carotenoids, sterole, terpene and tannin. *H. rhamnoides* pulp and its product (powder) contains fiber, fat, vitamin C, sugars, ß-carotene and some micro and macro minerals.

Keeping in view of the high demand of the *H. rhamnoides* and its products in the world market, and the existence of the substantial plantation and fruit, an appropriate new

process was developed for the preservation and transformation of the fruit into exportable product, which will contribute to our export earning from the non-conventional source. The commercialization of product would be a great achievement as an alternate diet source.

This sea buckthorn (*H. rhamnoides*) pulp based product when mixed with suitable amount of water to use as drink, provides good homogeneous mixing, have orange yellow color, natural flavor and acceptability.

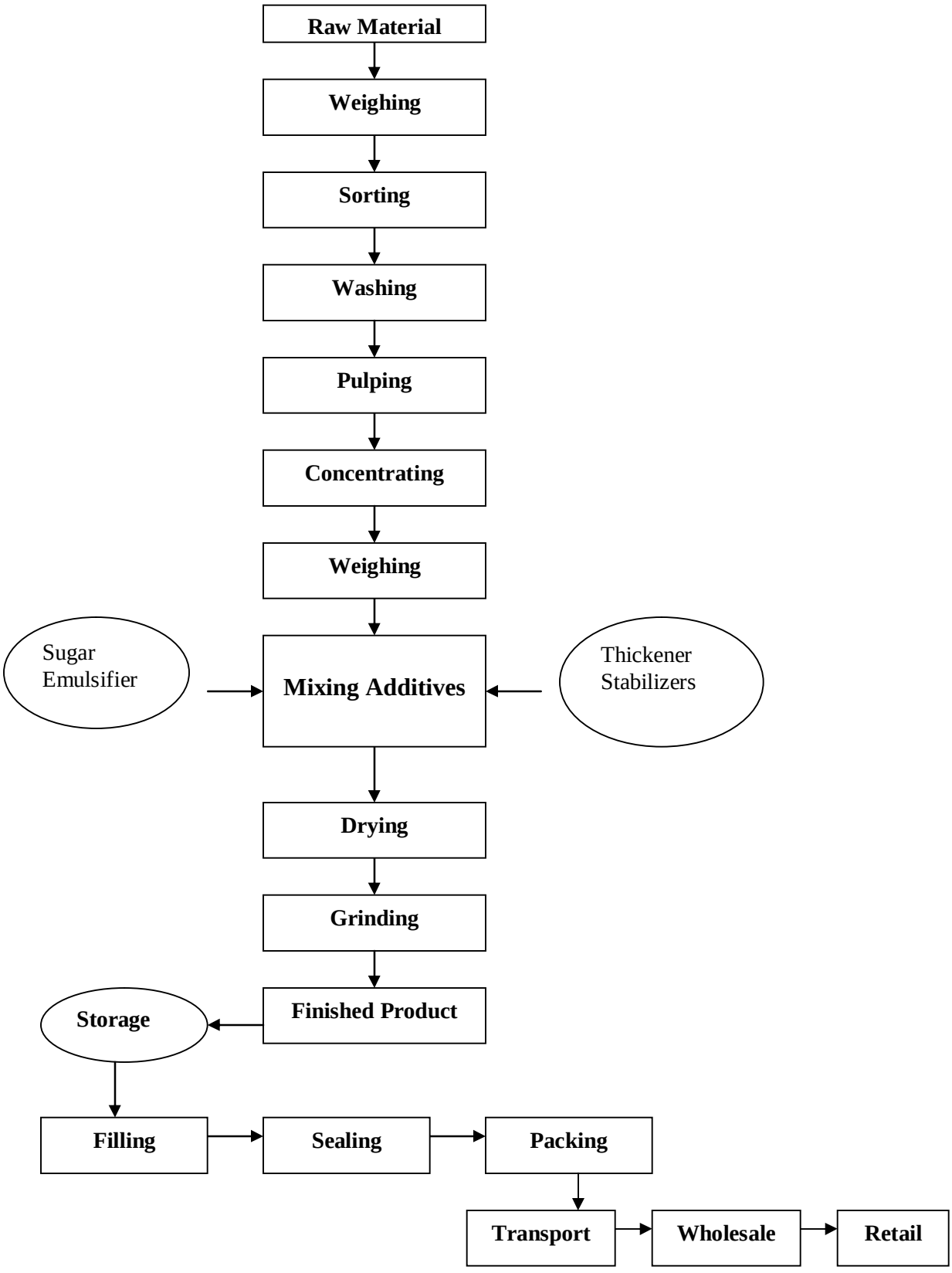
v. Trail Result:

Satisfactory

vi. Technical data

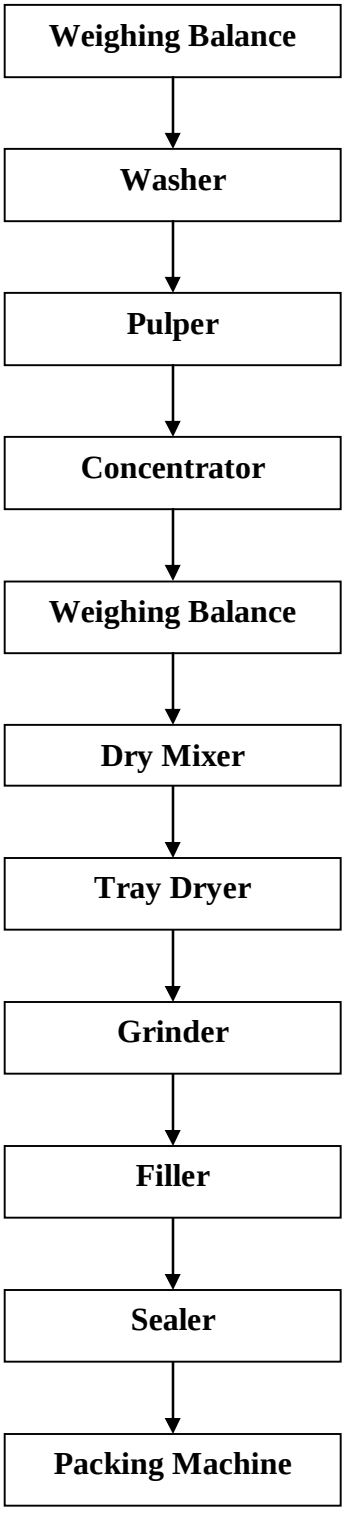
- Proposed capacity: 1000 Packs/ Batch
- Production time per batch: 16 hr (08 hrs/day)
- Packing size: 300 g/ Pack

vii. Production process/Flow diagram



viii. Equipment layout diagram

Diagram of Equipments Involved for Production of Sea buckthorn Powder Drink



ix. Machinery required with specification

S. No	Items	Description	Qty	Cost (Million Rs.)
1.	Pulper	Capacity: 50 kg/hr	01	0.70
2.	Concentrator/Evaporator	Capacity: 50 kg/ 8 hrs	01	1.50
3.	Weighing Balance	Capacity: 100 Kg	01	0.50
4.	Dry mixer	Capacity: 50 Kg	01	0.20
5.	Tray Dryer	500 Kg	01	1.50
6.	Grinder	50 Kg/hr	02	0.50
7.	Filler/Storage Tank	500 kg	01	0.50
8.	Sealer	-	02	0.20
9.	Packing Machine	150 packs/hr	01	0.80
10.	Miscellaneous items including office equipments, furniture, spears, accessories, and tools etc	-	-	1.00
			Total	**7.40**

x. Standard specifications & test methods

Standard specifications	Test methods
Moisture (%)	Standard methods of Chemical Analysis (AOAC 2000)
Total Ash (%)	-do-
Total Acidity (%)	-do-
Crude Fat (%)	-do-
Crude Fiber (%)	-do-
Crude Protein (%)	-do-
Total sugars (%)	-do-
Ascorbic acid (mg/ 100g)	-do-
ß -Carotene (mg/ 100g)	UV-Spectrophotometer
Minerals (mg/100g)	Atomic Absorption Spectrophotometer

xi. Quality control equipment with specifications

S. No	Items	Quantity
1.	Electric Oven (Range up to 150 ^{o}C)	01
2.	Moisture analyzer	01
3.	UV-Spectrophotometer, Model UNICO 2100 Series Japan	01
4.	Furnace (Range up to 1000 ^{o}C)	01
5.	Digital balance (digital)	01
6.	pH meter (digital)	01
7.	Weighing balance (Top loading, Capacity; 100 kg)	01
8.	Miscellaneous labs equipments, glassware and chemicals etc	As required

xii. Environmental Impact:

Production of Sea buckthorn powder drink is an environmentally safe process. It does not cause any hazardous effects to the environment as no toxic chemicals being utilized during its production.

xiii. Availability of technical support: Available

xiv. Available of Brochures/Pamphlets: Available

xv. Status of registration/Patent/Trade Mark: Patent filed

3. Estimation of Fixed Capital Investment (PKR)

i. Fixed Capital Investment

Sr. No	Description	Cost (In Million Rs)
1.	**Machinery cost** Including installation, instrumentation, designing, consultancies, transformer, generator, furniture, quality control and mini pilot plant equipments	12.00
2.	**Land, building cost including development charges and transport** • Land required: 0.50 acre • Cost of land: Rs. 80.00 million per acres • Processing area required including laboratory, mini pilot plant, store and storage bins: 0.25 acre • Administration block area etc required: 0.25 acre • A development charges includes sheds (concrete), offices, store, laboratory, mini pilot plant and boundary wall etc • Transport for raw materials etc	45.00 10.00 3.00
Fixed Capital Investment		**70.00**

ii. Technology Transfer Fee: 5.0 Million

iii. Total Project Cost

Sr. No	Description	Cost (In Million Rs)
1.	Working Capital Investment (Annexure-II)	2.92
2.	Fixed Capital Investment	70.00
3.	**Capital Investment (Total Project Cost)** (2.92 + 70.00)	72.92
4	**Capital Investment (Total Project Cost)** (In case when the land is available) 2.92 + (12.00+13.00)	27.92

4. Marketing Aspects:

i. Total industry and annual growth Data not available

ii. Current demand Data not available

iii. Local production facilities Nil

iv. Imports Data not available

v. Major users Food industries

vi. Marketing strategy

- Supply of samples to SMEDA for marketing
- Distribution of brochures among stakeholders
- Display of samples at various chambers of commerce and industry
    - **Hold regional exhibition & seminars** Nil
    - **Publicity through electronic & print media** Nil

5. Detail of Cost:

Sr. No	Description	Cost (Rs)
1.	Direct Production Cost (Annexure-III)	50/pack
2.	Raw material cost per unit	24.16/pack
3.	Direct wages cost per unit	0.65/pack
4.	Production overhead cost per unit (Annexure-I)	4.65/pack
5.	Manpower including expenses (admin, selling, salaries and benefits)	60,450/month
6.	Utilities charges per month	6500/month
7.	Communication expanses per month	Nil
8.	Other expanses (depreciation) per month	61,659/month
9.	Publicity, advertisement per month	25000/month

Annexure-1

Operating Cost/Labor Cost/batch

S #	Description	Employees required	Charges per batch	Wages per month
1	Factory Manager	One	Rs.1200	Rs.1560
2	Processing /Production supervisor	One	Rs.600	Rs.7800
3	Electrician	One	Rs.200	Rs.2600
4	Chemist	One	Rs.300	Rs.3900
5	Skilled workers	One	Rs.300	Rs.3900
6	Unskilled workers	Two	Rs.350	Rs.4550
7	Selling & Distribution charges	One	Rs.450	Rs.5850
8	Accountant/Cashier	One	Rs.300	Rs.3900
9	Storekeeper-cum-Purchase Officer	One	Rs.300	Rs.3900
10	Armed Guard/Security Guard	Two	Rs.400	Rs.5200
11	Driver	One	Rs.250	Rs.3250
	Total	**Thirteen**	**Rs.4650**	**Rs.60450**

Annexure-1I

Working Capital

S #	Description	Cost (Rs. In million)
1	First 02 months salaries of the staff	0.121
2	First 02 months Utilities	0.169
3	Raw material cost for 02 months	0.630
4	Cash in hand (permanent portion of working capital in the form of cash)	2.00
	Total working capital	**2.92**

Annexure-1II

Production Cost

S #	Description	Cost
1	Raw material	Rs.24160/batch
2	Operating Cost (Labor)	Rs.4650/batch
3	Utilities	Rs.6500/batch
4	Depreciation charges	Rs.4743/batch
5	Packing material	Rs.10000/batch
	Total Cost	**Rs.50053/batch**

Cost per Pack Rs.50.053