PERIWINKLE

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SECTION I

PRODUCT CHARACTERISTICS AND SPECIFICATION

Family: Apocynaceae

Pronunciation: cath-ar-AN-thus ROW-zee-us

Common Indian Names

- Ainskati
- Billaganneru (Telugu)
- Nayantra
- Nityakalyani(Tamil)
- Periwinkle (English)
- Rattanjot
- Sada bahar
- Sadaphul
- Ushamanjairi

Botanical description

Family: APOCYNACEAE
Pronunciation: cath-ar-AN-thus ROW-zee-us

An erect bushy perennial herb

An evergreen shrub, it grows to a height of 1m with a spread of 1m.

Flowers are soft pink, tinged with red, Five petals appearing in spring and autumn.

This species was formerly known as Vinca rosea and has the alternative common name of Vinca. (Should not be confused with the perennial groundcover Vinca minor.)

Origin and distribution

This periwinkle is native to Madagascar.

It is grown commercially for its medicinal uses in Australia, Africa, India and southern Europe.
It prefers rich, well drained, moist soils in a protected, sunny position and is drought and frost tender.

It is cultivated as an ornamental plant almost throughout the tropical and subtropical world.

It is abundantly naturalized in many regions, particularly in arid coastal locations.
PRODUCT APPLICATION

Periwinkle contains more than 70 alkaloids mostly of the indole type

The rootbark contains the alkaloid Alstonine which has been used traditionally for its calming effect and its ability to reduce blood pressure.

Pharmaceutical Activities

- Animal repellent activity
- Anithyperglycemic activity
- Antiascariasis activity
- Antibacterial
- Antidiuretic
- Antifungal
- Antifertility
- Antihypercholesterolemic
- Antihyperglycemic
- Antihypertensive
- Anti-inflamatory
- Antimalarial
- Antimitotic
- Antimutagenic
- Antispasmodic
- Antispermatogenic
- Antitumor
- Antiviral
- Cardiotonic
- CNS depresant
- Cytotoxic
- Hyperglycemic
- Hypoglycemic
- Hypotensive
- Inotropic
- Insect feeding deterrent
- Insect sterility induction
- Insecticidal
- Insulin
- Larvicidal
- Leukopenic
- Smooth muscle relaxant
- Spasmogenic
- Uterine relaxation effect
- Uterine Stimulant effect
More recently, extracts from Madagascar Periwinkle have been shown to be effective in the treatment of various kinds of leukemia, skin cancer, lymph cancer, breast cancer and Hodgkin's disease.

Indeed, Madagascar Periwinkle is a modern day success story in the search for naturally occurring anticancer drugs.

**Traditional Medicinal Uses**

<table>
<thead>
<tr>
<th>Country</th>
<th>Medicinal uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Brazil</td>
<td>Diabetes</td>
</tr>
<tr>
<td>China</td>
<td>Menstrual regulator</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>Diabetes, Hypertension, Cancer</td>
</tr>
<tr>
<td>Dominica</td>
<td>Diabetes, Combat primary inertia in child birth</td>
</tr>
<tr>
<td>England</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Europe</td>
<td>Diabetes</td>
</tr>
<tr>
<td>France</td>
<td>Antigalactagogue</td>
</tr>
<tr>
<td>French Guiana</td>
<td>Cholagogue</td>
</tr>
<tr>
<td>India</td>
<td>Diabetes, Cancer, Hodgkin’s disease, Menorrhagia</td>
</tr>
<tr>
<td>Jamaica</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Kenya</td>
<td>Stomach problem</td>
</tr>
<tr>
<td>Mexico</td>
<td>Cancer</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Diabetes, Rheumatism, Hypotensive and Febrifuse</td>
</tr>
<tr>
<td>North Vietnam</td>
<td>Menstrual regulator</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Peru</td>
<td>Cancer, Leishmaniasis</td>
</tr>
<tr>
<td>Philippines</td>
<td>Emmenagogue, Diabetes, Amenorrhea, Menorrhagia</td>
</tr>
<tr>
<td>South Africa</td>
<td>Menorrhagia, Diabetes</td>
</tr>
<tr>
<td>South Vietnam</td>
<td>Antigalactagogue</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Thailand</td>
<td>Diabetes</td>
</tr>
<tr>
<td>USA</td>
<td>Euphoriant</td>
</tr>
<tr>
<td>Venda</td>
<td>Venereal Disease</td>
</tr>
<tr>
<td>West Indies</td>
<td>Diabetes, High Blood Pressure</td>
</tr>
</tbody>
</table>
SECTION III

INDIAN MANUFACTURERS

The Indian extractors/formulators of Periwinkle produce Vincristine, Vinblastine, Vincamine, Vindoline, Vindosine from Periwinkle or buy and formulate Vincristine, Vinblastine, Vincamine, Vindoline, Vindosine.

Such organisations include the following.

* Biddle Sawyer Ltd
  25, Dalal Street,
  Mumbai-400 023

* Cipla Ltd.
  Factory: Lamieda Bhai Shastri Marg,
  Vikhroli,
  Mumbai-400 083.

* Khandelwal Laboratories Pvt Ltd
  Plot No.B-1/90,Wagle Indl Estate,
  Thane-400 604,

* Biochem Pharmaceutical Industries.
  Factories : 1. Biochem House, L.B.S. Marg,
  Vikhroli (W), Mumbai-400 083.

* Southern Herbals Ltd.,
  64, Jigani Indl. Area, Jigani-562 106.
  Anekal Taluk, Bangalore District.

* Vintec Pharmaceuticals Pvt. Ltd.
  Plot B2, Phase II,
  Madras Export Processing Zone,
  Tambaram, Madras-600 045.

* Amrutanjan Ltd.,
  Fine Chemicals Division,
  Old Mahabalipuram Road
  Egattur Village, Via Kelambakkam
  Padur P.O.-603 103, Kanchipuram Dist.

Total Indian processing capacity:- Around 20 Kgs per annum of Crude Periwinkle
SECTION IV
IMPORT/EXPORT LEVEL

4.1. Imports
Nil

4.2. Exports

Countrywise Export of Vinca Rosea Alkaloids: vincritine, Vinbla Sline, Vincisterine

Period April 2001 to March 2002

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity in Kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>25</td>
</tr>
<tr>
<td>Kenya</td>
<td>94</td>
</tr>
<tr>
<td>Mexico</td>
<td>30</td>
</tr>
<tr>
<td>Peru</td>
<td>200</td>
</tr>
<tr>
<td>Zambia</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>384</td>
</tr>
</tbody>
</table>
## SECTION V

### PRICE

<table>
<thead>
<tr>
<th>Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic price of Dry plant material</td>
<td>Rs.65 per kg</td>
</tr>
<tr>
<td>Taxes and duties</td>
<td>Extra as applicable</td>
</tr>
</tbody>
</table>
The important downstream product of Periwinkle is Vincristine, which is an anti cancer drug.

**Vincristine (Oncovin)**

Vincristine is one of the older chemotherapy drugs which has been around for many years. Vincristine, anticancer drug is produced from Catharanthus roseus.

It is given by intravenous route only. It is most commonly used in treatment of the following cancers:

- Lymphomas
- Hodgkin's Disease
- Breast cancer
- Acute Lymphocytic Leukemia
- Soft tissue sarcomas
- Multiple Myeloma
- Neuroblastoma

**Pharmacology of Vinblastine, Vincristine, Vindesine and Vinorelbine**

Vinblastine and vincristine are alkaloids found in Catharanthus roseus.

They are all administered intravenously in their sulfate form once a week; these solutions are fatal if they're administered any other way and can cause a lot of tissue irritation if they leak out of the vein.

Although these three compounds are very similar in structure and have the same basic action, they have distinctly different effects on the body.

**Yield**

One tonne of Vinca rosea leaves yield 50 grams of Vincristine sulphate in crude form. On further purification, 40 grams of Vincristine is obtained.

Vincristine is presently produced by a few units in the country.

Estimated demand for Periwinkle leaves for production of Vincristine in crude form is around 400 to 500 tonnes per annum.

**Growth rate in demand** 6 to 7% per annum.
SECTION VII

BROAD OUTLINE OF MANUFACTURING PROCESS

Cultivation Practices

Climate and Soil

* No specific climatic requirements but mostly Tropical and Sub-tropical area

* Rainfall of 100 cm or more is considered ideal for raising it as a commercial crop under rainfed conditions

* Light requirements: Full Sun

* Any type of soil except those which are highly alkaline or water-logged.

* Light sandy soils rich in humus are preferred for large scale cultivation of the plant

* It grows wild in coastal area

Periwinkle prefers full sun and takes a long time to flower when started from seed. The brittle stems break easily.

The plant tolerates heat and drought and can be relied on to flower in the hottest weather. Grow Periwinkle in sun or shade.

Soil must be moist but well-drained as too much moisture could lead to bacterial fungus or stem rot.

Propagation

<table>
<thead>
<tr>
<th>Propagation</th>
<th>Through Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds required per hectare</td>
<td>2 to 3 kg</td>
</tr>
<tr>
<td>Seeding period</td>
<td>March to April</td>
</tr>
<tr>
<td>Seed germination period</td>
<td>About 10 days time</td>
</tr>
<tr>
<td>Planting material (607 cm)</td>
<td>Within two months</td>
</tr>
<tr>
<td>Seed spacing</td>
<td>45 cm x 30 cm or 45 cm x 45 cm</td>
</tr>
</tbody>
</table>

For nursery sowing and transplanting, about 500 gram of seed, sown in 200 m² bed is required for producing seedlings for one hectare

When the plants grow up they are thinned out, leaving a distance of 25 - 30 cm between the plants.
Harvesting

Ready for harvest of Root after one year

The crop is cut about 7.5 cm above the ground and dried for stems, leaves and seeds.

Then the whole field is copiously irrigated and ploughed and the roots are collected. The roots are washed well and dried in shade and latter made into boundless for marketing

Yield

Under rainfed conditions (All dry basis) per hectare

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>0.75 tonne</td>
</tr>
<tr>
<td>Stems</td>
<td>1 tonne</td>
</tr>
<tr>
<td>Leaves</td>
<td>2 tonnes</td>
</tr>
</tbody>
</table>

Under irrigated conditions (per hectare)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>1.5 tonne</td>
</tr>
<tr>
<td>Stems</td>
<td>1.5 tonne</td>
</tr>
<tr>
<td>Leaves</td>
<td>3 tonnes</td>
</tr>
</tbody>
</table>

Seed Companies (Breeding, Production and Sales)

Technisem  France

Unicorn Agrotech Ltd.  India

Environmental Seed Producers  USA

Sakata Seed America  USA

Resellers

Stokes Seeds Ltd.  Canada
Source of technology for agri practices

* Central Institute of Medicinal and Aromatic Plants, (Council of Scientific and Industrial Research)
  Kukrail Picnic Spot Road,
  P O CIMAP,Lucknow - 226015

Source of Technology for extraction of Vincristine

* National Chemical Laboratory (NCL),
  Pune
SECTON VIII

RAW MATERIAL AVAILABILITY

Area of Commercial Cultivation in India- Around 3000 hectare

Cultivated mainly in Tamil Nadu, Karnataka and to a small extent in Gujarat and Madhya Pradesh

**Varieties**

Three Local types based on the colour of the flower
- Alba with white flowers
- Roseus with pink rose coloured flowers
- Ocillata with white flowers having rose-purple spot in the centre
SECTION IX

GLOBAL SCENARIO

International players including the following

* Eli Lilly, USA

<table>
<thead>
<tr>
<th>Product</th>
<th>Brand name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinblastine</td>
<td>Velban</td>
</tr>
<tr>
<td>Vindesine</td>
<td>Eldisine and Fildesin</td>
</tr>
</tbody>
</table>

* Glaxo Wellcome, Inc, USA

Vinorelbine is currently in Phase II clinical trials as a treatment for ovarian cancer. It will be marketed as Navelbine by Glaxo Wellcome, Inc., if the trials are successful and the FDA approves the drug. Thus far, Vinorelbine seems to have a wider range of antitumor activity than the other vinca alkaloids
SECTION X

DISCUSSIONS ON ECONOMIC CAPACITY,
PROJECT COST AND PROFITABILITY PROJECTIONS

Economic capacity 30 tonnes per annum of Periwinkle dried leaves

Project cost: Rs.25 lakhs

Assessment of project cost

1. Land

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs. in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Cost of land of 50 acre at Rs.25000 lakh per acre</td>
<td>12.50</td>
</tr>
</tbody>
</table>

Subtotal 12.50

2. Building

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs. in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Building of area 50 sq.m. at Rs.3200/sq.m.</td>
<td>1.60</td>
</tr>
</tbody>
</table>

Sub total 1.60

3. Cost of Plant & Machinery

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs. in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Miscellaneous machinery</td>
<td>3.50</td>
</tr>
<tr>
<td>3.2</td>
<td>Packaging machinery</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Total cost of plant and Machinery 6.50

4. Technical know-how fees Rs.1.00 lakhs
5. **Preliminary & Pre-operative expenses:**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs.in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1.</td>
<td>Preliminary expenses</td>
<td>0.20</td>
</tr>
<tr>
<td>6.2.</td>
<td><strong>Pre-operative expenses:</strong></td>
<td></td>
</tr>
<tr>
<td>6.2.1</td>
<td>Establishment</td>
<td>0.20</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Rent rates and taxes</td>
<td>0.20</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Travelling expenses</td>
<td>0.20</td>
</tr>
<tr>
<td>6.2.4</td>
<td>Interest and commitment charges on borrowings</td>
<td>0.60</td>
</tr>
<tr>
<td>6.2.5</td>
<td>Insurance during construction period</td>
<td>0.20</td>
</tr>
<tr>
<td>6.2.6</td>
<td>Other preoperative expenses and deposits</td>
<td>-</td>
</tr>
<tr>
<td>6.2.7</td>
<td>Interest on deferred payment</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1.60</strong></td>
</tr>
</tbody>
</table>

6. **Provision for contingency**
   Rs.0.56 lakhs

7. **Working capital margin**
   Rs.1.28 lakhs

8. **Total project cost**
   Rs.25 lakhs

9. **Means of finance (Rs. in lakhs)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoter’s contribution</td>
<td>10</td>
</tr>
<tr>
<td>Term loan from financing institutions</td>
<td>15</td>
</tr>
<tr>
<td>Total project cost</td>
<td>25</td>
</tr>
</tbody>
</table>
10. Financial statements

Cost of production

<table>
<thead>
<tr>
<th>A</th>
<th>Variable cost</th>
<th>Rs. in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw material and utilities</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td>Spares and maintenance</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Selling expenses</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td><strong>Total variable cost (A)</strong></td>
<td><strong>4.36</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>Fixed cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salaries and wages</td>
</tr>
<tr>
<td></td>
<td>Interest on term loan and working capital loan</td>
</tr>
<tr>
<td></td>
<td>Depreciation</td>
</tr>
<tr>
<td></td>
<td>Administrative expenses</td>
</tr>
<tr>
<td></td>
<td><strong>Total fixed cost (B)</strong></td>
</tr>
</tbody>
</table>

| C.    | **Total cost of production (A+B)**                 | **15.14**    |

| D.    | Selling price of Dried leaves per kg. (in Rupees)  | 65           |

| E.    | Annual sales turnover                              | 19.5         |

| F.    | Net profit before tax (E+C)                        | 4.36         |

| G.    | Breakeven point in %                               | 71           |
## SECTION XI

### SWOT ANALYSIS

<table>
<thead>
<tr>
<th>Strength</th>
<th>Ideal tropical conditions for plant growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakness</td>
<td>Lack of production of downstream product in large way in India</td>
</tr>
<tr>
<td>Opportunity</td>
<td>Exports</td>
</tr>
<tr>
<td>Threat</td>
<td>Lack of standardisation</td>
</tr>
</tbody>
</table>
SECTION XII

FACTORS INFLUENCING THE POSITION FOR A NEW INDUSTRY AND RECOMMENDATION

Periwinkle is extensively grown in India for the last several centuries and exported to developed countries. Most of the exports take place from Tuticorin port in Tamil Nadu.

While Periwinkle is exported as herb, the value addition does not take place substantially in the country.

With the introduction of the concept of organic cultivation, there is need to introduce better methods of organised and organic cultivation for Periwinkle in Tamil Nadu. This would further improve the export prospects for the product.