Course Code & Name: FLA-311 Medicinal and Aromatic Crops 3(2+1)

Topic- Production Technology of Periwinkle

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Botanical classification:

Common Name	**:**	**Periwinkle**
Hindi Name	**:**	**Sadabahar, Sadasuhagan**
Botanical Name	**:**	***Catharanthus roseus* L. Syn. *Vinca rosea* L.**
Family	**:**	**Apocynaceae**
Chromosome No.	**:**	**2n = 2x = 34**
Center of origin	**:**	**Madagascar**
Plant Parts used	**:**	**Leaves, stem and roots**

Introduction:

- An erect herb, much branched, annual or perennial herb, 30-90 cm. height, probably native to Malagasy, occasionally found wild but mostly naturalized up to an altitude of 1300m. and commonly grown in gardens throughout the country.
- Leaves oblongelliptic, acute, rounded apex, glossy, slightly foetid; flowers fragment, white to pinkish purple in terminal or axillary cymose clusters; follicle hairy, many seeded, 2-3 cm long; seeds oblong, minute, black.
- The plant is native of Malagasy and commonly grown in gardens throughout the world for bedding, borders and for mass effect. On commercial basis it is cultivated in Malagasy, Israel, India and United States.

Importance and Scope:

- **Periwinkle a foreign exchange earning medicinal crop. Global production of root alkaloids (ajmalicine) is to the tune of 3600 kg per year, whereas, that of leaf alkaloids (vinblastine and vincristine) is only a few kilograms.**
- **The market value of these alkaloids, however, is in the range of several hundred million US dollars.**
- **The global demand for leaves and roots is in excess of 1000 tons each year. Leaves are imported by the USA, while roots are imported by Germany, Italy, the Netherlands, UK and other countries. India is a regular exporter of leaves and roots.**

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- **The crop is commercially cultivated in the south Indian states, with a larger area in Tamil Nadu. Cultivation is reported in Assam, Gujarat and in Madhya Pradesh also.**
- **In the absence of authentic estimates, the cultivated area was estimated at 1000-3000 hectares. However, judging by the exports and local consumption, the area appears to be declining due to :**
  - **(a) Problems in marketing leaves and roots,**
  - **(b) Farmers switching over to more remunerative crops and,**
  - **(c) The reported commercial cultivation of periwinkle in other countries.**
- **The estimated area under cultivation is less than 500 hectares with a production level of approximately 500 tons of leaves and roots, of which more than 50% is exported annually.**

Medicinal Properties of Periwinkle:

- **Periwinkle produces more than 100 terpenoid indole or bisindole alkaloids. Most important among these are the dimeric leaf alkaloids; *Vinblastine* and *Vincristine* and the monomeric root alkaloid "*Ajmalicine*".**
- **The alkaloids *vindoline, catharanthine, cathenamine, strictosidine, seqpentine, secologanin* and *leurosine* have also been detected in these plants.**
- **The alkaloids are distributed in all parts of the plant in varying proportions : roots 0.7-2.6o/o, root bark 4.5-9.}, stem < 0.1-0.5%, leaves 0.3-7.5o/o, flowers < 0.1-0.8%, fruits < 0.1-0.4o/o, seeds upto 0.2%.**
- **The root contains 0.01-0.1% *ajmalicine*, while the leaves yield 0.001-0.002% *vinblastine* and 0.000002-0.005% *vincristine*.**
- **Factors such as genotypes, crop age, nipping tops or pruning, defloration, soil moisture regime, fertilizers application, PGRs, climatic conditions etc., influence the total alkaloid concentration in the leaves and**

Species and Cultivars:

- **Based on flower colour, chiefly three natural variants are recognized in India. They are:-**

  1. Pink colour flowered with stems of these plants are Purple coloured - *rosea* (contains more of alkaloids)

  2. White colour flowers (stems are green coloured) - *alba*

  3. White flowers (green stems) having rose-purple or red or pink or a dull brown spot in the center- *occellata*

White flower (*C. ocellata*)

- **More variants of these three genotypes exhibiting taxonomical variations have also been identified.**
- **In Maharashtra, all three genotypes produced identical leaf and root yields.**

➢ **In Bangalore and Ludhiana, rose-purple coloured diploids/tetraploids recorded greater leaf/root yields or alkaloid levels compared to white flowered genotypes.**

➢ **In contrast, in Hyderabad, the white flowered genotype gave higher leaf biomass and alkaloid yields over the rose-purple genotype.**

CIMAP, Lucknow developed two verities of periwinkle - Nirmal and Dhaval, which yields more alkaloids.

Agro-climatic requirements:

- Periwinkle is very hard, and can grow luxuriantly under a great variety of climatic and soil conditions except the highly alkaline or water logged soils.
- If the crop is cultivated exclusively for leaves, fertile black soils are best suited, but if grown for roots, light to medium textured soils, rich in humus are preferable.
- High salt content reduces leaf and root yields by more than 50.0%.
- Tropical periwinkle thrives well in tropical, and sub-tropical climates up to an altitude of 900 m (as an ornamental plant up to 1300 m) above MSL.
- Low winter temperature restricts growth and development.
- A well distributed rainfall of 700-1000 mm is ideal for raising it as a commercial rainfed crop.

Propagation by Seed:

- Commercial plantations are raised through seeds not older than one year. Freshly collected seeds showed 90-100% germination but 40-55% germination (var. *alba*).
- On prolonged storage, the seed viability decreases drastically. However, seeds stored in a desiccator over calcium chloride exhibited 49 % germination even after four years.
- Similarly, seeds collected from hydroponically grown plants and stored in paper bags at room temperature, retained high germinability for three years.
- Light, temperature, humidity and internal seed tissue pH influence germination of the seeds.
- Continuous light, temperatures lower than 25 ^{0}C, low relative humidity and high internal seed tissue pH decrease seed germination percentage.
- Soaking in water, gibberellic acid (2.88 mM), potassium nitrate (100 mM), Sulphuric acid (9N) and use of farm yard manure (F.Y.M.) and soil mixture as a medium of germination improved germination of seeds.

Land Preparation and Planting:

- The land is brought to a fine tilth through two to three ploughings, followed by discing and leveling.
- The crop is raised for roots, deep ploughing is recommended for good root growth.
- Weeds and stubble from the previous crop are removed. The field is made into plots of convenient size.
- Where irrigation facilities exist, bunding is done and irrigation channels are made.
- For transplanting the crop, a nursery is raised during the summer months using 0.5 to 1.0 kg seeds/ha.
- Nursery beds are prepared by mixing equal quantities of sand and leaf mould with garden soil.
- Seeds are sown in rows 10 to 15 cm apart at a depth of 1.5 to 2.0 cm and watered regularly.
- Ready for transplanting in the main field at 30 to 45 x 15 to 30 cm^2 spacing.
- Closer spacing produces thinner roots and wider spacing, thicker roots.

Irrigation:

- Periwinkle is drought tolerant, therefore, it can be successfully grown as a rainfed crop in soils with good water holding capacity and in areas with well distributed rainfall.
- In South Indian states, which receive both the South-West and the North-East monsoon rains, it is commonly grown as a rainfed crop.
- In areas with irrigation facilities, weekly irrigations during the non-rainy periods.
- Usually 5 to 6 irrigation at an interval of 10 to 12 days is good enough after the rainy season.
- In the case of rainfed crops, 5 to 6 irrigations are sufficient for obtaining optimum yield.

Manures and Fertilizers:

- The crop responds well to manuring with 80 kg nitrogen/ha in sandy soils; with detopping of plants at 2.0 cm height, up to 120 kg N/ha can be applied profitably.
- Split application of Nitrogen gives better results. Phosphorous and potash at 40 kg/ha or green manuring and application of micronutrients are recommended.

Intercultural and Pruning:

- The crop is given 2-3 intercultures at 20 or 30 days interval.
- Mulching with rice straw or cut grass is beneficial. At early flowering stage top 2 to 3 cm portion of the plant are removed to promote vegetative growth and alkaloid content.
- The plants are drought resistant and do not require much water. 5 to 6 light irrigation given for the

Weeding:

- The crop is manually weeded 30, 50 and 120 days after sowing or transplanting.
- Fluchloralin at 0.75 kg a.i./ha as pre-plant application or Alachlor at 1.0 kg ai/ha as pre-emergence of weeds, provide ample protection to the crop from weed competition.
- Mulching with organic mulches minimize weed growth and conserves soil moisture.
- Intercropping with short duration crops in paired or triple rows controls weed growth to a certain extent and improves returns.




Plant protection:

- Periwinkle crop is relatively free from damage due to pests and diseases. Termites and soil-borne insect sometimes infest the growing seedlings.
- Adding BHC (0.5%) to the soil before planting protects the seedlings.
- A little-leaf disease due to Mycoplasma like organisms was observed. Spraying tetracycline hydrochloride (100ppm) is beneficial.
- Periodical spraying of Diethane Z-78 controls Die-back, bud rot and other fungal infections.

Harvesting and Yield:

- About 150 days after sowing or translating, the periwinkle roots penetrate the soil up to 15-25 cm and then develop lateral rootlets.
- The crop is ready for harvest of root after one year. During this period two leaf striping are obtained and third when the whole plant is harvested.
- For harvesting the roots plants are 7cm above the ground level, the field irrigated and ploughed, and the roots collected, and washed.
- Roots are cut into 15-20cm length and dried. On drying the root and stem loses 70 to 80% of their weight. The produce can be stored under normal storage conditions for one or two years.
- The total yield of plant material consisting of foliage, basal, stem and roots from an irrigated crop in peninsular India is 2.2 tones/ha. and in North Indian plains 1.8 tones/ha. Rain fed crop yields 1.0 to 1.5


THANK YOU