

## **Plant Cultivation Technique Development Paris polyphylla Sm.**

### **Introduction**

We predict that although Paris polyphylla is well distributed in Himalayan region, its local population in Api-Nampa Conservation Area (ANCA) is declining continuously at an alarming rate by human interference such as unsustainable harvesting (over- and premature- collection), unscientific use, illegal/cross-border trade of rhizomes, habitat destruction, overgrazing, forest-fire, and soil-erosion. It was found during stakeholder consultation that the existing threat to the population of Paris polyphylla is that peoples are heavily dependent on nature for the plant and there is no cultivation technology developed yet. The fact that Paris has very low germination percentage (about 10%, on sand:soil:compost combination). People tend to grow every plants in the haphazard way and not knowing whether the plants are acidic or alkaline lovers, how to break the dormancy, what is the best soil:sand composition, the value of soil temperature and value behind it.

Therefore, it was essential to develop the development protocol on the plant and accordingly transfer the technology to the farmers by trainings and demonstrations.

Germination strength of any seeds is related to collection, harvesting season, drying methods and storing methods of seeds. There seems to have little knowledge or better say, ignorance in these field. For the cultivation technique development, one must experiment and answer, the seed behaviour towards the season.

### **Objective**

1. To find out the climatic and edaphic barriers for the optimum growth of the plant.
2. To document the physical, physiological, chemical and morphological parameters about the plant.
3. To find out the best soil:sand composition, dormancy breakage application, optimum soil temperature and to know whether light has any extra role on the best germination of seeds.
4. To find out the low cost drying and storing methods of seeds.

### **Material and Method:**

- For the experimental work, Paris polyphylla Sm. is selected.
- For checking the climatic barrier one climatic factor is taken into consideration- Temperature.
- Experimental plants are grown in different temperature. For this, plants are grown inside polyhouse (Avg. temp 27<sup>0</sup>C ) and outside field ( Avg. temp 22<sup>0</sup>C)
- For checking the edaphic factor one condition is taken- Soil PH .
- Difference in soil PH is maintained. To make soil acidic, Sequestrene is applied, to make soil alkaline, Calcium carbonate is applied. Neutral soil is maintained by giving the required chemical (Calcium carbonate or Sequestrene) in appropriate quantity.

## Minimal Descriptors for characterisation and preliminary evaluation

### A. Evaluation of Site data

1. Name of place: Pasti, Darchula
2. Name of district: Darchula
3. Name of country: Nepal
4. Name of researchers: Mohan d Joshi and Kuber Bhatta
5. Altitude: 2370m
6. Evaluator's name/add: Mohan dev joshi, mojspost@gmail.com
7. Sowing date or planting date: 2070-08-15
  - 9.1 First germination app: 2070-12-02
  - 9.2 First appearance of three leaves: 2070-12-14
  - 9.3 Germination percentage: varied (shown in germination test)
8. Evaluation environment: Poly house and Field
9. Seed germination: varied (shown in germination test)
10. Field spacing:
  - 14.1 Distance between plants within a row: 10 cm
  - 14.2 Distance between rows: 30 cm
11. Soil texture: Sandy loam and Gravely
12. Soil temperature: 21<sup>0</sup>C
13. Soil pH: varied (shown in germination test)
14. Fertilizers: Compost fertilizer, 800 kg per ropani
15. Plant protection: Nuvan, 2gm per litre
  - Malathion, 2 gm per litre
  - Delfin, 4gm per litre
16. Site note: seeds are planted in four columns. Each column contain about 60 plants in 10 rows.

First column is given acidic soil treatment, second one is given alkaline soil treatment, and the third one is given its natural soil, which is slightly alkaline. Sequestrene is given in order to make soil acidic and calcium carbonate is given in order to make soil alkaline. In the adjoining west column, valeriana jatamansii is planted, while in the adjoining east column, cutting of taxus baccata are placed.

Breeding history: open pollination

Passport information on site of collection: seeds are collected from pasti, Darchula, altitude, 2800m. collected on the month of October. The plant was found interspersed with mainly *Iris decora*, on the north facing slope, moist place under the shades of *Abies spectabilis*.

#### Germination test:

##### 1. Soil :sand composition

For the germination condition. The experiment methodology test, different soil, sand composition is prepared and seeds are shown in both the plot under same and primary results are given below:

Experimental Plot	Seed sowing date	Dimension	Soil,sand composition	Germplasm	Seed wt.
A.	2070/08/15	2.5m*1.5m	5:2	Darchula	40gm
B.	2070/08/15	1.5m*1.0m	2:5	Darchula	40 gm

Result: About 60% germination rate in plot A, by 070/01/20.

About 10% germination rate in plot B, by 070/01/20.

##### 2. Seed dormancy breakage

For the dormancy breakage experiment, seeds are given different dormancy breakage treatment. Seeds are dipped in cold water (50°C) and in mild hot water (16°C). the experiment and results are given below:

Experimental Box	Seed sowing date	Treatment	Soil,sand composition	Germplasm	Seed wt.
A+	2070/08/28	(cold water) 16°C	2:1	Darchula	5 gm
B+	2070/08/28	(Luke warm water) 42°C	2:1	Darchula	5 gm

Result: About 60% germination rate in plot A+ by 070/01/28.

0% germination rate in plot B+ by 070/01/28.

##### 3. Light influence germination test

Seeds are experimented in natural light inside polyhouse and in added fluorescent light inside polyhouse to see if there is any hold of light on germination of plant. The experiment and results are given below:

Experimental Box	Seed sowing date	Treatment	Soil,sand composition	Germplasm	Seed wt.
C+	2070/09/12	Alternate light 6hr day,3hr night	2:1	Darchula	5 gm
D+	2070/09/12	No treatment	2:1	Darchula	5 gm

Result: About 60% germination rate in plot C+by 070/01/28. (soil temp. 23<sup>0</sup>C)

About 50% germination rate in plot D+by 070/01/28 (soil temp. 21<sup>0</sup>C)

#### 4. Soil temperature

Seeds are shown in seed box, polybag and in field plot, both inside and outside polyhouse. Soil temperature in every conditions were recorded. The experiment and results are given below:

Experimental plot	Seed sowing date	Soil temp.	Room temp.	Germplasm	Seed wt.
A+ (outside polyhouse)	2070/09/12	17 <sup>0</sup> C	26 <sup>0</sup> C	Darchula	5 gm
B+ (inside polyhouse)	2070/09/12	23 <sup>0</sup> C	33 <sup>0</sup> C	Darchula	5 gm

Results: 0% germination in plot A+ by 070/01/28.

80% germination in plot B+ by 070/01/28.

#### **Seed collection, drying and storing practices (Field work)**

The tubers are usually collected in the month of Ashwin-Kartik (September –November). It is considered that September is best month to pick the tubers, but it's practically impossible in the local condition, for the month is too cold and the field is hard to dig. Seeds are collected prior to root collection. Seeds collected in the month of June-July are, when dried and stored, are only 20% viable in comparison to seeds collected in August-September, which are 80% viable.

Seeds ought to dry out for better germination result and for sustainable storing. Usually seeds are dried out in open sun for 3-4 days before they are stored, but in this practice there is a danger of total damage to seeds.

Seeds are dried out with low cost methods. They put the seeds over dried charcoal in a plastic box and cover the whole box with plastic.. The charcoal, seed composition must not be more than 3:1.

## **Results and findings:**

1. The seeds of *Paris polyphylla* is best germinated and the plant can be best cultivated in alkaline soil.
2. For the seed germination, a warm temperature (room temp 33°C and soil temp. 23°C) is good, but for the planting, outer environment is good.
3. To save the time and energy, sow the seeds in the month of Falgun-Chaitra (March-April). This is the best time to place the seeds on soil
4. Keep the distance between plants within a row 10 cm and distance between row 30 cm.
5. For the first year plant, water twice a week and afterwards occasionally. 18- 28 °C temperature range and 11 hour sunshine period is considered best for fruiting.
6. For better seed germination, recommended soil sand composition is 5:2.
7. It is better to treat the seeds in cold water for 1-3 hours prior to seed sowing.
8. Around 23°C soil temperature is best for better seed germination.
9. Collect the seeds in August-September, for more viability.
10. Apply the above mentioned low cost methods of seed drying.

## **Training programs:**

Following topics are covered during 5-day interactive training programs.

### **Potential plants and plants products**

1. Species identification: key features and identification techniques
2. Opportunities and constraints: role of concerned organisations
3. Plants and poverty reduction
4. Herbarium: preparation, importance and techniques
5. Documentation of floral richness of the area
6. Identification of potential plants
7. Potential plants products and sustainable livelihood
8. Documentation of traditional knowledge (TK)
9. Revitalisation of TK
10. Scientific approach and input into TK
11. Adoption of best practices and success stories

### **Sustainable collection, harvesting and storing practices**

1. Protocol on good agricultural cultivation practices
2. Protocol on good collection, harvesting and storing practices
3. MAPs and NTFPs: introduction, importance and issues
4. Sustainable collection: why, when and how?
5. Sustainable harvesting: why, when and how?
6. Sustainable storage: why, when and how?
7. NTFPs collection and harvesting: time table
8. Things to consider: collection, harvesting and storage

9. Collection practices and tools
10. Harvesting practices and techniques upliftment
11. Storage practices and techniques
12. Packaging and grading

#### Basic techniques of plant processing and value addition

1. Plant processing: why and how?
2. Techniques of plant processing and importance
3. Prerequisite of processing plant
4. Processing procedure: what to look in a plant?
5. Processing procedure: what to look in a material?
6. Processing procedure: time management and leak holes
7. Post processing techniques
8. Value addition procedures
9. Identification of potential plants

#### Cultivation technology of selected plants

1. Sexual and asexual methods of plants propagation
2. Seeds: introduction, types and features
3. Collection practices of seeds: techniques and considerations
4. Common seed test: why and how?
5. Seed storage: short term and long term practices
6. Plants propagation: cutting, budding, grafting, layering, division
7. Seed showing: pre-considerations, when and how?
8. Field test layout methods
9. Know your soil: features, alkaline and acidic soils
10. Soil: preparation and manipulation
11. Fertilisers: types, importance and soil friends
12. Plant care: watering, ploughing, diseases and other features
13. Cultivation technology of selected plants

#### Nursery establishment and plant production

1. Site features: location, elevation and geography
2. Nursery: site selection, introduction
3. Nursery to suit your needs
4. Components of nursery
5. Plant production: how much do you want?
6. Nursery soil and management
7. Nursery: seed bed and cutting bed
8. Plants: pre and post care

#### Market management and green economy

1. Go green: organic production and market

2. Market management: production estimate and key players
3. Market management: green economy
4. Market management: intervention
5. Market strategy and business plan
6. Strategy for promoting herbal products
7. Identification of new NTFPs markets
8. Market strategy and value addition

## Photographs



Left: A local women collecting Paris tubers. Right: Field practice training.



Left: Interaction and stakeholder consultation. Right: Interaction with farmers.



Left: Myself with team. Right: Training program.