# 1. Popular Black Pepper Varieties in Vietnam

* **Vĩnh Linh Variety**
  + Strong growth, widely spreading branches, medium-length flower spikes, and densely packed fruits.
  + High yield, with spike length averaging **8.9 cm**, bulk density **584.9 g/l**, and a dry yield per post of **4.25 kg**.
  + Grown mainly in **Vietnam’s Central and Southern regions**.
* **Lada Belangtoeng Variety**
  + Imported from Indonesia in **1947**, known for **strong growth** and **resistance to root rot**.
  + Slow flowering under **low-intensity farming**, resulting in **lower and unstable yields**.
* **Sẻ Black Pepper Varieties**
  + Early flowering, **high and stable yields** in the first few years.
  + **Susceptible to quick wilt disease**.
  + Common sub-varieties include **Sẻ Lộc Ninh, Sẻ Đất Đỏ Bà Rịa, and Sẻ Mỡ Đắk Lắk**.
* **Indian Black Pepper**
  + Originating from **India**, with **strong growth**, **medium-sized leaves with wavy edges**, **early fruiting**, and **large spikes**.
* **Trâu Variety**
  + A **local variety** characterized by **large, dark green leaves**.
  + Highly **resistant to quick wilt** but has **low and unstable yields**.
* **Phú Quốc Variety**
  + **Originated from Cambodia**, well-known for **high-quality peppercorns** in the **1930s–1940s**.
  + **Highly susceptible to root diseases**, limiting large-scale cultivation.
* **Best Regions in Vietnam for Black Pepper**
  + **Central Highlands**: Đắk Lắk, Gia Lai, Đắk Nông
  + **Southeast Region**: Bình Phước, Bà Rịa-Vũng Tàu
  + **Southwest Region**: Phú Quốc

# 2. Caring Techniques for Black Pepper (*Piper nigrum*) at Each Development Stage in Vietnam

General Care

* **Trellising:** Secure vines **loosely** to avoid restriction.
* **Pruning:**
  + **First pruning** at **10–12 months** when vines reach **80–100 cm**.
  + **Second pruning** when vines have **3–5 lateral branches**.
* Irrigation & Drainage
  + **Watering Schedule:**
    - **Dry season:** 7–15 days per cycle, depending on soil type.
    - **Flowering season:** Requires a **30–45-day dry period** before watering.
  + **Drainage system:**
    - **Shallow ditches (30 cm deep)** between rows.
    - **Main drainage channels (60 cm deep, 60 cm wide)** at plot edges.

#### **2.1. Nursery Stage**

* **Seed Selection**
  + Select healthy, disease-free cuttings from high-yielding mother vines (preferably 2-3 nodes long).
  + Disinfect cuttings by soaking them in a fungicide solution (e.g., Bordeaux mixture 1%) before planting.
* **Propagation & Seedling Care**
  + Plant cuttings in polybags filled with a mixture of topsoil, compost, and sand (ratio 2:1:1).
  + Provide 50-70% shade and ensure adequate moisture for root development.
  + Apply a light dose of **NPK 16-16-8** fertilizer every 3-4 weeks to promote growth.
  + Monitor for damping-off and root rot; use copper-based fungicides if needed.
* **Hardening & Transplant Preparation**
  + Gradually expose seedlings to more sunlight (reducing shade to 30-40%) before transplanting.
  + Ensure cuttings have well-developed roots and at least 3-4 healthy leaves before field planting.

#### **2.2. Planting & Early Growth Stage**

* **Site Selection & Preparation**
  + Choose well-drained, slightly acidic soil (pH 5.5-6.5) with good organic content.
  + Avoid low-lying areas prone to waterlogging to prevent root diseases.
  + Establish **support structures** (live or dead poles) before planting vines.
* **Planting Process**
  + Dig planting holes (40cm x 40cm x 50cm) and mix topsoil with organic compost.
  + Space plants **2.5m x 2.5m** or **3m x 3m** depending on vine management.
  + Water immediately after planting and mulch around the base to conserve moisture.
* **Initial Training & Support**
  + Guide vines onto poles using soft ties to avoid damage.
  + Remove weak or excessive shoots to encourage strong vertical growth.
* **Fertilization & Watering**
  + Apply **NPK 20-10-10** or composted manure every 2-3 months.
  + Maintain regular watering, especially in the dry season (2-3 times per week).
* **Weed & Disease Control**
  + Keep the base weed-free to reduce competition for nutrients.
  + Monitor for root rot, fusarium wilt, and downy mildew; apply fungicides if needed.

#### **2.3. Vegetative Growth & Vine Development**

* **Canopy & Vine Management**
  + Train vines to grow evenly around the support structure.
  + Prune excess lateral branches to maintain an open, well-ventilated canopy.
* **Nutrient Application**
  + Increase nitrogen (N) application to promote vigorous growth.
  + Supplement with micronutrients (zinc, boron, magnesium) to strengthen vines.
* **Irrigation & Mulching**
  + Maintain moisture through irrigation during dry periods.
  + Apply organic mulch (dry leaves, coffee husks) to retain soil moisture and regulate temperature.
* **Pest & Disease Prevention**
  + Monitor for mealybugs, thrips, and stem borers; use biological control when possible.
  + Prevent fungal infections (e.g., Phytophthora root rot) by ensuring good drainage and applying fungicides when necessary.

#### **2.4. Flowering & Fruit Setting**

* **Nutrient Management**
  + Switch to **NPK 10-10-20** or **12-12-17** to support flowering and fruit development.
  + Apply foliar sprays with boron and calcium to improve fruit set and quality.
* **Pollination & Stress Management**
  + Reduce nitrogen application to prevent excessive vegetative growth.
  + Maintain stable soil moisture to prevent flower drop.
* **Pruning & Canopy Maintenance**
  + Remove unwanted suckers and excessive growth to improve light penetration.
  + Keep vines well-ventilated to reduce fungal disease risks.
* **Pest & Disease Control**
  + Monitor for spike shedding caused by fungal infections.
  + Control thrips, aphids, and mites using organic insecticides when necessary.

#### **2.5. Berry Development & Maturation**

* **Watering & Soil Management**
  + Provide consistent moisture during fruit development.
  + Avoid excessive watering close to harvest to prevent fungal diseases.
* **Nutrient Application**
  + Apply potassium-rich fertilizers (e.g., **NPK 12-12-20** or **15-10-25**) to improve fruit size and quality.
  + Use well-decomposed manure or compost to enhance soil health.
* **Disease & Pest Control**
  + Continue monitoring for root rot and spike drop disease.
  + Protect fruits from berry borers and fungal infections using eco-friendly sprays.

#### **2.6. Harvesting & Post-Harvest Care**

* **Harvesting Techniques**
  + Harvest when berries turn from green to yellowish-red for maximum quality.
  + Pick only mature spikes to ensure uniform drying and processing.
* **Post-Harvest Processing**
  + Dry pepper under the sun or in solar dryers until moisture content reaches **10-12%**.
  + Turn drying berries frequently to prevent mold growth.
  + Store dried pepper in airtight bags in a cool, dry place to maintain quality.