

Cultivation of Ashwagandha (*Withania Somnifera*) in Madhya Pradesh

Er Medha Vyas

Department of Horticulture and Food Processing MP, India

DOI: <https://dx.doi.org/10.51244/IJRSI.2025.1210000019>

Received: 06 October 2025; Accepted: 14 October 2025; Published: 28 October 2025

ABSTRACT

Ashwagandha (*Withania somnifera*) is a key component of Ayurvedic medicine and is seeing rising demand in India and internationally. This paper reviews agronomic practices, agro-climatic suitability, crop management, economic viability, and post-harvest handling in Madhya Pradesh. Drawing on local agro-ecological conditions, it offers practical recommendations for farmers and policymakers to improve yield, quality, and profitability while supporting sustainable agriculture.

INTRODUCTION

Ashwagandha, commonly known as Indian ginseng or winter cherry, is a drought-tolerant medicinal crop valued for its roots and phytochemical constituents (withanolides). Madhya Pradesh, with large tracts of semi-arid and sub-humid zones, presents suitable conditions for commercial cultivation. This paper synthesizes cultivation techniques adapted to MP's diverse agro-climatic zones and examines constraints and opportunities for scale-up.

Agro-climatic Suitability in Madhya Pradesh

- **Climate:** Ashwagandha thrives in semi-arid to arid climates. MP's central and western districts (e.g., Indore, Ujjain, Dewas, Dhar, Sehore, Khandwa) with hot summers and moderate rainfall (400–900 mm) are well-suited for the crop.
- **Temperature:** Optimal growth occurs between 20–35°C; seedling establishment tolerates higher temperatures but frost can damage plants.
- **Soil:** Prefers well-drained sandy loam to loamy soils with good aeration. Heavy clay and waterlogged soils are unsuitable. Slightly alkaline to neutral pH is acceptable.

Varieties and Seed Material

Farmers should prioritize certified and locally adapted varieties. High-quality seed with verified germination rates is essential. State agricultural universities, such as RANI Durgavati and JNKVV Jabalpur, offer high-yield or high-withanolide cultivars through ongoing breeding programs.

Propagation and Nursery Practices

- **Ashwagandha is mainly propagated by seed. To address irregular germination,** seed priming and treatment with fungicides or bio-priming using *Trichoderma* are recommended to improve establishment.
- **Sowing seeds** in raised nursery beds and transplanting after 35–50 days enhances plant uniformity. Direct sowing is also an option, depending on rainfall and farmer preference.

Sowing Time and Methods

- **Sowing window:** In Madhya Pradesh, the best sowing period is post-monsoon to early winter (October–November). Some farmers also plant during the late monsoon, depending on the availability of moisture.
- **Depth and spacing:** Sow seeds at 0.5–1.0 cm depth. Recommended spacing ranges from 30–45 cm between rows and 10–20 cm within rows (transplanting densities vary depending on target root size and mechanization levels).

Nutrient and Soil Management

- **Organic amendment:** Incorporation of farmyard manure (FYM) or compost (5–15 t/ha) improves soil structure and root quality—important for medicinal value.
- **Fertilizer recommendations:** Balanced use of NPK is advised; example rates are 40–60 kg N, 20–40 kg P₂O₅, and 20–40 kg K₂O per hectare, adjusted per soil test. Excess nitrogen stimulates vegetative growth at the expense of root development.

Irrigation and Water Management

Ashwagandha is moderately drought-tolerant but requires timely moisture during establishment and tuberization. Drip irrigation is recommended for water-limited areas as it conserves water and promotes uniform root development. Avoid waterlogging.

Weed, Pest, and Disease Management

- **Weeds:** Early-stage manual or mechanical weeding is essential. Mulching and inter-row cultivation reduce weed pressure.
- **Pests and diseases:** Incidence is generally low but includes root rot (*Rhizoctonia*), damping-off, and foliar diseases. Cultural practices (crop rotation, seed treatment), biological controls, and targeted fungicidal measures maintain crop health.

Harvesting and Post-Harvest Processing

- **Harvest timing:** Typically 150–180 days after sowing when plants show maximum root biomass and reduced vegetative growth. Harvesting at the right physiological stage is crucial for optimum withanolide concentration.
- **Post-harvest:** Roots should be cleaned, sliced if required, and sun- or shade-dried to a moisture content <10% for stable storage. Proper storage in dry, ventilated conditions prevents quality loss.

Yield and Quality Considerations

Yield varies with variety, management, and environment. Typical dry root yields range from 0.8 to 2.0 t/ha under conventional practices; well-managed farms can achieve higher yields. Quality assessment (withanolide content) determines market value—post-harvest handling and drying protocols significantly affect phytochemical retention.

Yield and quality considerations for ashwagandha involve optimizing agronomic practices and harvesting to maximize the root's dry weight and its concentration of active compounds, particularly withanolides. Important factors include selecting the right variety, managing soil fertility, and determining the optimal harvest time.

Yield considerations: Cultivation factors

- **Variety selection:** High-yielding and high-potency varieties, such as CIMAP-Pratap, NMITLI-101, and Poshita, offer better returns compared to local varieties like Nagori.
- **Spacing and density:** Research has shown that denser spacing, such as 15 cm x 10 cm, can significantly increase dry root yield per hectare by producing a higher number of plants, though wider spacing may result in thicker roots.
- **Fertility management:**
 - While ashwagandha can grow on low-fertility soil, integrated nutrient management substantially boosts yield.
 - Combining farmyard manure (FYM) with inorganic nitrogen and phosphorus has shown excellent results.
 - Bio-stimulants derived from sources like vermicompost and certain weed leaf extracts can also increase dry root yield and biomass.
- **Irrigation and climate:**
 - Ashwagandha is drought-tolerant and thrives in dry, semi-tropical climates with 500–800 mm of annual rainfall.
 - Excessive rainfall and waterlogged conditions are detrimental and can cause root rot, while supplemental irrigation during the dry season can increase yields.
 - Winter temperatures can improve both root yield and quality.
- **Harvest timing:** The crop is ready for harvest in 150–180 days, typically from January to March, when the leaves dry and the berries turn yellow-red. Harvesting at peak maturity maximizes root biomass.

Expected yield

- Dry root yield averages between 400 and 1,200 kg per hectare, but can reach as high as 1,500–1,700 kg/ha with improved varieties and intensive management.
- Seed yield ranges from 50 to 500 kg per hectare, depending on the variety and conditions.

Quality consideration: Bioactive compound content

- **Withanolides:** The primary therapeutic compounds, withanolides, are concentrated in the roots. Standardized extracts are valued for their specific withanolide content, often between 1.5% and 5%.
- **Harvest time impact:** Research shows that harvesting the roots at maturity maximizes the concentration of withanolides, total phenolics, and total flavonoids.
- **Nutrition impact:** Higher nitrogen levels, along with phosphorus and farmyard manure, can increase total withanolide content in the roots.
- **Root size:** Thicker roots generally contain higher concentrations of withanolides and command higher market prices. Roots are graded based on length, diameter, and interior color.

Post-harvest handling and storage

- **Processing:** After uprooting, the roots should be washed, separated from aerial parts, and cut into smaller pieces (7–10 cm) to aid drying.
- **Drying:** Proper drying is critical to prevent mold and retain bioactive compounds.
 - Sun drying is common, but controlled hot air drying (e.g., 50°C for 12 hours) can yield higher withanolide concentrations.
 - The final moisture content should be 6% or lower.
- **Grading:** Dried roots are graded based on thickness, length, and brittleness, with thicker, whiter, and smoother roots fetching premium prices.
- **Storage:** Dried, graded roots should be stored in cool, dry, and ventilated conditions, preferably in cloth or jute bags, to prevent moisture retention and fungal contamination.

Safety and standardization

- **Contaminants:** Final products must meet strict regulatory standards for contaminants, which can accumulate during growth and processing. These include:
 - **Microbial contamination:** Pathogens like *E. coli* and *Salmonella* should be absent.
 - **Heavy metals:** Limits are in place for heavy metals like lead, arsenic, cadmium, and mercury.
 - **Pesticide residues:** Ashwagandha grown organically or with minimal pesticides has a lower contamination risk.
 - **Aflatoxins:** Fungal mycotoxins like aflatoxins are a major concern and must be below permissible limits.
- **Quality control:** Reputable products should be third-party tested and standardized to a specific withanolide content to ensure potency, purity, and safety.
- The enhancement of root yield and quality of ashwagandha.

Hand-weeding at a 30-day interval helps to control the weeds effectively. Total two weedings. 2nd weeding after 2 months.

Economics and Market Opportunities

Ashwagandha cultivation offers attractive returns due to rising demand in the nutraceutical and herbal industries. Costs are moderate—major expenses include seed, land preparation, manpower for weeding/harvest, and post-harvest processing. Certification (organic/GMP-compliant processing) can fetch premium prices but requires adherence to standards.

Sustainable Practices and Innovations

- **Organic cultivation:** Enhances marketability and soil health.
- **Integrated nutrient management (INM):** Combines organic and inorganic inputs to balance yield and quality.
- **Drip irrigation and mulching:** Improve water use efficiency.

- **Value addition:** Local small-scale drying, powdering, and packaging units increase farmer margins.

Policy and Extension Recommendations for Madhya Pradesh

1. Promote certified seed distribution and local varietal trials through KVKs and state universities.
2. Train farmers on quality-focused agronomy (harvest timing, drying).
3. Facilitate aggregation and processing units (cooperative or private-public partnerships) to enable value addition and traceability.
4. Encourage organic certification schemes for interested farmer groups to access premium markets.

CONCLUSION

Madhya Pradesh possesses favorable agro-climatic conditions for profitable and sustainable cultivation of ashwagandha. With appropriate variety selection, soil and water management, and post-harvest practices, farmers can achieve good yields and high-quality roots suitable for industrial processing. Policy support, farmer training, and investments in processing infrastructure will accelerate adoption and increase returns for growers.

Suggested Further Research

- Comparative varietal trials across MP agro-ecologies for yield and withanolide content.
- Long-term impacts of organic vs. conventional nutrient regimes on root quality.
- Cost-benefit analysis of drip-irrigation and value-addition models for smallholder groups.