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Commercial Cultivation of Medicinal Mushrooms

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Once a niche activity for herbalists, medicinal-mushroom farming is now a fast-growing agribusiness driven by demand for immunity boosters, functional foods, nutraceuticals and cosmeceuticals. Global sales of reishi, shiitake, cordyceps and other therapeutic fungi exceeded USD 4 billion in 2024 and are forecast to double by 2030. Unlike button-mushroom production, medicinal species fetch higher margins but require tighter climate control, careful strain selection and strict contamination management. The following primer summarises the species, substrates, costs and market outlook for Indian entrepreneurs planning a commercial unit.

Table 1: Engineering Perspectives in Medicinal Mushroom Cultivation

Engineering Domain	Application/Role	Key Parameters / Technologies	Remarks
Structural Engineering	Design of cultivation rooms and racks	Load-bearing structures, insulated panels, modular shelves	Must ensure hygiene and temperature retention
Environmental Control Engineering	Maintain optimal temperature, humidity, CO ₂ levels	HVAC systems, humidifiers, exhaust fans, CO ₂ sensors	Essential for different mushroom species
Electrical & Automation	Lighting control, incubation timing, contamination alerts	Programmable timers, PLCs, IoT sensors, LED lighting	Reduces labor, increases accuracy
Thermal Engineering	Sterilization of substrates and equipment	Steam boilers, autoclaves, heat exchangers	Ensures aseptic conditions
Material Handling & Process Engineering	Substrate mixing, filling, harvesting, drying	Conveyor belts, vacuum dryers, tray dryers, ergonomic trolleys	Ensures scalability and safety
Energy Engineering	Reduce power usage in temperature/humidity control systems	Solar panels, insulation materials, variable frequency drives (VFDs)	Minimizes operational cost
Waste Management Engineering	Handling spent substrate and contaminated waste	Composting systems, biogas units, filtration systems	Supports sustainability goals
Instrumentation & Control	Real-time monitoring and feedback systems	Thermocouples, hygrometers, air quality sensors, SCADA systems	Enables precision farming in mushroom production

1. Market momentum and money-spinners

Reishi (*Ganoderma lucidum*) leads the pack, accounting for more than USD 200 million in 2024 thanks to its triterpenoids and polysaccharides. Shiitake and maitake follow, while cordyceps commands premium prices in capsule and powder form.

2. Choosing the right species for Indian farms

Species differ in climate needs, incubation length and market channel. Table 2 maps the most popular candidates to their preferred temperature range and typical yield.

Table 2: Cultivation profile of key medicinal mushrooms

Species	Optimum temp (°C)	Crop cycle (days)	Biological efficiency* (%)	Typical Indian markets
Reishi	24 – 28	90 – 120	80	Extractors, pharma
Cordyceps (<i>C. militaris</i>)	18 – 22	55 – 65	100 – 120	Capsule makers
Shiitake	22 – 25	45 – 60	75 – 85	Gourmet food, pharma
Lion's mane (<i>Hericium</i>)	20 – 24	40 – 50	90	Cognitive-health brands
Turkey tail	21 – 25	60 – 70	70	Immune-boost supplements

Biological efficiency = kg fresh mushrooms / kg dry substrate × 100.

3. Substrate strategy and yield optimisation

Success hinges on substrate quality, supplementation and sterilisation. Sawdust-based blocks dominate for wood-loving species; nutrified grains excel for cordyceps.

Table 3: Common substrates and average yields

Substrate recipe	Suitable species	Sterilisation method	Avg. yield (kg block ⁻¹)
Hardwood sawdust + 20 % wheat bran	Reishi, shiitake, lion's mane	Autoclave 121 °C, 60 min	0.8 – 1.0
Paddy straw pellets + 10 % rice bran	Turkey tail, maitake	Steam-pasteurise 90 °C, 4 h	0.6 – 0.8
Sorghum grain + 2 % glucose	Cordyceps	Autoclave 121 °C, 45 min	0.35 – 0.45 (dry)
Spent brewery grains + 5 % gypsum	Oyster-style medicinals	Pasteurise 72 °C, 8 h	1.2 – 1.5

4. Economics: a sample 100 m² indoor unit (Cordyceps focus)

Table 4: Projected first-year cost and return (₹ lakh)

Item	Cost	Notes
Poly-insulated grow room (100 m ²)	9.0	HVAC, HEPA filters
LED rack system & timers	3.5	5-tier, 2000 jars
Autoclave & lab setup	4.0	100 L high-pressure
Spawn & mother culture	0.8	Certified strain
Substrate, jars, utilities	2.7	Four cycles /yr
Total fixed + operating	20.0	
Annual yield (@ 400 g dry kg ⁻¹)	800 kg	Four 50-day cycles
Gross revenue (@ ₹5500 kg ⁻¹)	44.0	Bulk extract grade
Net profit (after 25 % contingencies)	≈ 12.0	Payback ≈ 18 months

Values are illustrative averages for South India in 2025.

5. Quality assurance & risk management

Contamination by *Trichoderma*, excess CO₂ and mycotoxin residues are the top threats. Preventive sanitation and rapid lab diagnostics are non-negotiable.

Table 5: Major contaminants and control measures

Problem organism / issue	Early signs	Control action
<i>Trichoderma</i> spp.	Green patches on substrate	Increase sterilisation time; apply 2 % bleach wipe
Bacterial blotch (<i>P. tolaasii</i>)	Slimy brown lesions	Lower humidity < 90 %; improve air circulation
Lipid-rich mites	Fine webbing; yield drop	Heat-treat empty room 60 °C, 2 h
Aflatoxin risk (poor grains)	Musty odour	Source tested grains; reject > 14 % moisture

Conclusion

Medicinal mushrooms marry wellness trends with high-value farming. With modest space, rigorous hygiene and market-oriented species, Indian growers can net profits two-to-three times higher than culinary mushrooms. The keys are (1) strain-substrate match, (2) climate automation, (3) contamination vigilance and (4) diversified sales—fresh, dried, powdered and extracted. As consumers pivot toward natural therapeutics, the spore of opportunity is ripe for cultivation.

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