

induce antler-like or other atypical fruiting structures and are accompanied by changes in metabolite profiles and increased accumulation of phenolics, polysaccharides, triterpenoids, and steroids; however, they may also inhibit normal pileus formation and cell-division-related processes (Fang et al., 2025). Therefore, in facility-based production, the ventilation strategy should be determined according to product goals. If standard pileus-type *G. lucidum* is produced, air exchange should be strengthened; if special morphotypes such as antler-type *G. lucidum* are produced, CO₂ accumulation may be regulated within a controllable range.

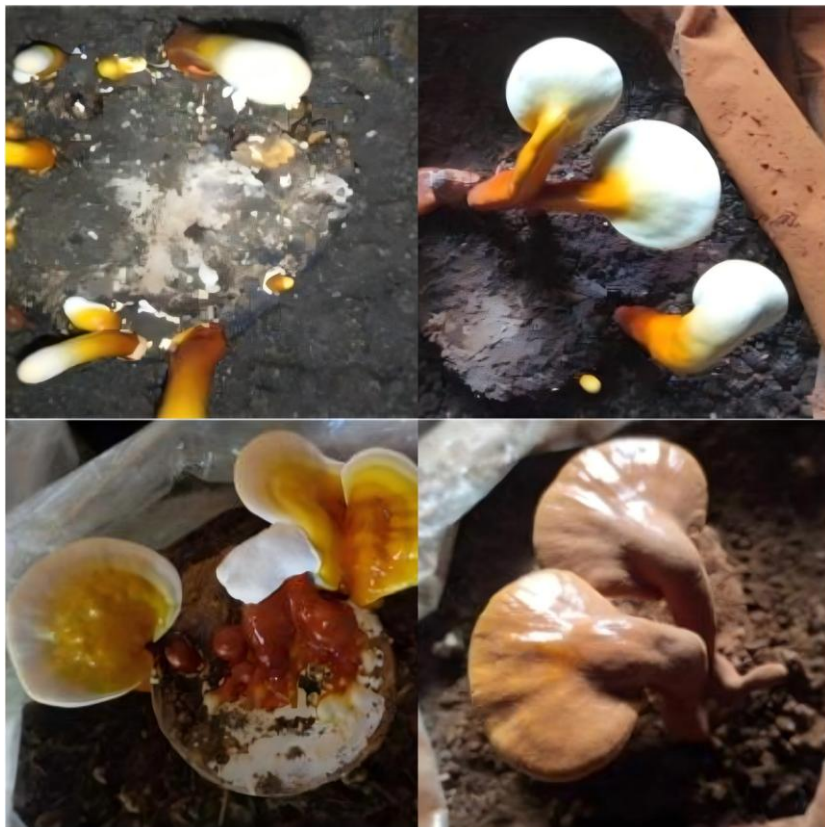


Figure 1 Different growth stages of *Ganoderma lucidum* (Adopted from Bijalwan et al., 2021)

Ventilation regulation can also improve the humid and hot environment inside the facility, reduce localized water accumulation and stuffiness, and lower the risk of pathogen proliferation. In actual production, the ventilation demand is relatively low during the mycelial incubation stage, whereas air exchange should be strengthened during primordium differentiation and pileus development to ensure oxygen supply and reduce CO₂ concentration. However, excessive ventilation may reduce air humidity, causing fruiting body margins to crack or growth to stagnate. Therefore, ventilation management should be synchronized with humidity regulation. Natural air exchange, mechanical ventilation, circulation fans, and CO₂ monitoring systems can be used to achieve a dynamic balance between ventilation and moisture retention. Fang et al. (2025) pointed out that facility-based cultivation requires adjustable ventilation and CO₂ monitoring equipment so that management strategies can be switched according to the production goals of normal fruiting bodies or special morphotypes.

Light is another key factor affecting primordium induction, fruiting body differentiation, and quality formation in *G. lucidum*. *G. lucidum* exhibits obvious photosensitivity during the fruiting stage. Appropriate light can promote primordium formation and pileus differentiation, whereas darkness is more favorable for vegetative mycelial growth. Although *G. lucidum* is not a strong light-demanding fungus, a certain intensity of scattered light is beneficial for pigment formation, pileus expansion, and appearance quality improvement. Studies in environmentally controllable “mushroom factories” have shown that, under conditions of approximately 28°C, about 90% humidity, and a 12 h light/12 h dark cycle, continuous or intermittent green light promotes stipe length, pileus diameter, fruiting body weight, crude protein, triterpenoid and polysaccharide contents, and extracellular