hemsleyanum ecologically within bamboo forest spaces. Moso bamboo (*Phyllostachys edulis*) forests usually have relatively high canopy closure and a stable microclimate, forming a cool, humid, and shaded understory environment. This is highly consistent with the ecological requirements of *T. hemsleyanum*, which prefers warm-temperate evergreen forest habitats and moderately low-light conditions. Light-treatment studies have shown that approximately 70% shading is beneficial to photosynthesis and growth in *T. hemsleyanum*. Therefore, when constructing a compound cultivation model under bamboo forests, canopy shading regulation should be regarded as one of the key technical links (Xu et al., 2018). Bamboo forest floors usually contain abundant litter, which can increase soil organic matter content and improve soil structure after decomposition, thereby providing a certain basis for root development and tuberous root enlargement in *T. hemsleyanum*. However, long-established bamboo forest soils are usually acidic, and nutrient supply and pH regulation should be strengthened after intensive understory cultivation is introduced (Zhang et al., 2019a).

In constructing this model, planting areas should be reasonably determined according to bamboo forest canopy closure, bamboo stand density, rhizome distribution, and topographic conditions. *T. hemsleyanum* can be intercropped between bamboo rows, using bamboo culms, simple mesh frames, or understory support structures to support its climbing growth, so that the vines are distributed upward in an orderly manner and poor ventilation and disease occurrence caused by long-term creeping along the ground can be avoided. In plots with overly dense bamboo stands and insufficient understory light, weak, old, and overly dense bamboo culms should be thinned appropriately to improve understory ventilation and light transmission. In areas with dense bamboo rhizomes and strong root competition, ditch isolation, localized land preparation, and the application of well-decomposed organic fertilizer and biochar-based organic fertilizer can be used to reduce water and nutrient competition between bamboo rhizomes and *T. hemsleyanum*. Studies have shown that, compared with pure moso bamboo forests, moso bamboo-*T. hemsleyanum* systems can increase soil organic carbon and available nitrogen contents, but soil pH and available potassium contents are lower. This suggests that potassium supplementation should be emphasized in production, and alkaline amendments should be applied when necessary (Zhang et al., 2019b).

The advantages of the *T. hemsleyanum*-bamboo forest compound cultivation model lie in its stable ecological environment, suitable shading conditions, and relatively high utilization efficiency of forestland space, making it suitable for promotion in mountainous areas rich in bamboo resources. Related studies have shown that applying biochar-based organic fertilizer under moso bamboo forests can increase soil pH and organic carbon content, significantly increase *T. hemsleyanum* biomass, and reshape bacterial community structure at the phylum and genus levels. At the same time, bamboo forest-medicinal plant systems can increase soil bacterial diversity and alter dominant bacterial groups, with soil pH, organic carbon, and available phosphorus being closely related to microbial community structure (Zhang et al., 2019c). Therefore, this model should comprehensively integrate reasonable plant and row spacing, organic fertilizer or biochar-based fertilizer application, potassium supplementation, pH regulation, drainage management, and green pest and disease control measures, so as to maintain habitat conditions characterized by “moderate shading, good ventilation, loose soil, and moisture without waterlogging” and improve the survival rate, tuberous root yield, and medicinal material quality of *T. hemsleyanum*.

4.2 *Tetrastigma hemsleyanum*-fruit forest compound cultivation model

The *Tetrastigma hemsleyanum*-fruit forest compound cultivation model refers to planting *T. hemsleyanum* between fruit tree rows or in the lower spaces beneath fruit tree canopies, thereby realizing compound management of fruit trees and medicinal plants. Fruit forests can provide certain shading, diverse litter inputs, and a relatively stable understory microclimate for *T. hemsleyanum*. At the same time, fruit tree spacing is usually relatively regular, and the understory space is relatively open, facilitating land preparation, trellising, fertilization, irrigation, and harvesting management. Compared with bamboo forests, fruit forest understories have stronger management controllability. They can reduce the adverse effects of strong summer light and high temperature on *T. hemsleyanum* while improving land-use efficiency and comprehensive output per unit area by utilizing the lower spaces under fruit trees.