alone as cultivation substrates or combined with bark, sphagnum moss, perlite, and other materials. Previous studies have used spent mushroom residues, Chinese herbal residues, chestnut shells, peanut shells, mulberry branches, corncobs, wood chips, and soil or clay amendments to construct granular substrates for *D. officinale*. The results showed that such composite substrates significantly improved disease resistance and root health, increased the survival rate to more than 98%, and enhanced plant height, stem diameter, polysaccharide content, and yield. Rice husks and related materials are also considered effective structural improvement and moisture-regulating components in substrates for *Dendrobium* and other soilless crops (Figure 1) (Rahman et al., 2021; Hou et al., 2025). However, the application performance of agricultural waste-based substrates is greatly affected by raw material source, processing method, fermentation degree, and salt content. Insufficiently treated materials may carry risks such as pathogen residues, unbalanced nutrient release, or phytotoxicity. Therefore, in production practice, raw material pretreatment, fermentation and composting, sterilization, and scientific formulation should be strengthened to improve substrate stability and safety.

Figure 1 The growth of Dendrobium Shavin White orchid seedling in different substrate (Adopted from Rahman et al., 2021)

Image caption: A-T1; Rice husk+Chitosan, B-T3; Oil palm EFB+Chitosan, C-T4; Rice husk+Peat moss+Chitosan, D-T5; Rice husk+Peat moss+Oil palm EFB+Chitosan. Bar=1cm (Adopted from Rahman et al., 2021)