

An Attempt to Develop High-performance Edible Mushroom Hybrids through a Cross-Breeding-Based Approach

M.N. Husnil Rila^{1*}, H.A.P.A. Shyamalee², G.Y.H. Weerasinghe², S.A.M. Niroshani²,
and P. Saththivel¹

¹Department of Biosystems Technology, Faculty of Technology, University of Jaffna,
Ariviyal Nagar, Kilinochchi, Sri Lanka

²Agriculture Research Station, Telijjawila, Matara, Sri Lanka

*rilanawas687@gmail.com

Oyster mushrooms (*Pleurotus spp*) are highly valued edible fungi, accounting for 25% of global mushroom production, and are rich in protein (15-30% dry weight), essential vitamins, minerals, and dietary fiber. However, commercial cultivation faces challenges, including low biological efficiency, slow growth, and environmental sensitivity, necessitating the development of improved strains through systematic breeding approaches. This study examined six interspecific hybrid combinations among six oyster mushroom types: *Pleurotus ostreatus* (American Oyster), *P. cystidiosus* (Abalone), *P. djamor* (Pink Oyster), *P. pulmonarius* (Black Oyster), *P. sajor-caju* (Bhutan Oyster), and *P. ostreatus* var. *curly* (Curly Oyster) to identify superior hybrids for commercial-scale production. The experiment was conducted at the Agriculture Research Station, Thelijjawila, Matara, Sri Lanka, using a Completely Randomized Design (CRD) with 15 replicates per treatment. A total of six hybrid combinations were developed: Bhutan × American Oyster (T1), Bhutan × Abalone (T2), American Oyster × Curly (T3), Pink Oyster × Curly (T4), American Oyster × Black Oyster (T5), and Abalone × Black Oyster (T6). Clamp connection microscopic observation confirmed successful dikaryon formation. Marked variations ($P < 0.001$) were noted among treatments regarding spawn run duration, fruiting initiation, yield, stalk length, and cap diameter. T3 and T4 showed exceptional performance, attaining the shortest spawn run (~26 days), the earliest fruiting (16-28 days), and the greatest yields (83.71 g and 71.29 g), respectively. Performance variation was significant, with 84% range for spawn run time, 369% for fruiting start, and 187% for yield. Heritability study revealed that a substantial genetic regulation of stalk length ($R^2 = 85.34\%$) and modest effect on yield ($R^2 \approx 60\%$), whereas cap diameter was predominantly influenced by environmental factors ($R^2 = 36.96\%$). T3 and T4 are endorsed for commercial use owing to their enhanced productivity, swift growth, and reliability. The findings confirmed that interspecific hybridization is an effective breeding strategy for developing *Pleurotus cultivars* with enhanced biological efficiency and improved cultivation potential.

Keywords: Heterosis, Interspecific hybridization, Mushroom breeding, *Pleurotus ostreatus*, *Pleurotus spp*.