ABSTRACT

Growing of mushrooms is a sustainable opportunity that enhances availability of food and improving nutrition in Kenya. Its productivity however has since remained limited due to over reliance on controlled indoor systems. Deficient knowledge regarding how environmental conditions influence its performance under different cultivation settings is also another common challenge. Oyster (Pleurotus spp) is the most common edible grown mushrooms because of its high nutritional content and short cropping cycles. However, variations in temperature, humidity, carbon iv oxide and light often affect its performance in terms of yield, growth and quality. Banana plantations, which are widely grown in western Kenya is a common crop that provide shade and humid microclimates to other crops such as mushrooms when grown together. Their suitability that could potentially support mushroom cultivation compared to indoor systems however remains underexplored. This study evaluated the performance and microclimatic influence of Pleurotus ostreatus and Pleurotus australis under indoor and outdoor (banana-integrated) systems across wet and dry seasons at Masinde Muliro University Farm, Kakamega County. A quasi-split split plot design was used (season = main plot, cultivation condition = subplot, genotype = sub-subplot). Data collection (ODK, field notes) covered: mycelial growth (size and growth rate), incubation/spawn-run duration and time to pinhead appearance, length of the fruiting (fructification) phase, morphological traits (stalk/stipe length, cap/pileus diameter), number of fruit bodies, number of deformed fruits, contamination level (%), biological efficiency (%), total yield, and microclimate variables (relative humidity, temperature, light intensity in lux, and CO_2), with microclimate readings taken thrice daily. Data were analyzed using univariate ANOVA and least-square means comparisons (SAS 9.4). From the results, the treatments of season, cultivation condition and genotype interactions significantly influenced overall performance ($p < 0.05$). Notably, the interactions of wet season, outdoor (banana-integrated) condition, and P. ostreatus genotype performed the best. The interaction resulted to largest mycelial expansion (~32.3 cm), shortest incubation period (~22 days), widest caps (~13.1 cm), highest biological efficiency (~694%), and greatest yield (~2,582 g). These results coincided with favorable microclimate values (high humidity, moderate temperature, balanced light and lower CO_2). The findings indicate that outdoor banana-integrated cultivation creates a favorable microclimate that, through season × condition × genotype interactions, markedly improves mushroom growth and productivity relative to indoor systems.