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MICROBIAL BIODIVERSITY AND ECOSYSTEM FUNCTIONING IN MALAYSIAN PEATSWAMP FORESTS

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Southeast Asian tropical peat swamp forests support distinctive microbial communities that differ from those of other wetlands, including temperate peatlands. The microbes control the decomposition of plant matter, and consequently their activities are crucial to the formation of peat and sequestration of carbon in peat layers up to 25 m deep. Metagenomic studies indicate that up to 80% of the microbes are novel species or strains, underscoring the enormous gap in our microbial taxonomic knowledge. The extreme, nutrient poor, acidic environment fosters strong competition for niches and scarce nutrients among microbes resulting in the evolution of antibiotics and anti-biofilm agents to overcome competitors, and also nutrient-acquiring enzymes (e.g. to decompose cellulose and lignin under acidic conditions). The microbial communities vary with peat depth and also with respect to the rhizospheres of different tree species. At the surface Acidobacteria, commonly associated with acidic soil, are abundant as well as Proteobacteria (e.g. *Rhodospseudomonas* known for lignin degradation; *Burkholderia* which produces antimicrobial compounds) and also *Actinobacteria*. The activity of microbial enzymes involved in C, N and P cycling is mainly confined to the peat surface where senescent leaves fall. Archaea (Crenarchaeota) are uncommon in surface peat, but dominate deeper (> 20 cm), older, anaerobic peat layers where microbes are less abundant and less metabolically active. The anaerobic blackwater – acidic, low nutrient water with high levels of toxic compounds (tannins, humic acids and phenols leached from newly fallen leaves) and the tough, toxic leaves of the flora (their source of nutrition) exert a potentially strong selective pressure on the microbial community and the diversification of their genomic potential. Slow detrital decomposition typical of pristine peat swamps results in the accumulation of peat but when these conditions no longer prevail (e.g. due to drainage, logging and conversion to oil palm plantations) peat inevitably breaks down.

Keywords:-