O22-4

Estimation of methane emission in organic paddy fields using remote sensing indexes

S. Kingpaiboon*, S. Khantotong, P. Mungkarndee

Khon Kaen University, Khon Kaen, Thailand

This research studied methane emission in organic paddy fields in order to compare the correlation between methane emission and different vegetation indexes and to build a prediction equation for methane emission in organic paddy fields based on vegetation indexes and remote sensing data. The research site was in Thung Kula Ronghai area, Pathumrat District, Roi-et Province, where organic *Hom Mali 105* variety is grown. The findings show that during seeding to tillering, CH_4 emission was in the range of 0.193–0.760 $mgCH_4\,m^{-2}\,h^{-1}$. Tillering to ripening, CH_4 emission was in the range of 1.666–2.446 $mgCH_4\,m^{-2}\,h^{-1}$. Ripening to harvesting, CH_4 emission was in the range of 0.935–2.273 $mgCH_4\,m^{-2}\,h^{-1}$.

Methane emission from organic rice fields was found to increase with the age and growth of rice stalks and to decrease at the period before harvesting. This finding is consistent with the vegetation indexes, which continue to increase along the rice growth stages until the maximum leaf growth when the vegetation index is at a high. The index then decreases slightly at the stage during seed growth and leaves turning yellow.

When taking the 4 types of vegetation indexes, namely, NDVI, GNDVI, SAVI and IPVI to calculate the Pearson coefficient correlations, it was found that GNDVI had the greatest correlation with methane emission from the rice paddy, i.e., 0.752. Then the predicting equation for methane emission was built from the GNDVI parameter: $Y = -11.24x^2 + 15.21x - 3$.

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O22-6

A biorefinery approach for the conversion of forest wastes into polyhydroxyalkanoates

P.C. Lemos*, A. Freches, I.C. Paulo

LAQV-REQUIMTE, FCT NOVA, Almada, Portugal

Polyhydroxyalkanoates (PHA) are bacterial intracellular carbon/energy reserves that can be produced by mixed microbial cultures (MMC) using several waste streams. These biopolymers present physical–chemical properties that make them suitable as biodegradable and biocompatible thermoplastics. PHA production may consist of two or three steps, having in common a microbial culture selection and a maximization PHA production step, when using substrates rich in short-chain organic acids (SCOA). For a three-step process, when a high sugar content is present in the initial substrate a pre-fermentation step is required to enrich the feed in SCOA. In this work, the valorisation of forest industry residues into PHA by MMC in a three-step process is proposed, using as substrate pinewood residues converted to pyrolysis bio-oil.

Considering the pre-fermentation step, acidogenic fermentation of bio-oil in continuous operation mode resulted in the production of lactic, butyric, propionic, and valeric acids. For the selection step, a sequencing batch reactor operated under aerobic dynamic feeding was enriched using unfermented bio-oil. Both hydroxybutyrate (HB) production yield (>0.10 Cmmol/Cmmol S) and the maximum HB content (4–6%/wt.) were in the average range for the selection processes. In order to test the selected culture response for PHA accumulation, three feed pulses of acetic acid (30 mM) were performed, being completely consumed during each pulse. A maximum of 46% HB content was obtained, although the culture did not reach its saturation. The coupling of both systems, using a stable SCOA stream from the anaerobic fermenter, should improve these results.

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O22-7

Bacterial exopolysaccharide: A smart biomaterial to address the heavy metal stress

P. Satish, B. Mohite*, S. Koli

North Maharashtra University, Jalgaon, India

Metals fetch serious environmental pollution causing a threat to human health and ecosystem. The heavy metal accumulation due to anthropogenic activities results in toxicological manifestation. The increasing presence of heavy metals in the microbial habitat compels the microbes to develop the ability to tolerate or resist the presence of heavy metals. Exopolysaccharides (EPS) production is one of the strategies of microbes to fight against the metal stress. EPS are microbial biopolymer which produced under stress of harsh environment and nutrition conditions. On this framework, the heavy metal stress consequences on exopolysaccharide (EPS) producing agricultural isolate, *Pantoea agglomerans* was studied. *P. agglomerans* show tolerance and mucoid growth in the presence of heavy metals, i.e., mercury, copper, silver, arsenic, lead, chromium, and cadmium. EDX confirmed the metal accumulation and further, FTIR determined the functional groups involved in metal binding. The ICP-AES used to determine the cell-bound and intracellular metal accumulation. Metal deposition on cell surface has released more Ca^{2+}. The effect on bacterial morphology investigated with SEM and TEM revealed the sites of metal accumulation, as well as possible structural changes. Each heavy metal caused distinct difference and accumulated as cell bound EPS with some intracellular deposits. The metal stress caused a decrease in total protein content and increased total carbohydrate with a boost in EPS. The high EPS production in the metal presence might protect the bacterial cell from metal stress. Thus the performance of *P. agglomerans* under metal stress indicated a potential candidate for metal bioremediation.

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