

The effect of humic substances on increasing the viability of hydrocarbon-oxidizing bacteria

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The aim of the work was to investigate the effect of humic substances (HS) on the viability of bacteria destructing hydrocarbons. It was shown that the introduction of HS (0.03–3.0 g/L) into the *Acinetobacter junii* culture of the stationary growth phase resulted to an increase in the number of viable cells (VC) up to 15 times compared to the control without HS during 4 months storage (Fig. 1A). The increase in the number of VC is associated both with an increase in the formation of persistent cells (P) [1], which mature into resting cells (RC) [2], and stress-protective (antioxidant [3]) activity of HS. The introduction of HS into the pre-stationary bacterial culture of *Rhodococcus erythropolis* led to an increase in the number of VC up to 11 times during storage for 1 month (Fig. 1B).

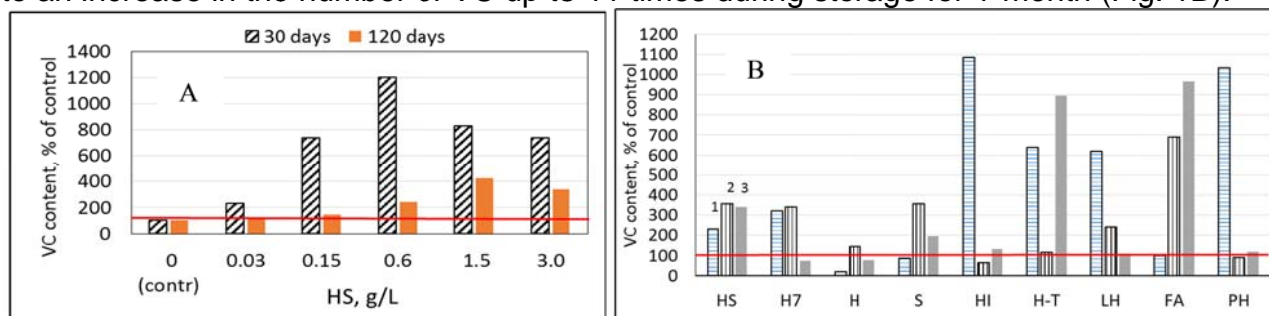


Fig. 1. A. Change in the number of viable cells of *A. junii* (% of control) during storage for 30 and 120 days in the control (without HS) and experimental variants with the addition of Humikom: 1 - control, 2 - 0.03, 3 - 0.15, 4 - 0.6, 5 - 1.5, 6 - 3.0 g/L.

B. The number of viable cells of *R. erythropolis* after 1 month of incubations with different concentrations of HS (g/L): 1 - 0.15; 2 - 0.5; 3 - 1.5, compared with the control without HS (100%). HS are: HS - Sakhalin, G7 - Humate+7, S - sapropelic, HI - Irkutsk, HT - Technoexport, LH - Lignohumate, F - fulvic acids, PH - Powhumus.

The formation of persistent cells is increased by the most oxidized hydrophilic HS (increased content of alkyl, alkoxy, carboxyl and carbonyl groups), and the stress-protective activity of HS is determined by the contribution of less oxidized humates with higher antioxidant activity (increased content of aromatic carbon, both substituted and not substituted heteroatoms).

References

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