

Yamborko N. / Ямборко Н.А.

Institute of Microbiology and Virology, Academy of Science of Ukraine, Kyiv, Ukraine;
yamborkon@gmail.com.

SEASONAL DESTRUCTION OF HEXACHLOROCYCLOHEXANE ISOMER- COMPLEX BY INDIGENOUS SOIL MICROORGANISMS

The ability to decompose hexachlorocyclohexane isomer-complex by Stenotrophomonas maltophilia IMV B-7288 was the most stable for seasons among studied strains and may be interesting relating to creation microbial combinations with other effective strains for destruction of chloroorganic pollutants and promising for development of soil remediation technology.

Способность разлагать комплекс изомеров гексахлорциклогексана была наиболее стабильной в течении сезонов года у штамма Stenotrophomonas maltophilia IMV B-7288 и это свойство может быть ценным с точки зрения его комбинирования с другими микроорганизмами с целью деструкции хлорорганических загрязнений и перспективным для развития технологий ремедиации почв.

Ключевые слова: Гексахлорциклогексан; комплекс изомеров; микробная деструкция; *Stenotrophomonas maltophilia*; *Pseudomonas putida*; *Bacillus megaterium*.

Keywords: Hexachlorocyclohexane isomer-complex; microbial destruction; *Stenotrophomonas maltophilia*; *Pseudomonas putida*; *Bacillus megaterium*.

Introduction

The development of effective strategies for the decontamination of chloroorganic contaminated ecotopes is thus needed. Bioremediation treatments can extensively apply for the decontamination of soils from an sample areas using laboratory or in situ approaches.

Methods

Research the ability to decompose the HCH-isomers complex (α , β , γ) by microorganisms was executed in liquid media using gas chromatography analysis.

Results and Discussion

We have researched possible changes in HCH-isomers degrading activity of selected microbial strains during all seasons for year under laboratory conditions in liquid nutrient medium. For *S. maltophilia* IMV B-7288 has been found that the ability to degrade HCH-isomers depend on the season a little, however it was at average maximum in the summer time for every studied HCH-isomer (Fig. 1). The significant differences between degradation several isomers were revealed to *S. maltophilia* IMV B-7288 and *B. megaterium* IMV B-7287 in the autumn. The lowest degrading level for α - and β -HCH have been observed.

S. maltophilia IMV B-7288 has the sustainable ability to decompose HCH-isomers complex, the property is stable for a long time regardless of season. But researchers point out the possibility to change the intensity of microbial growth in laboratory conditions, depending on the season of year and solar activity [1]. *S. maltophilia* has also been found to play important role in the bioremediation of chlorinated pesticides like Chlorpyrifos [2] and endosulfan [3]. Soil isolates of *Stenotrophomonas* degraded dichloro-diphenyl-trichloroethane (DDT), 1,1-dichloro-2,2-bis(p-chlorophenyl) ethane (DDD) [4]. The three main enzyme families implicated in pesticide degradation are esterases, glutathione S-transferases (GSTs) and cytochrome P450 [5].

In our case fluctuation of destruction activity also was observed to strain *B. megaterium* IMV B-7287, the microorganism has not demonstrated the stability of HCH-isomers decomposition for year (Fig. 2). In the summer we observed minimal destruction activity in the liquid nutrient medium – 57,4-75,1% were destroyed only from initial content, comparing with 95,5-97,7% in the winter-spring period ([Fig. 2).

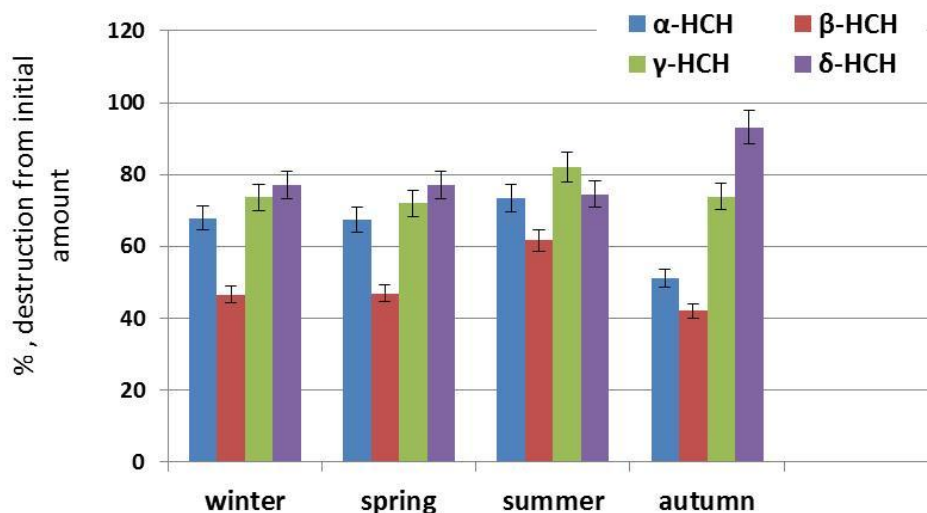


Figure 1. The seasonal destruction activity the HCH-isomers complex by *Stenotrophomonas maltophilia* IMV B-7288

The ability to destroy hexachlorocyclohexane by fluorescent pseudomonads was previously described by many researchers [6]. The representatives of *S. maltophilia* are found ubiquitously distributed in soil and often associated with roots of many plant species.

In this regard, The ability to decompose hexachlorocyclohexane isomer-complex by *Stenotrophomonas maltophilia* IMV B-7288 was the most stable for seasons and may be interesting relating to creation microbial combinations with other effective strains for destruction of chloroorganic pollutants and promising for development of soil remediation technology.

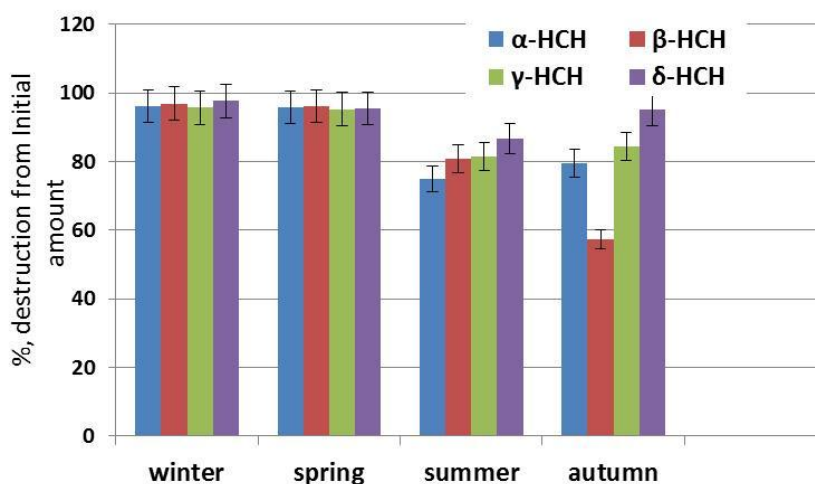


Figure 2. The seasonal destruction activity the HCH-isomers complex by *Bacillus megaterium* IMV B-7287

But the biggest difference between destructive activity HCH-isomers complex at different seasons was observed for *Pseudomonas putida* IMV B-7289 (Fig. 3). It is known that a lot of

microorganisms have stages with active growth, which are replaced by slow growth stages and stability of season growth properties is strain characteristic for microorganisms [7].

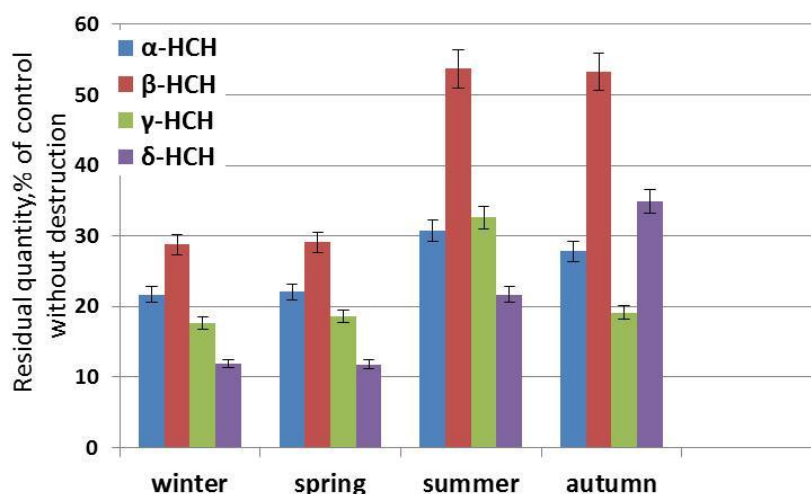


Figure 3. The seasonal destruction activity the HCH-isomers complex by *Pseudomonas putida* IMV B-7289.

The ability to decompose hexachlorocyclohexane isomer-complex by *Stenotrophomonas maltophilia* IMV B-7288 was the most stable for seasons among studied strains and may be interesting relating to creation microbial combinations with other effective strains for destruction of chloroorganic pollutants and promising for development of soil remediation technology.

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