Transfer of Degradation Capacity Between Microorganisms Treating a Persistent of Organic

陳盈盈、張玉明

E-mail: 9511339@mail.dyu.edu.tw

ABSTRACT

The ability of an indigenous microbial population to degrade a persistent xenobiotic organic compound is generally acquired after the microbes are acclimated to the target compound. The degradation pathway is believes to be mediated by an extra chromosomal agent plasmids. Plasmid is free to transfer from the original host to neighboring cells, thus a xenobiotic degradation capacity can be transfer to population that has not previously been acclimated to the target. The purpose of this research was to investigate the extent to which an activated sludge acclimated to 2,4-D was to transfer its degradation ability horizontally to one not acclimated. We sifted out the single bacteria from the sludge that have a ability to degrade the 2,4-D, and identification of this pure bacteria. We were trying to transfer the degrade capacity to Escherichia coli and Bacillus subtilis, and investigate these can get capacity of degradation or not. The results showed that: 1) we got the pure bacteria that can degrade the 2,4-D. It ’ s called Bacillus cereus after identification, and it can degrade 2,4-D very well. 2) After transferring, the degrade velocity of mixed bacterium are faster than single Bacillus cereus. The part of increase velocity is means acceptor of transfer already got the capacity of degradation.

Keywords : plasmid ; 2,4-D ; conjugation ; capacity of degradation ; horizontal transfer

Table of Contents

REFERENCES

參考文獻 1.Aly, O.M., and S.D Faust, (1964). Studies on the fate of 2,4-D and ester derivatives in natural surface waters. Agric. Food Chem. 12 (6) : 541-546. 2.Andrew CH, Harwood CS (2002). Chemotaxis of Ralstonia eutropha JMP134 (pJP4) to the Herbicide 2,4-Dichlorophenoxyacetate. AEM.68.968-972.2002. 3.Crosby, D. G., and H. O. Tutass. (1996). Photodecomposition of 2,4-Dichlotoph-Enoxyacetic acid. J. Agr. Food Chem. 14(6) : 596-599. 4.Digiovanni G.D, Neilson J.W,Pepper,I.L,Sinclair N.A(1996). Gene Transfer of Alcaligens eutrophus JMP134 Plasmid pJP4 to Indigenous Soil Recipients.AEM.62.7.2521-2526. 5.Don RH, Pemberton, JM(1985).Genetic and physical map of the 2,4-dichlorophenoxyacetic acid-degradative plasmid pJP4 161(1),466-468 6.Don RH, Weightman AJ, Knackmuss HJ, and Timmis KN (1985).Transposon mutagenesis and cloning analysus of the pathways for degradation of 2,4-dichlorophenoxyacetic acid and 3-chlorobenzoate in Alcaligenes eutrophus JMP 134(pJP4).161(1),85-90. 7.Don Rh, Pemberton JM(1981). Properties of six pesticide degradation plasmids isolated from Alcaligenes paradoxus and Alcaligenes eutrophus.J Bacteriol. 145,681-686. 8.Filer K, and Harker AR(1997). Identification of the Inducing Agent of the 2,4-Dichlorophenoxyacetic acid pathway Encoded by plasmid pJP4. Journal of Envi. Microbio.63(1),317-320. 9.Fulthorpe RR, McGowan C, Maltsena OV, Holben WE, Tiedje JM(1995). 2,4-dichlorophenoxyacetic acid-degrading Bacteria Contain Mosaics of Catabolic Genes.AEM.61.9.p.3274-3281. 10.Geerdink, M.J., van Loosdrecht M.C., and Luyben, K.Ch.A.(1996) Biodegradability of Diesel Oil, Biodegradation,7,73-81. 11.Halter, M,(1980).2,4-D in the aquatic environment. Section II in Literature Reviewsof Four Selected Herbicides:2,4-D,

dichlobenil, diquat&endotall.Shearer R., and M. Halter, eds. 12.Hemmett, R.B. and S.D Faust,(1969). Biodegradation Kinetics of 2,4-dichlorophenoxyacetic acid by aquatic microorganisms. Residue.Rev. 29: 191-207 13.Jensen, H.L.,(1957). Can. J. Microbiol,3,165.Johan HJ, Leveau, Alexander JB, Zehnder, and Jan Roelof van der Mee(1998). The tfdK Gene Product Facilitates Uptake of 2,4-dichlorophenoxyacetate by Ralstonia eutropha JMP134(pJP4) 180, 2237-2243. 14.Johnson.W.G., T.L, Lavy, and E.E. Gbur, (1995a).Persistence of Triclopyr and 2,4-D in Flooded and Non-Flooded Soil. Journal of Environmental Quality, 24(3) pp493-497. 15.Johnson. W.G., T.L. Lavy, and E.E. Gbur, (1995b). Sorption mobility, and degradation of triclopyr and 2,4-D and four soils. Weed Sci. 43:678-684. 16.Ka JO, Holben W.E, and Tiedje JM(1994). Genetic and phenotypic diversity of 2,4-dichlorophenoxyacetic acid (2,4-D)-degrading bacteria isolated from 2,4-D-treated field soils. Journal of Envir. Microbiol. 60(4),1106-1115. 17.Neilson JW, Josephson KL, Pillai SD, and Pepper IL (1992).Polymerase chain reaction and gene probe detection of the 2,4-dichlorophenoxyacetic acid degradation plasmid, pJP4 Journal of Envir. 18.Newby DT, Josephson KL, and Pepper IL (2000). Detection and Characterization of plasmid pJP4 Transfer to Indigenous Soil Bacteria. Journal of Envir. Microbiol. 66,290-296. 19.Newby DT, Gentry TJ, and Pepper IL (2000). Comparison of 2,4-dichlorophenoxyaceticacid Degradation and plasmid Transfer in Soil Resulting from Bioaugmentation with Two Different pJP4Donors. Journal of Envir. Microbiol. 66,3399-3407. 20.Que Hee, S.S., and R.G. Sutherland, (1981). The phenoxyalkanic Herbicides, Volume 1 :Chemistry, Analysis, and Environmental Pollution Press. Inc., Boca Raton, Florida 319 pgs. 21.Top EM, Maltseva OV, and Forney LJ(1996). Capture of a catabolic plasmid that encodes only 2,4-dichlorophenoxyacetic acid:alpha-ketoglutaric acid dioxygenase (TfdA) by genetic complementation. Journal of Envir. Microbiol. 62(7),2470-2476. 22.Turnbull GA, and Morgan JAW (2001). Degradation of Substituted Phenylurea Herbicides by Arthrobacter globiformis Strain D47 and Characterization of a plasmid-Associated Hydrolase Gene, puhA. Journal of Envir. Microbiol. 67(5),2270-2275. 23.張紘偉(2003)，氯酚分解的質體核酸(plasmid DNA)量化分析， 大葉大學環境工程學系研究所碩士論文 24.廖文景(2005)，活性污泥接受分解能力水平傳遞之探討，大葉大 學環境工程學系研究所碩士論文