The impacts of fungicide vinclozolin on soil bacterial communities

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Fungicide vinclozolin, an anti-androgen, has been proposed by many researches. However, the impact of vinclozolin on soil microbial community changes was rarely discussed. In this study, we were trying to find out the relation between vinclozolin degradation and soil bacteria. High performance liquid chromatography (HPLC) was used to detect the residues of vinclozolin in soil and polymerase chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE) was used to monitor the change in soil bacterial communities. From the result, soil pH and soil microbial communities were found to be the most important factors affect the degradation of vinclozolin in soil (Figure 1 and 2). Although the field concentration of vinclozolin showed a fast dissipation rate in soil samples (Table 1), but some of its metabolites were detected during experiment (Figure 3 and 4). From the UPGMA phylogentic analysis, soil microbial communities changed by the addition of vinclozolin despite the fast degradative rate of vinclozolin (Figure 5).

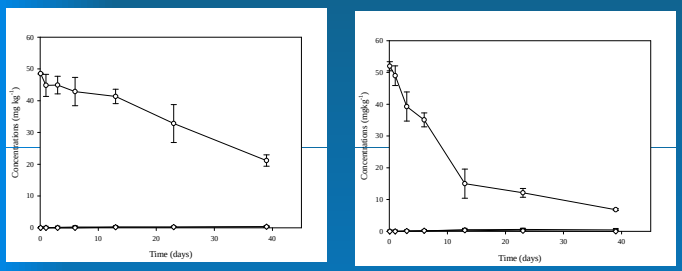

Fig. 1 The degradation of 50 mg kg-1 vinclozoloin in (a) sterilized Pu series soil and (b) non-sterilized Pu series soil by Hustert and Moza's HPLC method. The ○ represents vinclozolin, ◇ represent M2 and ▽ represents M3

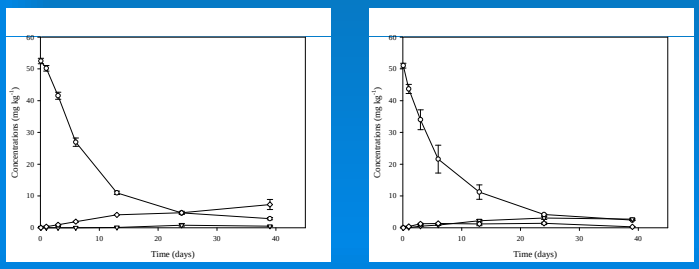

Fig. 2 The degradation of 50 mg kg-1 vinclozoloin in (a) sterilized WI series soil and (b) non-sterilized WI series soil by Hustert and Moza's HPLC method. The ○ represents vinclozolin, ◇ represent M2 and ▽ represents M3.

Table 1 The first-order degradation rate constant, half-life value, and determination coefficients of vinclozolin fitting in this study

Soil	Conc. (mg kg^{-1})	Condition	k	$T_{1/2}$ (days)	R^2
Pu (pH 5.67)	50	sterilized	0.0198	35.0	0.9587
		fresh	0.0535	13.0	0.9328
	5	sterilized	0.0346	20.0	0.9476
		fresh	0.0527	13.2	0.9445
WI (pH 7.56)	50	sterilized	0.08	8.7	0.9441
		fresh	0.0809	8.6	0.9559
	5	sterilized	0.0403	17.2	0.741
		fresh	0.0943	7.3	0.9549

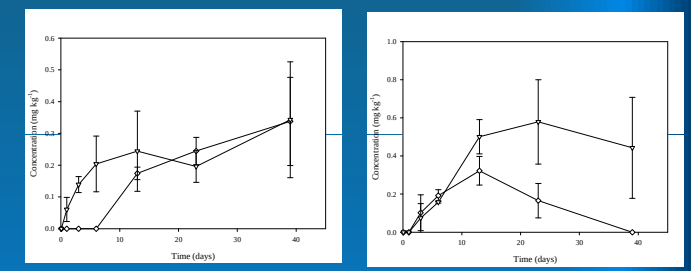

Fig. 3 The variation from vinclozolin to it degraded products, M2 and M3, in (a) sterilized Pu series soil and (b) non-sterilized Pu series soil by Hustert and Moza's HPLC method. The ◇ represent M2 and ▽ represents M3

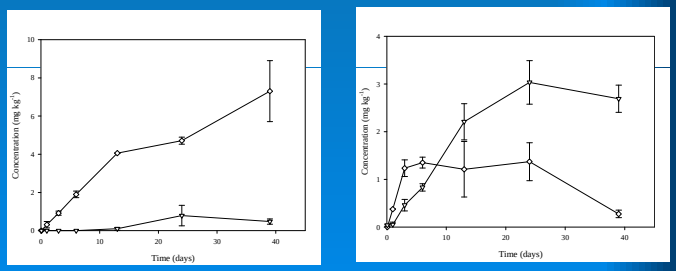

Fig. 4 The variation from vinclozolin to it degraded products, M2 and M3, in (a) sterilized WI series soil and (b) non-sterilized WI series soil by Hustert and Moza's HPLC method. The ◇ represent M2 and ▽ represents M3.

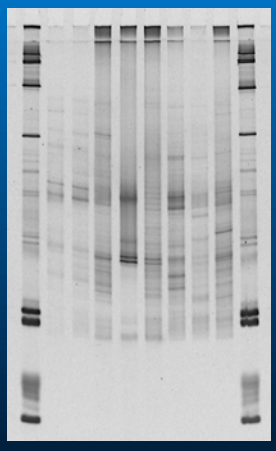

Fig. 5 The PCR-DGGE analysis of 16S rDNA sequence fragments obtained from non-sterilized Pu soil of 50 mg kg-1 vinclozolin treatment. Letter M represents marker, and the number 1 is control in day 0. Number 2 to 8 represent the days 0, 1, 3, 6, 13, 23, and 39 day in this study, respectively.