

Dissipation of herbicides pendimethalin and oryzalin in soils

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Pendimethalin and oryzalin are aniline herbicides applied widely in Taiwan. In this study, the mobility and degradation rates under different moisture contents, incubation temperatures and soil types were examined. Afterward, behavior assessment model (BAM) and groundwater pollution potential model (GWP) models were used to calculate the possibility of the contamination of the two herbicides. The results showed that the degradation rates became faster as the temperature and moisture content increased (Fig.1 and Fig.2). The values of K_d for pendimethalin and oryzalin were higher in high organic matter content soil (Clu) than in low organic matter content soil (Sa and Ycl). For BAM model, the mobility was faster for oryzalin than for pendimethalin (Table 1). And for GWP model, the groundwater would be contaminated after 18 days by oryzalin in Ycl soil (Table 2). So application aniline herbicides in Ycl soil must be attention and avoid to contaminate groundwater.

Table 1. Relative fate of four herbicides in soils after 42 days simulated by using BAM.

Herbicide	Soil	Volatilized	Degraded	Remaining
		----- % -----		
Pendimethalin	Clu	14.27	29.52	56.21
	Sa	14.94	36.2	48.86
	Ycl	14.21	35.52	50.27
Oryzalin	Clu	0.55	92.41	7.05
	Sa	0.48	86.34	13.18
	Ycl	0.38	60.67	38.95

Table 2. Travel time and residual mass percent to H=1 m or 3 m of three soils for two herbicides.

Herbicide	Groundwater depth (cm)	Time to reach H (yr)			Residual mass (%)		
		Clu	Sa	Ycl	Clu	Sa	Ycl
Pendimethalin	100	3.878	5.476	3.686	0	0	0
	300	11.63	16.428	11.059	0	0	0
Oryzalin	100	0.061	0.013	0.051	24.59	27.78	66.18
	300	0.183	0.219	0.152	1.61	2.31	29.7

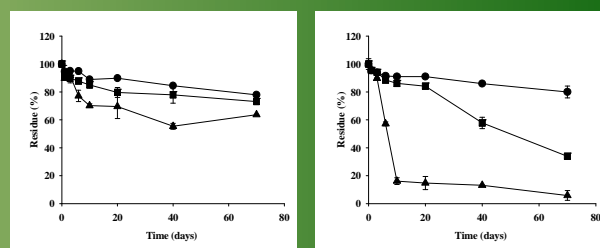


Fig.1. Dissipation of (A) pendimethalin and (B) oryzalin in Sa soil at 25°C under various moisture. Figure legends represent —●—: 30% water content; —■—: 60% water content; —▲—: 90% water content, respectively.

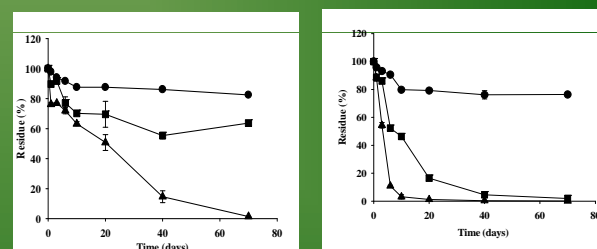


Fig.2. Dissipation of (A) pendimethalin and (B) oryzalin in Clu soil at 90% W.H.C. under various temperature. Figure legends represent —●—: 10°C; —■—: 25°C; —▲—: 40°C, respectively.