Supplementary Material "Behaviour of bentazon as influenced by water and tillage management in rice growing conditions"

Text S1. Soil samples (5 g) were treated with 10 mL of initial bentazon solutions (10, 20, 40, 60, 80 and 100 μM in 0.01 M in $CaCl_2$) by shaking mechanically at 20±1ºC for 24 h. Equilibrium concentrations in the supernatants were determined by high performance liquid chromatography (HPLC). The amount of bentazon sorbed (C_s) was calculated from the difference between the initial (C_i) and the equilibrium (C_e) solution concentrations. The measurements with control samples containing only bentazon showed that there were no losses of bentazon due to microbial activity, volatilization or sorption onto the surface of the tubes.

The desorption percentage was calculated as $\%D = [(C_{sa}-C_{sd})/C_{sa}]\times 100$, where C_{sa} is the amount of bentazon sorbed in the sorption process and C_{sd} is the amount of bentazon sorbed in the desorption process.

Text S2. Soil water content for the field capacity ranged between 0.28-0.33 m^3 m^{-3} for TF and NTS7, respectively. Prior to the addition of bentazon, soils were pre-incubated for 7 days in the dark at 20±1°C to allow the soil microorganisms to adapt to the incubation conditions, and also to allow the development of reducing conditions in the flooded soils, then the amount of bentazon corresponding to an application rate of 2 kg ha^{-1} dissolved in distilled water was applied. The tubes were then incubated in the dark at 20±1°C for 49 days. The moisture content was maintained at a constant level throughout the experiment by adding distilled water as necessary. Three replicate tubes from each treatment were removed periodically (at 2 hours and at 3, 5, and 7 days after herbicide application, and then at 7-day intervals for 49 days) to measure the herbicide concentration. Recoveries were greater than 95% of the bentazon applied to the soil. The bentazon dissipation curves in soils and water were fitted to first-order kinetics (C

= Co e^{-kt}), and the half-lives (DT_{50}) were calculated, where C is the herbicide concentration at time t (days), Co is the initial herbicide concentration, and k (day^{-1}) is the degradation constant.

Text S3. To measure the dehydrogenase activity (DHA), three replicate tubes from each treatment were removed periodically at the same times as for the dissipation experiment. The tubes were incubated for 20 h at 20±1°C in the dark with 1 mL of 0.4% 2-p-iodophenyl-3p-nitrophenyl-5 tetrazolium chloride (INT) as substrate. At the end of the incubation, the iodonitrotetrazolium formazan (INTF) produced was extracted with methanol, and the absorbance was measured at 490 nm.

Text S4. Leaching studies were carried out using disturbed soil columns. To minimize losses of soil during the experiment, the top 5 cm of the columns was filled with sea sand and the bottom 5 cm with sea sand plus glass wool. The remaining 20 cm was hand-packed with air-dried soil. The soil columns were saturated with 0.01 M $CaCl_2$ and allowed to drain for 24 h. Leachates containing the herbicide were collected daily, filtered, and assayed by HPLC. On average, the value of the pore-space in the soil columns was 148 mL.

Text S5. The values of TOC were low in all treatments (Table S1); the highest was in treatment NTS7, reflecting a major effect of long-term NT practices on this parameter. Indeed, the TOC value in NTS7 was, on average, 2.1-times higher than for the other treatments. Similarly, the WSOC, HA, and FA values were also significantly higher in NTS7 than in the rest of the treatments (Table S1). So, this accentuates the importance of looking at long-term effects, especially of management practices such as no-till. Furthermore, the differences between treatments TS and TF in terms of WSOC might be explained by the irrigation method used in each treatment. The EC values varied significantly among treatments, reflecting the great spatial variability of this parameter in field conditions. In 2013, the lowest value of EC corresponded to TS and the highest to NTS7 and NTS (Table S1). The TOC accumulation in the no-tillage management regimes and the organic matter depletion in TS may help to explain these contrasting trends. There was acidification of NTS soil in 2013, relative to 2011 (Table S1). However, the pH of the TS soil rose from 5.63 in 2011 to 6.24 in 2013. The TF soil showed a similar trend, but with a much smaller increase in pH. These increases in pH could be due to losses of organic matter in soils CTS and CTF.

Table S1. Some physicochemical properties of the soil for each management regime (0-20 cm).

	TOC (g kg^{-1})	DOC (mg kg^{-1})	HA (g kg^{-1})	FA (g kg^{-1})	HI (%)	EC (μS cm^{-1})	pH
				2011			
NTS7	15.6cA	219.6dA	1.60cB	1.03cA	10.2bB	1.51dC	5.84cA
NTS	7.93aA	133.1cC	0.833bB	0.532aA	10.5bB	0.906bB	5.91cB
TS	9.23abC	96.1bB	0.604aB	0.676bB	6.55aA	0.698aA	5.63bA
TF	9.92bB	74.4aB	0.627aB	0.634bA	6.32aA	1.26cB	5.15aA
				2012			
NTS7	15.5cA	198.4cA	1.33bA	0.993cA	8.62cA	0.490aA	5.92dA
NTS	6.80aA	66.4aA	0.514aA	0.579aB	7.32bA	0.857bA	5.92cB
TS	8.22bB	97.1bB	0.515aA	0.685bB	6.27aA	1.09cB	5.84bB
TF	8.25bA	61.2aA	0.481aA	0.661bA	5.83aA	1.27dB	5.21aB
				2013			
NTS7	16.2dA	213.9dA	1.76dC	0.998dA	10.8aB	1.26cB	5.84cA
NTS	7.67bA	112.4cB	1.13cC	0.764cC	14.8cC	1.38dC	5.22aA
TS	7.03aA	80.5bA	0.908aC	0.586aA	12.9bB	0.753aA	6.24dC
TF	8.60cA	64.9aA	0.984bC	0.639bA	11.4aB	1.08bA	5.33bC
Y	**	***	***	**	***	***	*
M	***	***	***	***	***	***	***
Y*M	***	***	***	***	***	***	***

TOC: total organic carbon; **DOC**: dissolved organic carbon; **HA**: humic acid; **FA**: fulvic acid; **HI**: humic index; **EC**: electrical conductivity; ANOVA factors are **Y**: year; **M**: management regime; **Y*M**: interaction year*management regime; *, **, and *** significant at α levels of 0.05, 0.01, and 0.001, respectively. Different letters indicate significant differences ($p<0.05$) between management regimes in the same year (lower case letters) and between years within the same management regime (upper case letters).