

人工溼地處理農藥—達有龍之效能評估

王姿文* 林瑩峰** 荊樹人** 李得元** 黃獻文**

*嘉南藥理科技大學藥學系

**嘉南藥理科技大學環境工程衛生系

摘 要

本研究即利用小型規模(small scale)之人工溼地系統處理一含氮的有機農藥—達有龍(Diuron)，評估人工溼地對於達有龍之去除效能。主要研究工作包括溼地系統的建立、連續入流穩定操作、營養鹽的添加、溼地對農藥污染的處理效率評估以及探討對環境之影響。人工溼地包含兩種系統，一為自由表面流動式人工溼地(free water surface system, FWS)，另一為表面下流動式人工溼地(subsurface flow system, SSF)。溼地系統種植香蒲，採並聯方式由同一進流槽連續進流，水力停留時間(HRT)為2天，於進流口及出口定期採樣分析，分析項目包括水樣中達有龍的濃度、COD、DO、SS、pH等水質項目。結果顯示FWS溼地與SSF溼地均能有效去除達有龍，去除率可達61~88%，高於對照組的41~60%。故初步研究中證實，人工溼地有能力去除分解有機性農藥物質，在農地逕流水的污染防治上為一種可行的技術選擇。

關鍵詞：人工溼地、達有龍、香蒲

前 言

台灣地處亞熱帶，屬於高溫多濕的氣候，農作物容易遭受病蟲害，加上所能種植的土地面積有限，為了增加經濟效益，農民普遍使用農藥。這些農藥往往隨著農地逕流水而污染地下水體，包括河川、湖泊、溼地及沿海地區，造成自然生態上的浩劫。達有龍是一種除草劑，屬於含氮的有機農藥，通常使用於鳳梨園、蔗園、柑橘園、茶園作為雜草防治，於土壤中被生物分解所需的時間約為8個月⁽¹⁾，一般施用於田間雜草的去除，大多於種植前先行施藥⁽²⁾。農藥的殘留透過自然水體可能直接或間接影響土壤生態、河流生態甚至海洋生態，例如土壤微生物及土壤中昆蟲或其他生物之社會結構改變，河流海洋中魚、蝦、蟹、貝類種類數量之變遷等。另外，達有龍的殘留也有可能造成作物本身生長上的抑制，例如將達有龍噴灑於田間30天後，可能造成水稻、胡瓜之生長受抑制，尤其濃度高時，更會使植物及土壤之微生物相受到嚴重的威脅⁽³⁾。因此，我們希望藉由人工溼地的處理，能加速達有龍於溼地中分解，減低田間逕流水的農藥量，以保障地下水或河川的品質。

ABSTRACT

Effects of Using Constructed Wetland to Treat Herbicide-Diuron

T. W. Wang*, Y. F. Lin**, S. R. Jing**, D. Y. Lee** and S. W. Huang

**Department of Pharmacy,*

***Department of Environmental Engineering and Health,
Chia-Nan University of Pharmacy and Science,
Tainan, Taiwan 71710, R.O.C.*

ABSTRACT

This research was using a small-scale constructed wetland (CW) system to treat an artificial wastewater containing herbicide, Diuron, to simulate runoff from agricultural land. The main work included building of CW system, stable operation with continuous influent, nutrient addition, and the treating efficient of herbicide. The CW systems used had two types: free water surface wetland (FWS) and subsurface flow wetland (SSF). Both types of wetlands were planted with cattails and connected in series. The hydraulic retention time (HRT) was controlled at about 2 days. Water samples were taken at inflow and outflow of the systems regularly. The constituents measured for the samples were Diuron, SS and COD and the properties of water, including DO and pH, were also recorded. The results showed that both FWS and SSF wetlands did not have apparent difference in removing Diuron and both had 61-88% removal efficiencies, higher than the control system (the removal efficiencies was 41-60%), indicating the removal of Diuron in CW system was degraded by the both plant and microorganisms. Therefore, the CW system has high degrading ability to the organic herbicide. Furthermore, this technique can be an option for pollution control on the runoff from agricultural land.

Key words: Constructed wetland, Diuron, Cattails.