

## A quick and inexpensive method to determine 2,4-dichlorophenoxyacetic acid residues in water samples by HPLC

Naghmeh Orooji<sup>a</sup>, Afshin Takdastan<sup>a,b,c</sup>, Reza Jalilzadeh Yengejeh<sup>a,\*</sup>, Sahand Jorfi<sup>b,c</sup>, Amir Hossein Davami<sup>d</sup>

<sup>a</sup>Department of Environmental Engineering, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran, Tel. +986133163430; Fax: +986133163384; emails: r.jalilzadeh@iauaahvaz.ac.ir (R.J. Yengejeh), n.oroji2007@gmail.com (N. Orooji)

<sup>b</sup>Department of Environmental Health Engineering, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran, emails: afshin\_ir@yahoo.com (A. Takdastan), Sahand369@yahoo.com (S. Jorfi)

<sup>c</sup>Environmental Technologies Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>d</sup>Department of Environmental Management – HSE, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran, email: Davami.ah1352@gmail.com

Received 22 May 2020; Accepted 7 December 2020

---

### ABSTRACT

This study aimed to develop and validate salting-out assisted liquid–liquid extraction (SALLE) with high accuracy for measuring 2,4-dichlorophenoxyacetic acid (2,4-D) in water samples. Several parameters affecting the extraction, including the volume of salting-out solvent, type, and the amount of extracting solvent, pH and the volume of sample solution were optimized. Then, to validate the proposed method, a high-performance liquid chromatography equipped with a C18 column with a UV detector at 283 nm was applied. The optimal salting-out parameters were obtained as follows: 1 mL of acetonitrile was added to 4 mL of sample solution with pH = 2 and 5 mL salting-out solvent containing 5%w/v sodium chloride. Under optimal SALLE conditions, the extraction efficiency was obtained 99.69 % in a calibration curve of 0.01–50 µg/L with  $R^2 = 0.9999$ , and the limits of detection and quantification were 0.004 and 0.01 µg/L, respectively. The recovery percentage of 2,4-D in real samples via the SALLE method was obtained between 95.98 and 115%, confirming the sample's insignificant effect on extraction efficiency. The method was successfully used for the determination of 2,4-dichlorophenoxyacetic acid in water samples containing incurred residue. The procedure proved to be quick, accurate, precise, sensitive, and selective.

**Keywords:** 2,4-dichlorophenoxyacetic acid; Salting-out assisted liquid–liquid extraction; Water; Ahvaz

---

\* Corresponding author.