Accepted Manuscript

The Mechanisms and Process of Acephate Degradation by Hydroxyl Radical and Hydrated Electron

Yuanyuan Huang, Renbang Zhao, Yencon Hung, HuiyuGao, PenghuiZhang, Yang Wang, Mengying Sun, Dan Liu, Shuai Wang

PII: S1319-562X(17)30271-1
DOI: https://doi.org/10.1016/j.sjbs.2017.10.022
Reference: SJBS 1040

To appear in: *Saudi Journal of Biological Sciences*

Received Date: 8 July 2017
Revised Date: 8 October 2017
Accepted Date: 12 October 2017

Please cite this article as: Y. Huang, R. Zhao, Y. Hung, HuiyuGao, PenghuiZhang, Y. Wang, M. Sun, D. Liu, S. Wang, The Mechanisms and Process of Acephate Degradation by Hydroxyl Radical and Hydrated Electron, *Saudi Journal of Biological Sciences* (2017), doi: https://doi.org/10.1016/j.sjbs.2017.10.022

The Mechanisms and Process of Acephate Degradation by Hydroxyl Radical and Hydrated Electron

Yuanyuan Huang [a], Renbang Zhao[a, *], Yencon Hung[b], HuiyuGao[c], PenghuiZhang[a], Yang Wang [a], Mengying Sun[a], Dan Liu[a], Shuai Wang[a]

[a.] *Faculty of Food Science and Technology, Agricultural University of Hebei, Baoding 071000,China*
[b.] *Department of Food Science and Technology, University of Georgia,Griffin30223, USA*
[c.] *National Institute for nutrition and food safety, Chinese center for Disease Control and Prevention, Beijing 100050,China*

**Email of corresponding author:* zhaorenbang@sina.com.

ABSTRACT

The degradation process of acephate in aqueous solution with ·OH and e^-_{aq} produced by ^{60}Co-γ irradiation and electron pulse radiolysis was studied in the present paper. In the aqueous solution, acephate reacted with e^-_{aq} and transformed to transient species which can absorb weakly in the wavelength range of 300nm to 400nm and decay very fast. According to the decay of hydrated electron, the reaction rate constant of e^-_{aq} and acephate is (3.51±0.076) $\times 10^9 dm^3 \cdot mol^{-1} \cdot s^{-1}$. The transient species produced in the reaction of ·OH and acephate do not distinctly absorb the light in the wavelength range of 300nm to 700nm, so the decay and kinetics of the transient species cannot determinedirectly. The competing reaction of KSCN oracephate with ·OH were studied to obtain the reaction rate constant of ·OH and acephate, which is (9.1±0.11) $\times 10^8$ $dm^3 \cdot mol^{-1} \cdot s^{-1}$. Although acetylamide and inorganic ions were determined in the products of the reaction of acephate with ·OH or e^-_{aq}, the concentration of inorganic ions in the products of the reaction of acephate with ·OH is higher than that in the product of the reaction of acephate with e^-_{aq}. Moreover, there were sulfide in the products of the reaction of acephatewith e^-_{aq}. The degradation pathways of acephate by ·OH and e^-_{aq} were also proposed based on the products from GC-MS.

*Keywords:*Acephate; Electron pulse radiolysis; Reaction kinetics; Degradation pathway