The International Journal of Engineering and Science (IJES)
|| Volume || 6 || Issue || 11 || Pages || PP 01-02 || 2017 ||
ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805

The Risk to Soil and Well Water from Atrazine Pesticide Application in Georgia, USA

Thomas M. Kollars, Jr.[1*] and Jason W. Kollars[2]
Department of Health Sciences, Liberty University, Lynchburg, Virginia, USA
Department of Computer Sciences, Georgia Southern University, Statesboro, Georgia, USA
Corresponding Author: Thomas M. Kollars,

ABSTRACT
Atrazine (ATZ) is a herbicide commonly used in the United States and several countries but it is a controversial pesticide. Obesity, neuroendocrine effects, and birth defects have been associated with elevated levels of ATZ in the environment. The type of soil and other environmental conditions affect the level of risk of ATZ contamination in the environment. The Bioagent Transport and Environmental Modeling System has been used in several countries to assess risk of biological/chemical contaminants in the environment. In this study, BioTEMS and geographic information systems were used to identify relative risk in Bulloch County, Georgia, an area important to agricultural production in the southeastern United States.

Date of Submission: 28-08-2017 Date of acceptance: 06-11-2017

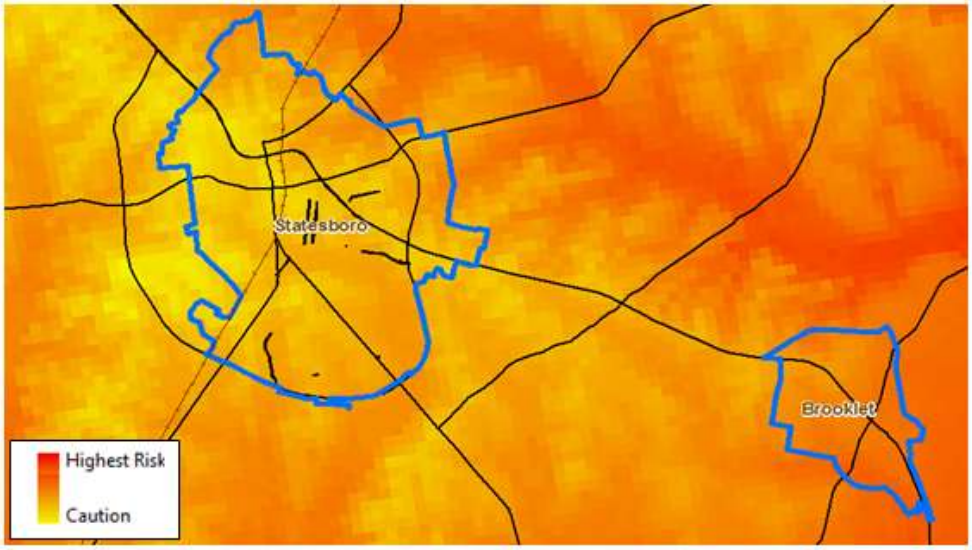
I. INTRODUCTION

Atrazine (ATZ) is one of the top two herbicides used in the U.S. and it is commonly used on commercial golf courses and lawns in the southeast. It is routinely found as a contaminant in surface and ground waters in areas of corn production [1, 2]. ATZ is moderately persistent under normal soil conditions and has low to moderate water solubility [3]. Although beneficial to crop production, atrazine has been shown to act on the neuroendocrine system and to have adverse health effects in unborn children and women; however, there has been some criticism of this research [4] ATZ has also been implicated in obesity in the U.S. [5]. Atrazine is no longer registered for use in Europe but the U.S. EPA has continued to approve its use in the United States [6]. In the state of Georgia, over 50 products containing ATZ are approved for use in agriculture, commercial and/or home use [7].

Corn production in Bulloch County, Georgia, USA ranks 25th in the state [8]. Over 85% of the soil in Bulloch County is composed of sand and sandy loam [9]. The label for the pesticide recommends that Atrazine not be applied to these types of soil near the water table [10], yet it is sold in stores in Bulloch County, including popular stores like Walmart and Lowes, and can be purchased online. The questions could be asked, how often do consumers know the soil type and risk of contamination of their well water, and what is the relative risk of applying ATZ to their immediate environment? A risk map of Bulloch County was developed to assist ATZ users in making the decision of, if and where they should apply ATZ.

ArcGIS geospatial analysis software, Statistica software and the Bioagent Transport and Environmental Modeling System (BioTEMS) were used to analyze geographic information and conduct data analysis. BioTEMS has been used for modeling biological and chemical weapons defense, and infectious diseases in several countries [11, 12]. BioTEMS utilizes up to several hundred abiotic and biotic factors to produce risk and vulnerability assessments for biological agents and infectious diseases. Examples of biotic and abiotic factors include pathogen strain, vector/host relationship, vectorial capacity, host/vector physiology, colonization ability, population dynamics of hosts and vectors, soil, shade, and weather conditions, such as wind, temperature, precipitation, and shade. Analytical methods within BioTEMS include artificial intelligence, fuzzy logic, niche analysis, and general additive regression. BioTEMS was used in the present study to indentify the relative risk of ATZ in Bulloch County (Figure 1). Based upon this information, a person should consider the label, type of soil, depth of water table and the risk of exposure to family members before applying Atrazine to kill weeds in their lawn.

Figure 1. Atrazine Risk to Soil and Well Water if Applied to Lawns and Farms in Bulloch County, Georgia, USA



REFERENCES

[1]. Kolpin DW, Sneck-Fahrer DA, Hallberg GR, Libra RD (1996) Temporal trends of selected agricultural chemicals in Iowa's ground-water, 1982–95: Are things getting better? J Environ Qual 26: 1007–17.
[2]. United States Geological Survey, Measured Atrazine in Streams (2017) water.usgs.gov/nawqa/home_maps/atrazine_streams.html
[3]. Schottler SP, Eisenreich SJ (1994) Herbicides in the Great Lakes. Environmental Science & Technology 28: 2228–32.
[4]. Goodman M, Mandel JS, DeSesso JM, Scialli AR. Atrazine and Pregnancy Outcomes: A Systematic Review of Epidemiologic Evidence. Birth Defects Research Part B, Developmental and Reproductive Toxicology. 2014;101(3):215-236. doi:10.1002/bdrb.21101.
[5]. Lim S, Ahn SY, Song IC, Chung MH, Jang HC, et al. (2009) Chronic Exposure to the Herbicide, Atrazine, Causes Mitochondrial Dysfunction and Insulin Resistance. PLoS ONE 4(4): e5186. doi:10.1371/journal.pone.0005186
[6]. Sass JB, Colangelo A (2006) European Union bans atrazine, while the United States negotiates continued use. Int J Occup Environ Health 12: 260-267.
[7]. Georgia Department of Agriculture, Plant Industry http://www.kellysolutions.com/ga/searchbyproductname.asp
[8]. US Department of Agriculture, (2012) Online Resources, County Profiles/Georgia https://www.agcensus.usda.gov.
[9]. United States Geological Survey, (Accessed 2017) Soil Data Mart.
[10]. University of Kentucky, Drexel, (Accessed 2017) http://pest.ca.uky.edu/PSEP/Private/Drexel%20Atrazine%204L.pdf
[11]. Kollars, TM (2008) BioTEMS-Biology based modeling to determine Bioagent fate. Chemical Biological Weapons Delivery Methods and Consequence Assessment Modeling Conference. National Geospatial Intelligence Center. Weapons Intelligence, Nonproliferation and Arms Control.
[12]. Kollars, TM (2017) Assessing likely invasion sites of Zika virus infected mosquitoes and naval maritime ports in Florida. Res Rep Trop Med. 8:1-6.

Thomas M. Kollars The Risk to Soil and Well Water from Atrazine Pesticide Application in Georgia, USA." The International Journal of Engineering and Science (IJES), vol. 6, no. 11, 2017, pp. 01-02.