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The Selenium Levels in Non-irrigated and Irrigated Fields in North Central Kansas.

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ABSTRACT

This experiment examined the selenium content in soils irrigated with water from Kirwin Reservoir in North Central Kansas. Soil samples were taken from adjoining irrigated and non-irrigated fields that had the same soil types. There were six fields consisting of at least 20 acres at three different locations. Samples were taken once for every 5-6 acres. The samples were then ground in a soil grinder and composited from each field. The samples were then analyzed for the active selenium. No significant differences were found between the non-irrigated and irrigated fields. Thus, there is no evidence that irrigation water from Kirwin Lake is adding selenium to the soil.

INTRODUCTION

Selenium is a natural occurring trace element that comes from weathering of natural rock formations (Venugopal & Luckey:1978). Recent studies show that there is an increase in selenium in the water content of Kirwin and Webster Lakes located in North Central Kansas. These studies raised great concern with the local farmers and with the Kirwin Irrigation District. EPA has established a water level of 5 micrograms per liter to protect fresh water aquatic life from chronic levels of selenium (Dugan & Frankenberger:1998). Selenium exceeding this criterion may be toxic to fish and mammals (including humans). High levels of selenium may lead to reproductive impairment and/or birth defects. Furthermore, selenium bioaccumulates within an organism, then biomagnifies through the food chain (Baath:1989).

Some of the selenium tests on water from the Kirwin Irrigation Canal in North Central Kansas showed an increase in selenium. There have been 10 tests done by the Bureau and 8 out of the 10 concluded that the water contained higher levels of selenium than EPA acceptable levels. The purpose of this study was to compare the difference in soil levels of selenium in irrigated fields and non-irrigated fields.

MATERIALS AND METHODS

The first step in this study was to select six different fields which consisted of at least 20 acres, three irrigated and three non-irrigated. Irrigated fields had been irrigated for at least 20 years. The fields were along laterals coming off the main Canal of the Kirwin Lake in Phillips and Smith Counties in North Western Kansas. The first location was at lateral 16.5, the second at 11.6, and the third at lateral 21. The laterals are numbered according to the miles away from the reservoir. There is a total of 90 miles of canals and laterals that comes out of this reservoir.

Each field sampled was close to its comparison field (irrigated or non-irrigated). Hord silt loam soil was the soil type at all of the locations. The Hord silt loam is nearly level in broad, smooth, small to large areas. The permeability is moderate and the water capacity is high. It is the most common irrigated soil type found in Smith and Phillips Counties (Hamiliton, 1978). One soil sample was taken for every 5-6 acres. A soil probe was used to take soil samples at the depth of 6 inches. The samples were air-dried by putting each individual sample in drying plates until dry. The samples were then ground and sieved through a 1.19 mm sieve. Twenty grams of soil was taken from each sample and composited by individual field. The samples were then sent to SDK laboratories in Hutchinson, Kansas where the amount of bioactive selenium was measured in ppm using aqua regia digest, hydride geteration and atomic absorption spectrophotometry.

RESULTS

No significant differences were found in selenium levels between irrigated and non-irrigated fields. In the first location there was 0.33 ppm of bioactive selenium in the irrigated field and the non-irrigated field had 0.30 ppm. In the second location the irrigated field had 0.30 ppm and the non-irrigated field had 0.31 ppm. In the third location the irrigated field had 0.30 ppm and the non-irrigated field had 0.31 ppm.

DISCUSSION

The fields that were tested showed no increase in the amount of bioactive selenium due to irrigation. This shows that the Kirwin Irrigation District is not adding bioactive selenium to the fields through its irrigation canals. The selenium content that is in these fields is no higher than natural levels. This is important information for the Kirwin Irrigation District so that they can continue delivering water without increasing selenium in the soil.

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