

Nitrate Contamination in the groundwater of the Lake Acıgöl Basin, SW Turkey

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The lacustrine Acıgöl basin, formed as an extensional half-graben, hosts various bodies of water, such as cold-hot springs, lakes, streams, and wells. The hydrologically closed basin contains a hypersaline lake (Lake Acıgöl) located in the southern part of the basin. The brackish springs and deep waters discharged along the Acıgöl fault zone in the southern part of the basin feed the hypersaline lake. Groundwater is used as drinking, irrigation, and domestic water in the closed Acıgöl Basin. Groundwater flows into the hypersaline lake from the highland. The Acıgöl basin hosts large plains (Hambat, Başmakçı, and Evciler). Waters in agricultural areas contain high amounts of nitrate; groundwater samples in agricultural areas contain nitrate levels higher than 10 mg/L. Nitrate concentrations in the groundwater samples varied from 0 to 487 mg/L (n=165); 25.4 % of the groundwater samples from the basin had nitrate concentrations above 10 mg/L (the WHO drinking guideline) and 52.2% of the groundwater samples from the basin had nitrate concentrations above 3.0 mg/L, and these high values were regarded as the result of human activity. The highest nitrate values were measured in the Hambat plain (480 and 100 mg/L) and Yırce Pınarı spring (447 mg/L), which discharges along the Acıgöl fault zone in the southern part of the basin. The average multi-temporal nitrate concentration of the Yırce Pınarı spring was 3.3 mg/L. Extreme nitrate values were measured in the Yırce Pınarı spring during periods when sheep wool was washed (human activity).

The lowest nitrate concentrations were observed in some springs that discharged along the Acıgöl fault zone in the southern part of the basin. Nitrate was not detected in deep groundwater discharged along the Acıgöl fault zone. Nitrate concentrations in deep groundwater and some springs discharged along the Acıgöl fault zone and those feeding the hypersaline lake were significantly affected by redox conditions. Nitrate in these reducing waters was transformed into ammonium. Nitrate concentrations in the Acıgöl Basin were enriched in groundwater beneath agricultural areas and this affected redox conditions. The main source of nitrate contamination was agricultural fertilizers. Elevated nitrate concentrations in groundwater, especially in agricultural areas of the Acıgöl Basin, can cause public health problems and environmental pollution.