Field Evaluation of Polymer Sealants to Control Seepage in Colorado Irrigation Canals

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A large amount of water diverted for irrigated agriculture in the Cache la Poudre River Basin seeps from earthen canals during conveyance to irrigated fields and results in a variety of environmental and economic damages. Canal seepage not only leads to water loss, but also contributes to mobilization and transport of subsurface pollutants and to shallow saline water tables which reduce crop yields. The cost of lining canals with conventional materials (concrete, geomembranes, etc.) is usually prohibitive and can exceed the benefits in many agricultural applications. Thus, there is a need for a seepage control technology that (i) leads to marked reduction in agro-environmental damages, (ii) is cost-effective, (iii) is easy to apply, and (iv) can allow groundwater recharge when needed.

This project proposes to evaluate the promise of polymers, both synthetic (with very high molecular weight and very low acrylamide monomer percentage) and biopolymers to reduce seepage from unlined irrigation canals in Northern Colorado. This applied research will be accomplished through the following set of objectives:

1. To collect field data, including the soil type in the canal perimeter and the suspended solid concentration in the canal water, that are representative of earthen canals in Colorado. Field samples will be used to simulate the field conditions in a controlled lab setting and will be treated with different polymers at varying concentrations to suggest an optimum combination of the polymer type and treatment level.
2. To use the lab findings to guide field-scale demonstrations of polymer treatment on one or two reaches of selected irrigation canals. The idea is to apply the polymers in granular form over the canal water surface which forms flocs with the suspended sediment in the water. The polymer-sediment flocs, upon settling, will clog the canal wetted perimeter and reduce the seepage rate. Pre-and-post treatment seepage tests will be conducted in the field to quantify the magnitude of field seepage reduction as a result of polymer application.
3. To communicate with agricultural stakeholders about the importance and best practices of canal seepage control using polymer sealants.

The scope of this research was identified in conjunction with our communications with the canal managers of the Larmier & Weld Irrigation Canal and the Poudre Valley Canal. The candidate student will work with the canal company, and possibly directly with farmers, while conducting the field seepage tests and polymer application. Along with contributing to the understanding of polymer effectiveness, the student will learn about the dynamics of working in the field with agricultural stakeholders, enhancing his/her personal and professional development in problem-solving. The student will share bi-weekly progress reports and meet online monthly to discuss methods and concerns, and will present a final oral and written report to the Board of Directors of the Larimer and Weld Irrigation Company. Financial support for equipment, supplies, and travel will be provided by supplemental sources.