

Quantification of Effect of Linear Anionic Polyacrylamide on Seepage in Irrigation Channels

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Abstract : In Chile, the water for irrigation and hydropower generation is delivered essentially through unlined channels on earth, which have high seepage losses. Traditional seepage-abatement technologies are very expensive. The goals of this work were to quantify water loss in unlined channels and select reaches to evaluate the use of linear anionic polyacrylamide (LA-PAM) to reduce seepage losses. The study was carried out in Maule Region, central area of Chile. Water users indicated reaches with potential seepage losses, 45 km of channels in total, whose flow varied between 1.07 and 23.6 m³ s⁻¹. According to seepage measurements, 4 reaches of channels, 4.5 km in total, were selected for LA-PAM application. One to 4 LA-PAM applications were performed at rates of 11 kg ha⁻¹, considering wet perimeter area as basis of calculation. Large channels were used to allow motorboat moving against the current to carry-out LA-PAM application. For applications, a seeder machine was used to evenly distribute granulated polymer on water surface. Water flow was measured (StreamPro ADCP) upstream and downstream in selected reaches, to estimate seepage losses before and after LA-PAM application. Weekly measurements were made to quantify treatment effect and duration. In each case, water turbidity and temperature were measured. Channels showed variable losses up to 13.5%. Channels showing water gains were not treated with PAM. In all cases, LA-PAM effect was positive, achieving average loss reductions of 8% to 3.1%. Water loss was confirmed and it was possible to reduce seepage through LA-PAM applications provided that losses were known and correctly determined when applying the polymer. This could allow increasing irrigation security in critical periods, especially under drought conditions.

Keywords : canal seepage, irrigation, polyacrylamide, water management

Conference Title : ICAEE 2017 : International Conference on Agricultural and Environmental Engineering

Conference Location : Melbourne, Australia

Conference Dates : November 29-30, 2017