YONTS, C. DEAN[1]*, BRIAN L. BENHAM[2], JURG M. BLUMENTHAL[1] and RICHARD B. FERGUSON[2], [1]University of Nebraska, 4502 Ave. I, Scottsbluff, NE 69361 and [2]University of Nebraska, Box 66, Clay Center, NE 68933. **Polyacrylamide effects on irrigation performance and sediment yield.**

Abstract

In Nebraska, the Natural Resources Conservation Service estimates that soil erosion due to surface irrigation is between 7-8 t/ac/yr. Soil erosion on fields planted to sugarbeet are likely to be greater because of the increased number of irrigations due to the longer growing season compared to other crops. Polyacrylamide(PAM) is a long-chain high molecular weight polymer that when mixed with irrigation water stabilizes near-surface soil particles by forming polymer nets around existing soil aggregates. PAM reduces erosion by maintaining the integrity of the top few millimeters of the soil's structure and essentially keeps sediments in place.

During 1999 and 2000 a study was conducted to compare the performance of surge irrigation with conventional irrigation, both with and without PAM mixed in the irrigation water. A randomized complete block design was used to test the four treatments. PAM was injected into the irrigation water at a rate of 10 ppm and was only added during the first irrigation. Furrow evaluations were made during the first three irrigations of the season. Measured parameters included furrow inflow and outflow, furrow advance time and sediment discharge. A total of seven sites were tested during the two year period, three in 1999 and four in 2000. Furrow irrigation advance time to 1000 ft and total sediment loss at 1000 ft were measured for the first three irrigations.

During the first irrigation, furrow advance times to 1000 ft for surge irrigation were nearly equal to or less than the corresponding conventional irrigation treatment. This trend generally continued for the second and third irrigations. Overall when PAM was added to the irrigation water, furrow advance times were equal to or greater than the corresponding no PAM treated furrow.

Total sediment loss was reduced when PAM was added to the irrigation water during the first irrigation for both surge and conventional irrigation. This trend continued for the second and third irrigations even though PAM was not added to the irrigation water during these irrigations.

Field slope was between 0.5 - 0.8% for all sites except one which had a field slope of 1.9%. At the 1.9% slope site total sediment loss for the first three irrigations was 0.5 t/ac for surge irrigation without PAM and over 1.0 t/ac for conventional irrigation without PAM. The corresponding PAM treated furrows at this site had erosion rates of less than 0.05 t/ac for surge irrigation and 0.005 t/ac for conventional irrigation.

For the six sites with field slopes less than 0.8%, total sediment loss was generally less than 0.05 t/ac. At three of these sites sediment loss was measured to be less than 0.01 t/ac or 20 lb/ac. At these levels of furrow irrigation induced soil erosion, the use of PAM on fields with little slope may not be practical if the sole purpose for its use is to stop soil from leaving the field. The use of PAM may however provide a method of maintaining furrow structure for a longer period of time into the irrigation season. In addition, PAM would also allow for the use of greater furrow stream sizes as one method to improve irrigation uniformity without the concern for increased furrow erosion.