Farmers fighting and winning the soil loss battle

PAM keeps soil where it belongs

Good soil is the foundation of productive farms. Farmers are concerned about the impacts of soil loss through erosion on their farm. Many farmers are also concerned about the impact of erosion on the environment.

Too much sediment in a river can cause a myriad of water quality problems. Sediment carries with it applied nutrients such as phosphorus. These nutrients spur algae growth that robs fish and other aquatic life of the oxygen they need to live.

Malheur County farmers have been applying polyacrylamide, or PAM, to control furrow irrigation-induced soil erosion for many years.

PAM works to control erosion by binding soil particles together and by settling soil particles already suspended in water.

Most farmers apply PAM directly into the irrigation water as it is put on the field. Another method is to spread the chemical in its granular form into the furrow prior to irrigating.

Preapplication saves time because the farmer can distribute the PAM from the tractor while forming the furrows and cultivating fields to remove weeds.

Recently the Malheur Watershed Council and the Oregon Department of Agriculture conducted a test to determine the effectiveness of pre-irrigation PAM application in preventing excessive amounts of sediment reaching the Malheur and Snake Rivers.

Testing pre-irrigation PAM application

We compared two levels of PAM, 1.75 pounds per acre and 0.875 pounds per acre, applied directly to the furrow as the farmer cultivated his field prior to irrigation.

PAM covered the entire length of the furrow with the higher application rate. At the lower rate, the farmer left the center half of the furrow bare and applied PAM at the top and bottom ends of the furrow.

Our approach consisted of observing turbidity levels in the field, and taking samples for lab analysis.

We took our samples at the end of four furrows for each type of PAM treatment. We also measured water in four furrows where no PAM was applied, which served as a check.

We also wanted to see if PAM controlled erosion for an extended period of time, so we collected samples just as the water hit the end of the furrow, after one hour, and after three hours.

The lab technicians measured nitrogen, phosphorus, and the amount of suspended solids in these samples.

After getting the results back from the lab, we used a variety of statistical techniques to determine if the differences we observed were due to the PAM treatments.

Pre-application of PAM significantly reduced phosphorus, nitrate, suspended solids, and turbidity levels in irrigation return flows.

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Results

Our analysis shows that pre-applying PAM effectively reduces irrigation-induced erosion. Turbidity levels in furrows treated with PAM were about half what they were in the untreated furrows. The same was true for Total phosphorus, nitrate, and suspended solids. These differences were statistically significant.

Differences between covering the entire length of the furrow with PAM and only applying to the top and bottom ends were small. The results show that farmers could apply smaller amounts of PAM and still effectively control irrigation-induced erosion. The statistical tests we used indicated the majority of the observed differences were between applying PAM and not applying PAM at all.

PAM was still controlling erosion three hours after the irrigation water reached the end of the furrow. Figures 1 and 2 are examples of how the effects of PAM changed over time.

For both Total phosphorus and suspended solids, PAM's performance improved as time passed. The furrows with no PAM application showed reduced levels of phosphorus and suspended solids after one hour, but by the third hour the levels began to climb.

We found only small differences between the two rates of pre-applied PAM we tested. Farmers can apply small amounts of PAM and still control erosion.

An important question for future studies will be how long pre-irrigation-applied PAM controls erosion. Many farmers have irrigation sets lasting 12 or 24 hours; future study findings will be important in achieving maximum effectiveness with PAM in agricultural practices.

Key Findings

- Applying PAM prior to irrigating is not only convenient for the farmer, it effectively controls irrigation-induced erosion and substantially reduces turbidity, nitrates, Total phosphorus, and suspended solids.
- We found only minor differences between applying PAM for the entire length of the furrow versus applying at the top and bottom leaving the middle of the furrow bare.
- PAM remained effective for at least three hours.

PAM **No PAM**

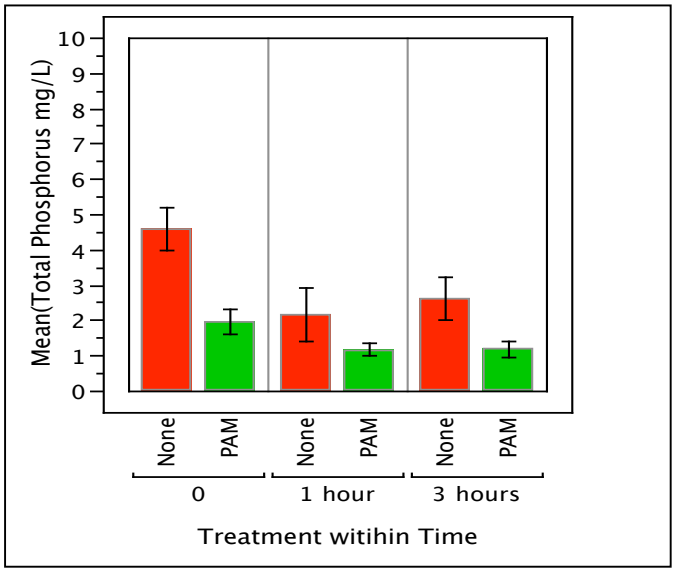

Figure 1. The effect of applying PAM prior to irrigation on Total phosphorus levels in irrigation return flows

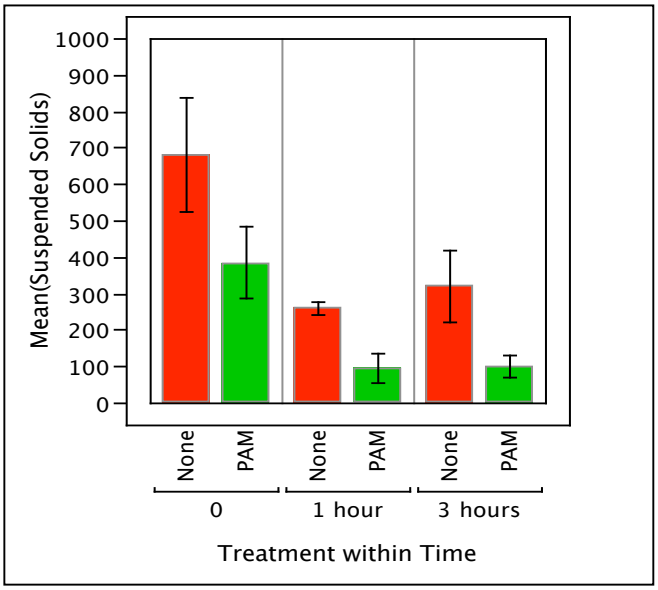

Figure 2. The effect of applying PAM prior to irrigation on suspended solid levels in return flow

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