Summary Research Progress Report for 1998 and Research Proposal for 1999

Submitted to:

SLV Research Center Committee and the Colorado Potato Administrative Committee (Area II)

Title: Potential Losses of Eptam During Sprinkler Application and the Influence of Soil Moisture Levels at Time of Application on Efficacy

Project Leaders: Dr. Scott Nissen, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, and Dr. Susie Thompson-Johns, Department of Horticulture and SLV Agricultural Experiment Station, Center, CO.

Project Justification: Eptam is an important herbicide in potato production across the US. In the SLV, Eptam remains one of the most consistent and economical herbicides for the control of volunteer barley and wild oat. In addition, Eptam can provide good to excellent nightshade and pigweed control; however, control of these weed species can also be highly variable. This variability in control can be the result of several factors, such as losses during chemigation, application in very high volumes of water that exceed soil infiltration rates or reduced residual activity due to increased microbial degradation.

Herbicides have traditionally been applied by chemigation in the SLV and this has provided growers with a reliable and efficient application method. Many herbicides currently used in potato production are well suited to chemigation; however, Eptam is probably not well suited to this application method. Research conducted at Washington State University suggests that temperature and wind speed can have a significant impact on Eptam losses during chemigation. Studies in the midwest have demonstrated that continued use of Eptam can result in reduced residual activity due to enhanced microbial degradation. This research, conducted with support from the CPAC (Area II), was designed to make sure that growers achieve the best results possible from Eptam so it will continue to be a useful product for weed control in the SLV.

Project Status: This project is on going but this will probably be the last funding request for Eptam research (unless additional research is requested by the research committee).

Significant Accomplishments for 1998: Research conducted in 1998 evaluated several remaining unanswered questions about Eptam behavior in the SLV. Previous research had established that 1) Eptam could be lost during the chemigation 2) application to wet soil or over irrigation while chemigating could result in even greater Eptam losses 3) the residual activity of Eptam in soil is highly variable in the SLV (1/2 life ranging from 1 to 7 days) 4) Eptam losses during chemigation are related primarily to air temperature and at temperatures in the range of 60F to 70F, volatility losses are significant.

Results of 1998 field research in the SLV

- A small portable chemigation unit was designed to evaluate the effects of air temperature on volatility losses of Eptam during chemigation. Water samples were collected during simulated chemigations at 6:30 am, 10:30 pm and 2:30 pm. This provided a range of air temperatures between 50F and 80F. Eptam losses increased with increasing air temperature, at 50F volatility losses averaged around 25%, while at 80F losses averaged 40 to 45%. Eptam losses increased 0.7% per one degree increase in air temperature.

- Reducing the nozzle height from 6ft to 3ft did decrease losses due to volatility; however, losses were reduced by only 9% at 80F.

- Etpam degradation was evaluated under controlled conditions to evaluate residual activity in a SLV soil. Soil was collected from the field site where previous research had been conducted. The soil was a sandy loam with 0.9% OM and was collected from a field site with a barley/potato/carrot rotation. The soil was divided into two groups and kept at field capacity during the course of the experiment. Half the soil was treated three times with Eptam at 1 ppm and treatments were separated by 30 days. The remaining soil received only one application of Eptam. Eptam degradation was monitored over a 30 day period. In the soil receiving 3 treatments of Eptam, only 5% of the herbicide remained after 3 days, while in the soil receiving a single Eptam application, 50% of the herbicide remained intact after 7 days. This project demonstrated that the half- life of Eptam under normal conditions (a single application, every other year) would be around 7 days. This is very similar to previously published research. On the other hand, split applications of Eptam and use in consecutive years could result in very little residual activity. This has also been demonstrated many times.

- Ground applications of Eptam followed by sprinkler incorporation could be a viable alternative to chemigation. Based on field research on the SLV research station, growers should be able to applied Eptam and wait up to 48 hours before sprinkler incorporation.

- Demonstration plots of common potato herbicides were available for the SLV summer field tour. Eptam alone at rates up to 6 pt/ac did not provide adequate nightshade control; however, tank mixes with metribuzin and Matrix provided good to excellent nightshade control. Matrix is not yet available for use in the SLV.

Objectives for 1999: Field research results have provided growers with valuable insights into Eptam behavior under environmental conditions in the SLV. Growers now have the information necessary to make educated choices about the use of Eptam.

Objective 1: Determine the maximum amount of time between broadcast applications of Eptam and sprinkler incorporation.

Results from the 1998 field study were encouraging; however, year to year variation could result in an unexpected loss of Eptam activity. This project will be repeated in

1999 and Eptam will be applied at two rates, 1 and 3 pt/ac. Times between application and sprinkler incorporation will be 0, 12, 24, and 48 hours.

Objective 2: Determine the movement of Etpam in the soil profile with different amounts of water for incorporation.

Weed control with broadcast applications of Eptam followed by sprinkler incorporation will depend on two components. The first will be making sure that the Eptam is incorporated in a timely manner and the second will be applying a sufficient but not excessive amount of water for activation and incorporation. The distribution and concentration of Eptam in the zone of weed germination will be critical for weed control. Eptam will be broadcast applied and incorporated with 0, 0.25, 0.5, 0.75 and 1.0 inch of water. Soil samples will be taken 24 hours after application to a depth of 6 inches, divided into 2 inch increments and analyzed for Eptam. This should provide excellent information about the amount of water needed for efficient incorporation.

Objective 3: Evaluate how Eptam distribution in the soil affects weed control.

The movement of Eptam in the profile could significantly impact weed control. Eptam absorption is thought to occur at the hypocotyl of germinatng weed seeds. Moving Eptam below that zone of absorption could significantly influence weed control. What appears to be an ideal distribution of Eptam in the previous experiment may not provide adequate weed control. This study will be conducted as a greenhouse experiment using barley and pigweed as indicators of Eptam activity. Soil columns will be constructed and weed seeds will be planted at a depth of 2 inches. Eptam will be applied as previous described and incorporated with the 0.25,0.5, 0.75, and 1.0 inches of water. Barley and pigweed response will be compared to untreated controls.

Funding Request:

1998 Allocation: $12,000

1999 Request

Item	Cost
Field Support Salaries-technical, student hourly	$2,500
Laboratory Support Salaries-research associate, student hourly to prepare soil samples	5,000
Travel-vehicle rental, lodging, food	1,000
Supplies-greenhouse, laboratory, field	1,500
Total	**$9,500**

Research Proposal for 1999

Submitted to:

SLV Research Center Committee
and the Colorado Potato Administrative Committee (Area II)

Title: Comparison of Potato Vine Kill with Diquat, Desicate II, Superquick and Liberty

Project Leaders: Dr. Scott Nissen, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, and Dr. Susie Thompson-Johns, Department of Horticulture and SLV Agricultural Experiment Station, Center, CO.

Project Justification: Potato vine killing before harvest is a common practice that aids in harvest efficiency and weed control. Killing vines several weeks before harvest allows stolons to loosen from tubers, develops tuber maturity, sets skin and decreases vine quantity. Potato vine kill can also be an important tool for management of late blight. Vines infected with late blight must be removed from the field or desiccated to point where the vines can no longer support the fungus.

In the SLV, most vines are killed with sulfuric acid, while in other parts of the state, Diquat has become the most common means of potato vine desiccation. Sulfuric acid is very effective and causes the most rapid rate of vine desiccation. Diquat can also be a very effective desiccant if weather conditions cooperate after application. If the weather turns cool or showery after application plants can sprout new shoots from axillary meristems. This can affect bulking and this new tissue can support late blight.

There are two other vine desiccation products that could be used for potato vine kill and a third product, developed by AgrEvo, that could be useful. Desicate II or endothall is currently labeled for potato vine desiccation in Colorado, but little information is available on how well this product works. Superquick is new formulation of Enquick that is applied at a rate of 5 gallons/ac. Superquick is a combination of sulfuric acid and urea. Again limited efficacy information is available for Superquick under conditions in the SLV. AgrEvo is marketing Liberty or glufosinate for weed control in corn and sugarbeets. Liberty does not translocation readily, has activity similar to Diquat and would be much safer to handle than sulfuric acid or Diquat. Liberty could be a good alternative to Diquat.

Project Status: New project

Objectives for 1999:

- Evaluate the efficiency of vine desiccation with Diquat, Desicate II, Superquick, and Liberty under field conditions in the SLV. Desiccants will be applied alone, in combination and sequentially. Combinations will be based on Desicate II in combination with Diquat, Liberty and Superquick. Sequential applications will include Desicate II followed in 5 to 7 days with Diquat or Liberty. Plots will be evaluated for leaf drop and vine desiccation.

- Evaluate bulking after vine kill. Bulking after vine kill may or may not be desirable. In theory, plants killed with sulfuric acid are not likely to bulk after application, while vines killed with Diquat, Desicate II or Liberty could show considerable bulking. Assuming that late blight is not present, bulking rates of key treatments would be evaluated. Two additional treatments would be added. One would be natural plant death and the other would mechanical vine removal. Tuber yield and quality would be evaluated 14 and 21 days after treatment.

Funding Request:

1999 Request

Item	Cost
Field Support Salaries-technical, student hourly -establishing plots -applications -harvest, grading, data analysis	$3,000
Travel-vehicle rental, lodging, food	500
Miscellaneous Supplies	500
Total	**$4,000**