**Summary Research Progress Report for 1999**
**and Research Proposal for 2000**

**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:

**Significant Accomplishments for 1999:** Field research conducted in the SLV in 1998 suggested that growers making ground applications of Eptam and incorporating with sprinkler irrigation could wait 48 hour before incorporation. This experiment was conducted using Eptam at a rate of 4 pt/ac with barley as an indicator species. This rate of Eptam provided 100% barley control regardless of incorporation timing; however, Eptam rates of 1 pt/ac have been should to significantly reduce barley growth under greenhouse conditions. A greenhouse experiment was conducted to using soil collected from the SLV and Eptam rate of 1 pt/ac to more clearly establish the influence of time between ground application and sprinkler incorporation on Eptam performance.

**Results of 1999**

- Barley was planted in pots at two depths: 1.5 and 3.0 inches. Eptam was applied at a rate of 1 pt/ac and incorporated with sprinkler irrigation 0, 12, 24, 48 hours after herbicide application. Barley planted 1.5 inches deep was completely controlled when Eptam was incorporated 0 and 12 hour after treatment (HAT) (Figure 1). Barley control decreased after 12 hours. Barley emergence was approximately 40% of the untreated control 48 HAT.

- Eptam did not adequately control barley when it was planted at a depth of 3 inches, regardless of the time between application and incorporation.

- The effect of the amount of water used for incorporate on Eptam distribution in the soil profile was evaluated in a different experiment. Soil profiles were reconstructed from soil collect from a potato field near Monte Vista. Profiles were reconstructed in a PVC pipe made up of five sections. The sections were 0-1, 1-2, 2-3, 3-6, 6-12. Eptam was applied to the pots using greenhouse sprayer at a rate of 4 pt/ac. Eptam was incorporated with 0, 0.25, 0.5 and 1.0 inches of water. Columns were allowed to equilibrate for 4 hours before sections were separated and analyzed for Eptam concentration using GC-MS.

- The 0-1 inch section of the column that was not watered contained approximately 8 mg of Eptam and that was considered 100% of the total Eptam available in the other columns. Eptam remained primarily in the 0-1 inch section regardless of the amount of water used for incorporation. Using less water appeared to cause more problems than using too much water. Only 35% of the Eptam was accounted for when 0.25 inches of water was used for incorporation compared to 68 and 61% when 0.5 and 1.0 inch were used, respectively. The maximum amount of Eptam moving below the 0-1 depth was only 10.5% when 1.0 inch of water was used for incorporation.

- It is assumed that the other 32% or more of the Eptam was lost due to volatility during incorporation. This part of the project is on going and final report will be provide later this year.

## Funding Request:

**1999 Allocation: $9,500**

**No Funding request for 2000**

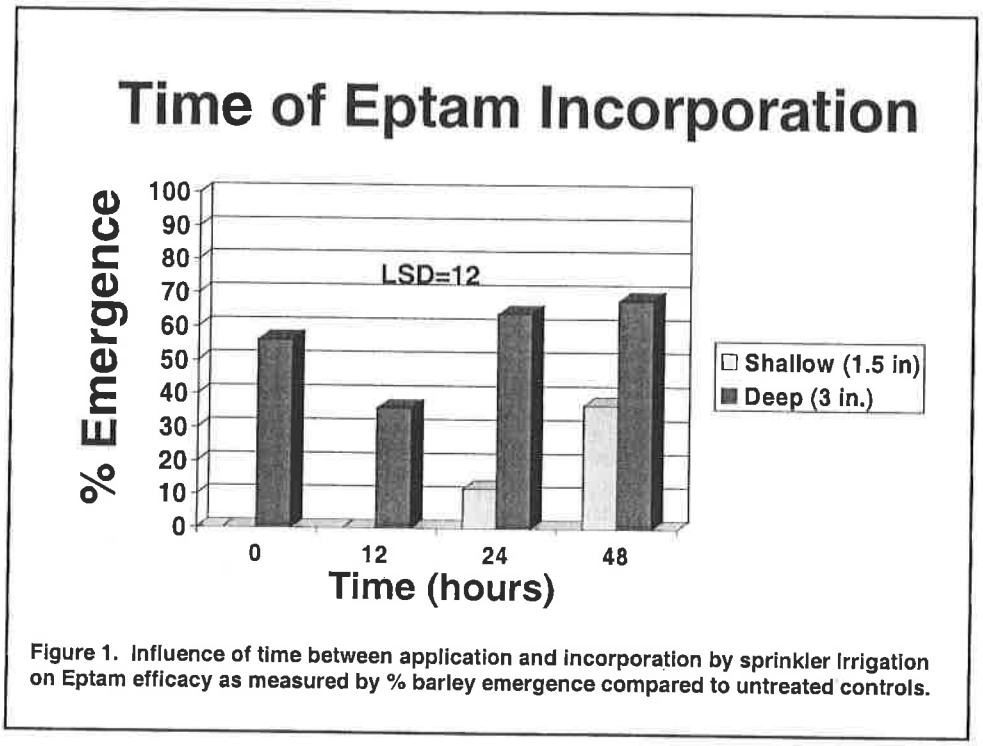


Figure 1. Influence of time between application and incorporation by sprinkler irrigation on Eptam efficacy as measured by % barley emergence compared to untreated controls.

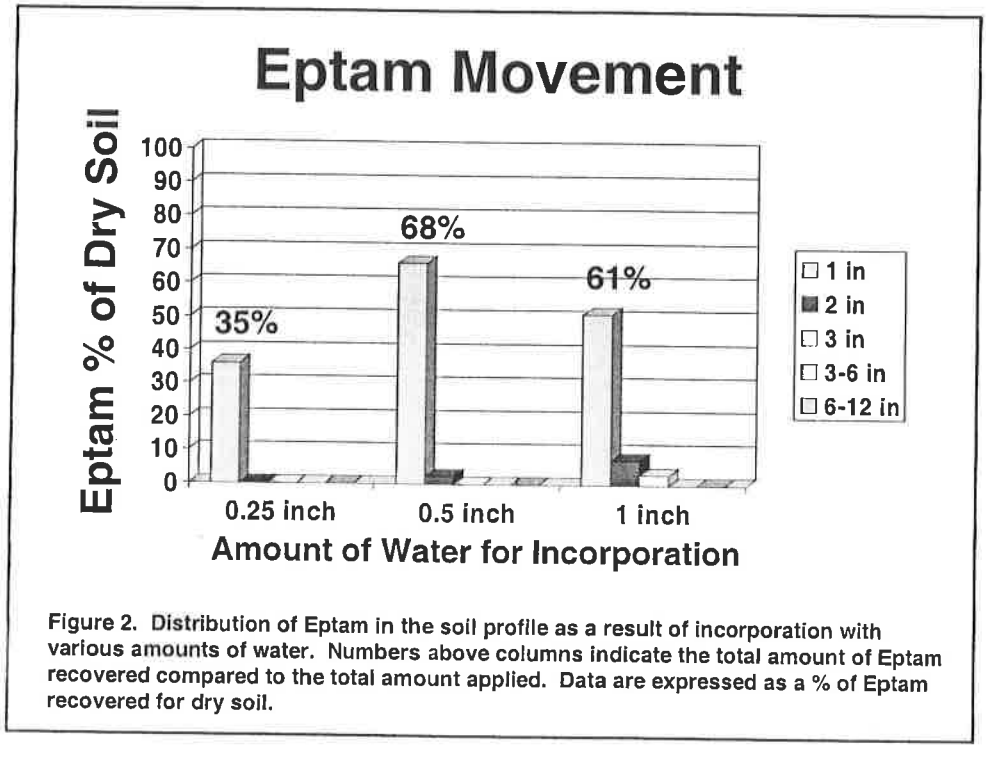


Figure 2. Distribution of Eptam in the soil profile as a result of incorporation with various amounts of water. Numbers above columns indicate the total amount of Eptam recovered compared to the total amount applied. Data are expressed as a % of Eptam recovered for dry soil.

**Summary Research Progress Report for 1999**
**Research Proposal for 2000**

**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, Rely and Spotlight

**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 and skin set 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. Combining fungicides with vine killing materials could be very important for late blight management.

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 four other vine desiccation products that could be used for potato vine kill in addition to sulfuric acid and Diquat. 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 received a label for "Rely" for 2000 as a potato vine desiccant. Rely translocates more readily than Diquat and should not be used on seed potatoes because it tends to inhibit sprouting. FMC has developed a product called Spotlight, being used as a desiccant in Europe.

**Project Status: Continuing**

**Significant Accomplishments for 1999:**

- Based on research conduct with Area III growers, Nuggets are more difficult to vine kill than Norkotahs. The experiment was originally designed to evaluate single applications that were applied on September 3 and were to be rated for % leaf drop, % green stems and % regrowth on September 9 or 10. Russet Nuggets were not responding at the same rate as Norkotahs so plots were retreated on September 9.

- Tank mix combinations of Desicate II/Diquat, Desicate II/Rely, and Desicate II/Spotlight were applied on September 9 and not retreated. These treatments resulted in % leaf drop of between 58% and 78%, seven days after treatment (DAT). Percent leaf drop increased to between 77% and 92% fourteen days after (DAT). All these treatments had about the same percentage of stems that remained green 14 DAT (about 25%) and with regrowth ranging from 5% to 9% (Figure 1, 3,5).

- Sequential applications in general resulted in greater % leaf drop, lower % green stems and lower % regrowth than single applications. The best results were obtained with two applications of Rely or a tank mix of Desicate II/Superquick followed 7 days later with a second application of Superquick. Split applications of Diquat (considered a standard treatment) produced intermediate results and the least effective treatment was sequential applications of Superquick (Figure 2,4,6).

- Rely appears to be slower acting then other vine desiccation products and does not cause rapid stem desiccation; however, Rely does appear to move in the plant and significantly reduce re-sprouting of axillary stem buds.

## Objectives for 2000:

- Continue evaluation of vine desiccation with Diquat, Desicate II, Superquick, Rely and Spotlight under field conditions in the SLV. Desiccants will be applied in combination and sequentially. Combinations will be based on Desicate II in combination with Diquat, Rely and Superquick. Sequential applications will include Desicate II followed in 5 to 7 days with Diquat, Rely and Spotlight. Comparisons will be made to single applications of Diquat and Rely. Plots will be evaluated for leaf drop and vine desiccation.

## Funding Request:

**1999 Allocation: $4,000**

**2000 Request: $4,000**

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

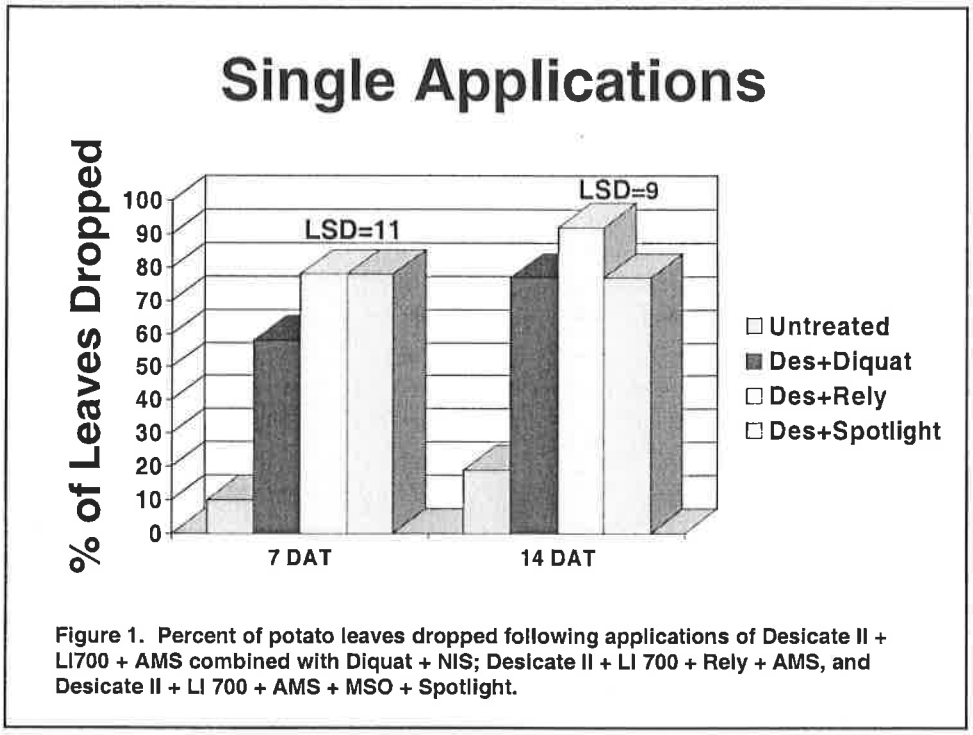


Figure 1. Percent of potato leaves dropped following applications of Desicate II + LI700 + AMS combined with Diquat + NIS; Desicate II + LI 700 + Rely + AMS, and Desicate II + LI 700 + AMS + MSO + Spotlight.

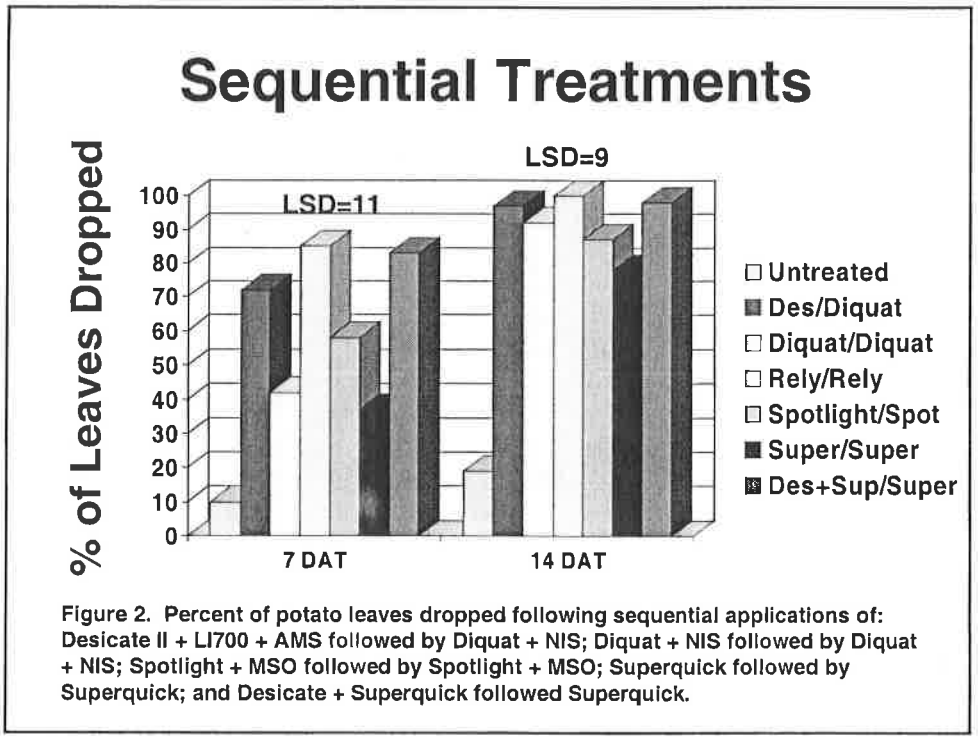


Figure 2. Percent of potato leaves dropped following sequential applications of: Desicate II + LI700 + AMS followed by Diquat + NIS; Diquat + NIS followed by Diquat + NIS; Spotlight + MSO followed by Spotlight + MSO; Superquick followed by Superquick; and Desicate + Superquick followed Superquick.

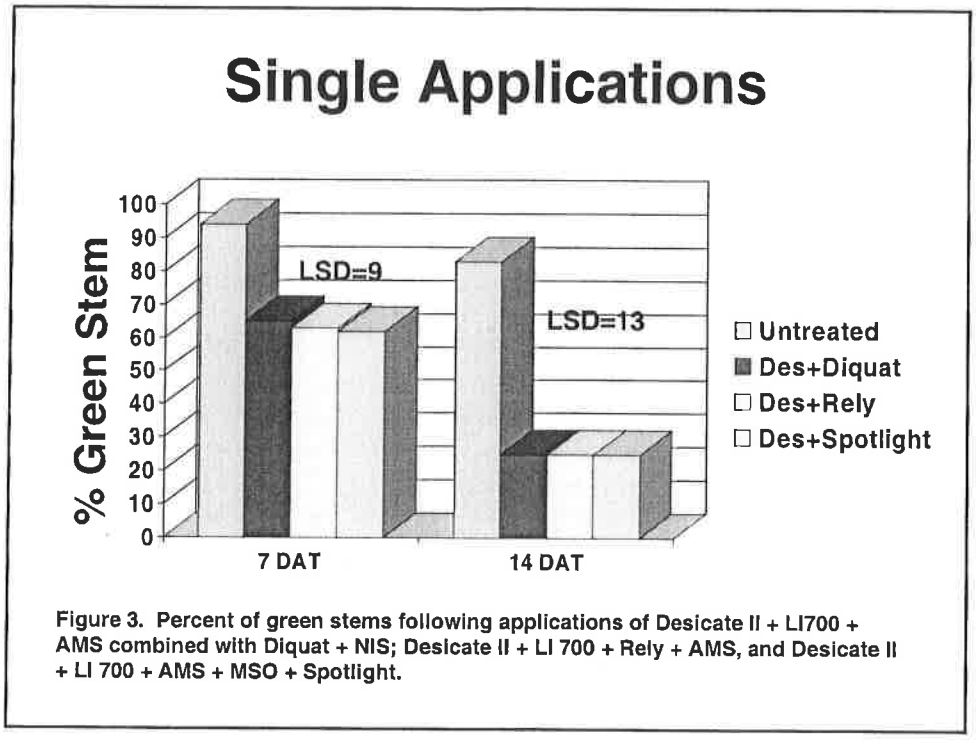


Figure 3. Percent of green stems following applications of Desicate II + LI700 + AMS combined with Diquat + NIS; Desicate II + LI 700 + Rely + AMS, and Desicate II + LI 700 + AMS + MSO + Spotlight.

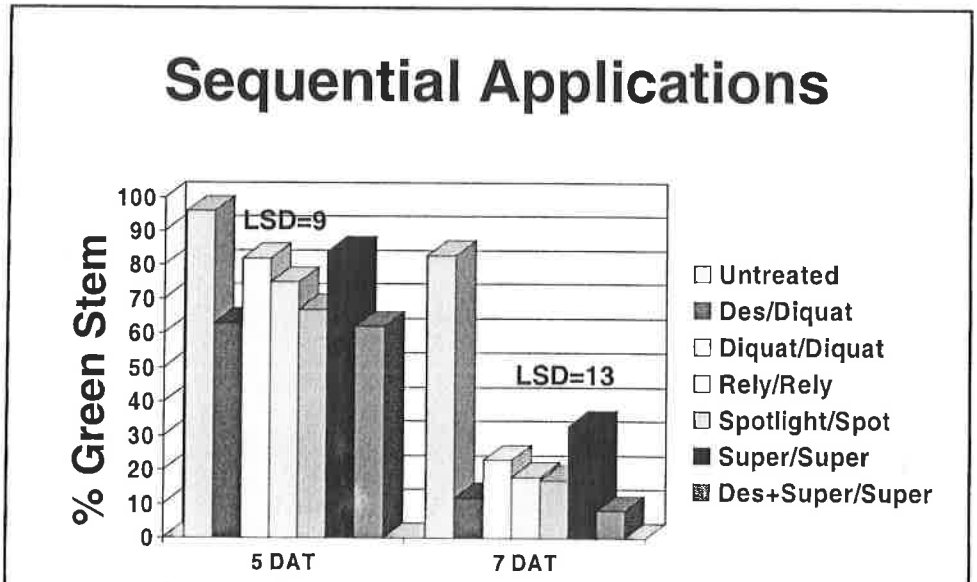


Figure 4. Percent green stems following sequential applications of: Desicate II + LI700 + AMS followed by Diquat + NIS; Diquat + NIS followed by Diquat + NIS; Spotlight + MSO followed by Spotlight + MSO; Superquick followed by Superquick; and Desicate + Superquick followed Superquick.

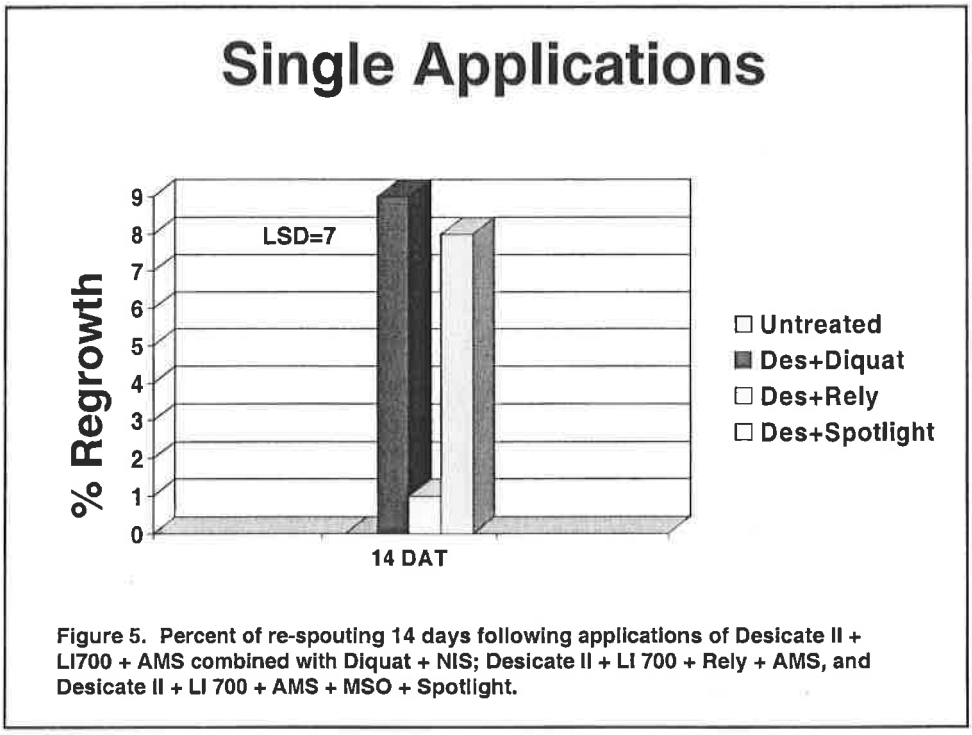


Figure 5. Percent of re-spouting 14 days following applications of Desicate II + LI700 + AMS combined with Diquat + NIS; Desicate II + LI 700 + Rely + AMS, and Desicate II + LI 700 + AMS + MSO + Spotlight.

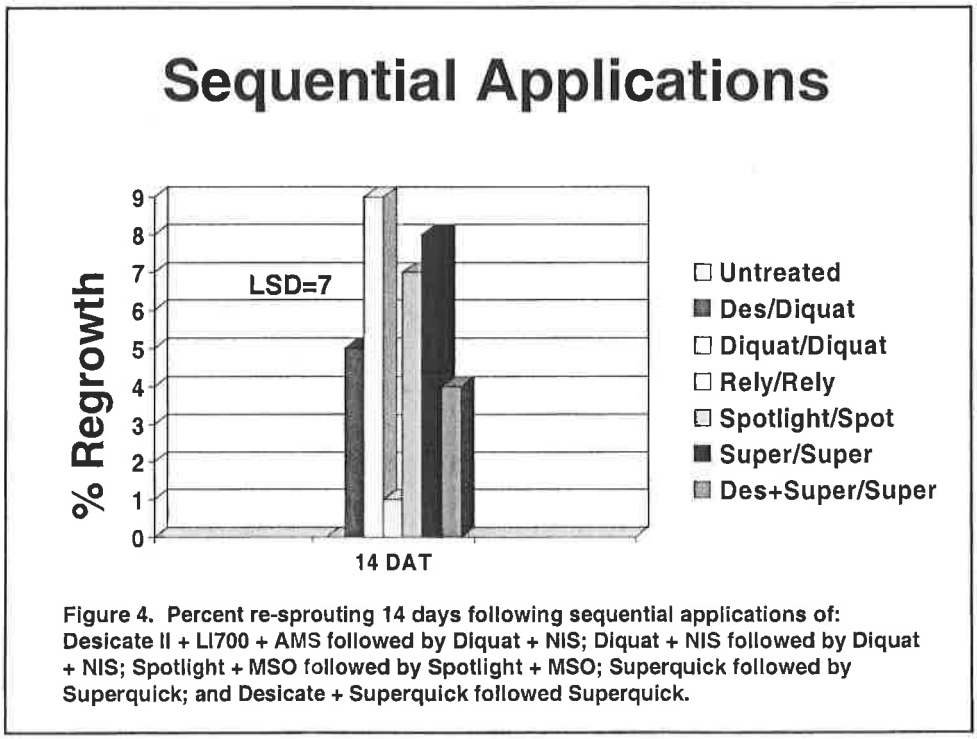


Figure 4. Percent re-sprouting 14 days following sequential applications of: Desicate II + LI700 + AMS followed by Diquat + NIS; Diquat + NIS followed by Diquat + NIS; Spotlight + MSO followed by Spotlight + MSO; Superquick followed by Superquick; and Desicate + Superquick followed Superquick.

**Research Proposal for 2000**

**Submitted to:**

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

**Title:** Continued Evaluations of New Herbicides for Weed Control in Potatoes

**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:** Matrix was the first new herbicide labeled for use in potatoes in more than twenty years. The wide spread occurrence of ALS resistant kochia and carryover problems to sugar beets have producers and weed scientists concerned. Evaluating new products for weed control in potatoes has been a major focus of my research effort for the past 4 years. This work has been conducted primarily along the Front Range, but with the identification of two very promising herbicides the research needs to expand to the SLV for evaluate weed spectrum and variety tolerance issues.

The consolidation in the agricultural chemical industry and significant cut backs in funding for applied research make support from commodity groups more important then ever. Commodity support can help with initial screening studies and to develop the type of data necessary to convince a chemical company that a products fits a market that could potentially be profitable. Based on research that was largely self-funded or funded with support from Area III growers, two exciting new compounds have been identified. Spartan was discovered and is marketed by FMC and has excellent broadleaf weed control including all nightshade species, redstem filaree, pigweed, lambsquarters and common mallow. Field test indicate that applications of Spartan at rates as low as 0.125 lb ai/ac in combination with Dual will provide season long weed control with no measurable crop response. Valor is marketed by Valent and is currently being used in the fruit tree and vine crop market. Valor also has an excellent spectrum for broadleaf weed control in potatoes because of its activity on all nightshade species. Valor is non-mobile in the soil and so would fit well in areas where herbicide movement to ground-water is an issue. These products would be applied as PRE/drag-off type treatments and so would be compatible with current weed management practices.

**Project Status:** New

**Objectives for 2000:**

- Evaluate the potential for crop injury with Spartan and Valor under environmental conditions and management practices in the San Luis Valley. Four potato varieties would be evaluated: Nugget, Norkotah, Chiptea, and Sangre. Herbicides would be applied at four rates to establish crop safety of each product. Plots would be rated for visual injury and harvested to evaluate yield and grade responses.

**Funding Request:**

| Item | Cost |
|---|---|
| Field Support<br>Salaries-technical, student hourly<br>-establishing plots<br>-herbicide applications<br>-handweeding of untreated plots<br>-harvest, grading, data analysis | $5,000 |
| Travel-vehicle rental, lodging, food | 500 |
| Miscellaneous Supplies | 500 |
| **Total** | **$6,000** |

## Research Pre-Proposal for 2000

## Submitted to:

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

**Title:** Potential of Apogee to Improve Seed Potato Production in the San Luis Valley

**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:** Apogee (prohexidione calcium) is a new plant growth regulator developed by BASF. It should receive EPA registration in 2000 and will be marketed for use in pears, apples, grass seed and turf. The main function of this product is to reduce vegetative growth without affecting crop yield. Results from Japan in the early 1990s suggest that Apogee could be very useful in the seed potato industry because the product increased yield and tuber number, while also increasing uniformity in tuber size and shape.

**Project Status:** New

### Objectives for 2000

Evaluate Apogee applied at three rates and two timing to improve seed potato yield and quality under environmental conditions in the San Luis Valley.

| Item | Cost |
|---|---|
| Field Support<br>Salaries-technical, student hourly<br>-establishing plots<br>-applications<br>-harvest, grading, data analysis | |
| Travel-vehicle rental, lodging, food | |
| Miscellaneous Supplies | |
| **Total** | |