

## 1990 VINE DESICCATION TRIALS FOR TWO POTATO CULTIVARS IN COLORADO

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### ABSTRACT

Four vine desiccation treatments were applied to cv. Sangre and Russet Nugget field plots. The field plots were located at the San Luis Valley Research Center.

Results for Sangre and Russet Nugget showed that Diquat applied at the rate of 2 pt/A resulted in a more rapid early desiccation of foliage when compared to the labelled rate of 1 pt/A ( $P < 0.05$ ). Russet Nugget also had a greater percentage of stems desiccated earlier when the same treatments were compared ( $P < 0.05$ ).

DesIcate (endothall) applied at the rate of 1 gallon per acre in combination with Diquat did not increase the amount of desiccation measured in the plots when compared to Diquat applied alone ( $P < 0.05$ ). Diquat applied under cloudy conditions resulted in more desiccation for Russet Nugget than when applications were made under sunny conditions ( $P < 0.05$ ). When data for these same treatments were compared for Sangre, there were no differences found for applications made under sunny versus cloudy conditions ( $P < 0.05$ ).

None of the treatments had any effect on the amount of internal tuber stem end discoloration measured at the end of the study ( $P < 0.05$ ).

### MATERIALS AND METHODS

Field trials were conducted at the Colorado State University Research Center located in the San Luis Valley, near Center, Colorado. The SLV is classified as a high desert valley (ca. 7600 ft msl) with abundant irrigation water. At least 90% of Colorado's potato crop is produced in the SLV with an estimated 65,000 A planted in 1990. Most of the crop is stored after harvest and sold on the fresh market.

Research plots were located within a certified seed field. The soil type was a gravelly sandy loam and the field was irrigated throughout the growing season using overhead irrigation. Normal cultural practices were followed throughout the study.

Cultivars used in the study were Sangre and Russet Nugget. Sangre is an early to medium maturing red-skinned white-fleshed cultivar grown for the fresh market. Russet Nugget is late maturing with vigorous vine growth and high tuber solids. The characteristics of the Russet Nugget tuber make it suitable for both processing and the fresh market. A frequent grower complaint is that 1 pt/A rate of Diquat does not desiccate Russet Nugget adequately for harvest. Therefore, most Russet Nugget growers use sulfuric acid (ca. 22 gpa) for desiccation.

Although initial treatment costs for sulfuric acid are greater, reapplication of Diquat by air ultimately costs more.

Vine desiccation treatments 2-4 were applied on August 12, 1990 and treatment 5 was applied on August 13. Treatments 2-4 were applied in the morning when the temperature was ca. 60 F. Few clouds were present during the morning and skies became partly cloudy during the afternoon. Treatment 5 was scheduled for the evening on August 12 to test the influence of a darkness period on desiccation by Diquat. However, because of wind and rain during the evening, this treatment was not applied until the following morning. Because skies were overcast on August 13, treatment 5 became a test of Diquat application on a cloudy day rather than the initially planned application to be made at dusk.

A portable (back-pack) sprayer was used to apply treatments to plots 25 ft long X 4 rows wide (row spacing=34 in). Treatments were delivered in a total volume of 40 gal/A at 18 psi boom pressure. The check plot (treatment 1) was not treated. Russet Nugget was flowering at the time treatments were applied and Sangre was nearing maturity. Treatments used and their application rates are listed in Table 1.

Treatments Applied to 1990 Vine Desiccation Trials
1. Check (not treated)
2. Diquat 1 pt + 0.25% X-77 (v:v) in 40 gal/A (sunny)
3. Diquat 2 pt + 0.25% X-77 (v:v) in 40 gal/A (sunny)
4. Diquat 1 pt + 0.25% X-77 (v:v) + 1 gal Des-I-Cate in 40 gal/A (sunny)
5. Diquat 1 pt + 0.25% X-77 (v:v) in 40 gal/A (cloudy) applied 24 hr later than treatments 2-4.
All applications were made at 18 psi boom pressure

Table 1. Treatments applied to vine desiccation plots in 1990. CSU Cooperative Extension, San Luis Valley Research Center, G. D. Franc.

All data were collected from the center two rows of the field plots. Ratings for foliar desiccation (estimated percentage of foliage dead) were taken on August 15, 16, 27, 30, September 3 and 13. Three visual readings per treatment plot, using the Horsfall-Barratt scale (0-11), were made on each date and means calculated to give one value per plot for statistical analysis. On August 30, September 3 and September 13, the percentage of stems dead was estimated using the Horsfall-Barratt scale by taking one visual reading per plot. On September 13, 10 tubers from each treatment plot were harvested by hand and rated for stem-end discoloration (SED) using a scale of 1-3 (lightest to darkest).

A randomized complete block design of 5 treatments was used for the study with two replications for Sangre (a third replication became unusable) and three replications for Russet Nugget. Cultivars were analyzed separately using *MSTAT-C* (subprogram: *ANOVA-2*) and means were separated using Duncan's Multiple Range Test at  $\alpha=0.05$  (subprogram: *RANGE*). All data collected using the Horsfall-Barratt scale were analyzed directly and converted to percentage for presentation in the tables.

## RESULTS

**Sangre:** Data for the estimated percentage of foliage desiccated is shown in Table 2. A statistically significant treatment effect for the estimated percentage of foliage desiccated was found for data collected on August 15, 16, and 27 and was not found on August 30, September 3 and September 13 ( $P<0.05$ ). All desiccation treatments were significantly better than the untreated check plot for data collected before August 30 ( $P<0.05$ ).

Data in Table 2 shows treatments 2 and 4 (Diquat (1 pt/A) and Diquat (1 pt/A)+DesIcate (1 gal/A), respectively) did not differ significantly ( $P<0.05$ ). The 2 pt rate of Diquat was significantly better than the 1 pt rate and had 126% to 154% more foliage desiccated for all data collected prior to August 30 ( $P<0.05$ ). When Diquat was applied under cloudy versus bright conditions (treatment 5 versus treatment 2), increased desiccation did not result ( $P<0.05$ ). Rather, treatment 2 showed significantly more desiccation than treatment 5 on August 15 ( $P<0.05$ ). However, treatment 2 had been applied to the plants 3 days prior and treatment 5 was applied only 2 days prior to when data was collected on August 15.

TREATMENTS APPLIED TO SANGRE	ESTIMATED PERCENTAGE OF FOLIAGE DESICCATED						
	AUG 15	AUG 16	AUG 27	AUG 30	SEP 3	SEP 13	
1 CHECK (NOT TREATED)	2.0 D	2.0 C	14.0 G	26.5 A	31.0 A	88.0 A	
2 DQ 1 pt/A (BRIGHT)	35.0 B	35.0 B	56.0 B	63.0 A	80.5 A	98.0 A	
3 DQ 2 pt/A (BRIGHT)	44.0 A	54.0 A	79.0 A	79.0 A	89.5 A	96.0 A	
4 DQ 1 pt/A + D'CATÉ 1 g/A	28.0 BC	40.5 AB	59.5 AB	65.0 A	73.5 A	93.0 A	
5 DQ 1 pt/A (CLOUDY)	26.5 C	31.0 B	54.0 B	76.5 A	72.0 A	88.0 A	

Table 2. Effect of vine desiccation treatments on cv. Sangre potato foliage desiccation. CSU Cooperative Extension, San Luis Valley Research Center, G. D. Franc.

Data in Table 3 shows that there were no significant treatment effects on the estimated percentage of stems desiccated or on the amount of stem end discoloration (SED) observed on tubers harvested on September 13 ( $P<0.05$ ). All treatments had significantly more stem desiccation evident than the untreated check for data collected on September 3 ( $P<0.05$ ).

TREATMENTS APPLIED TO SANGRE	% OF STEMS DESICCATED (EST.)			TUBER SED
	:AUG 30	SEP 3	SEP 13	
1 CHECK (NOT TREATED)	: 17.0 A	17.0 B	59.5 A	10.5 A
2 DQ 1 pt/A (BRIGHT)	: 59.5 A	69.0 A	94.0 A	11.0 A
3 DQ 2 pt/A (BRIGHT)	: 83.0 A	88.0 A	94.0 A	10.0 A
4 DQ 1 pt/A + D'CATE 1 g/A	: 69.0 A	76.5 A	88.0 A	10.0 A
5 DQ 1 pt/A (CLOUDY)	: 59.5 A	76.5 A	88.0 A	10.0 A

Table 3. Effect of vine desiccation treatments on cv. Sangre stem desiccation and internal stem end discoloration of tubers. CSU Cooperative Extension, San Luis Valley Research Center, G. D. Franc.

**Russet Nugget.** Data in Table 4 shows that all treatments significantly increased the estimated percentage of foliage desiccated for data collected on or before September 3 ( $P < 0.05$ ). The 2 pt rate of Diquat was significantly better than the 1 pt rate for data collected on August 15, 16 and 30 and was equal to the 1 pt rate for data collected on August 27, September 3 and 13 ( $P < 0.05$ ). When the 1 pt rate of Diquat was combined with DesIcate (treatment 4) there was no additional desiccation observed and treatments were occasionally significantly worse than Diquat applied alone ( $P < 0.05$ ). Diquat applied under cloudy conditions occasionally provided significantly better vine-desiccation than the same rate applied under sunny conditions ( $P < 0.05$ ).

Data in Table 5 shows that stems were completely green (0% desiccation) at the time treatments were applied. Only Diquat applied at the 2 pt/A rate significantly increased the amount of stem desiccation by August 30 ( $P < 0.05$ ). On September 3 and 13 all desiccation treatments were equal and had significantly more stem desiccation present than the untreated check ( $P < 0.05$ ). There were no treatment effects on tuber stem end discoloration ( $P < 0.05$ ).

TREATMENTS APPLIED TO RUSSET NUGGET	ESTIMATED PERCENTAGE OF FOLIAGE DESICCATED					
	:AUG 15	AUG 16	AUG 27	AUG 30	SEP 3	SEP 13
1 CHECK (NOT TREATED)	: 0.2 D	0.0 D	1.6 C	0.2 D	2.0 C	81.5 A
2 DQ 1 pt/A (BRIGHT)	: 10.0 B	14.0 C	42.0 A	33.0 B	26.5 AB	79.0 A
3 DQ 2 pt/A (BRIGHT)	: 29.5 A	35.0 A	54.0 A	54.0 A	37.0 A	75.0 A
4 DQ 1 pt/A + D'CATE 1 g/A	: 6.0 C	12.0 C	18.5 B	19.5 C	16.0 B	75.0 A
5 DQ 1 pt/A (CLOUDY)	: 12.0 B	25.0 B	38.5 A	44.0 A	26.5 AB	65.0 A

Table 4. Effect of vine desiccation treatment on cv. Russet Nugget foliage desiccation. CSU Cooperative Extension, San Luis Valley Research Center, G. D. Franc.

TREATMENTS APPLIED TO RUSSET NUGGET	% OF STEMS DESICCATED (EST.)			TUBER SED
	:AUG 30	SEP 3	SEP 13	
1 CHECK (NOT TREATED)	: 0.0 B	0.6 B	2.0 B	10.0 A
2 DQ 1 pt/A (BRIGHT)	: 0.6 B	10.0 A	28.0 A	10.3 A
3 DQ 2 pt/A (BRIGHT)	: 2.0 A	15.0 A	54.0 A	11.3 A
4 DQ 1 pt/A + D'CATÉ 1 g/A	: 0.0 B	6.0 A	23.5 A	10.3 A
5 DQ 1 pt/A (CLOUDY)	: 0.0 B	12.0 A	35.0 A	10.3 A

Table 5. Effect of vine desiccation treatment on cv. Russet Nugget stem desiccation and internal stem end discoloration. CSU Cooperative Extension, G. D. Franc.

### DISCUSSION

Rapid early vine death is a desirable treatment effect. This is especially true in the San Luis Valley where the growing and harvesting season is so short relative to most other potato production areas in the United States. Growers must maximize the growing season by waiting as long as possible and then they must rapidly prepare tubers for harvest via the vine kill methods that are available.

If higher rates of Diquat were to result in more complete and dependable vine death, as this study showed, it would give growers in the SLV more flexibility in their farming operation. Currently, repeated application of Diquat is sometimes needed for adequate vine kill. Minimizing the need for multiple applications will also decrease costs associated with vine kill as well as reduce the risk of pesticide drift onto sensitive crops commonly grown in close association with potatoes in the SLV.

Since the SLV potato crop is 100% irrigated, growers can carefully control soil moisture when applications are to be made. If higher labelled rates of Diquat are planned for the SLV, studies need to be done to determine the relationship of soil moisture at the time of vine kill and the rate of vine kill to tuber storability. Grower educational programs need to be developed to be certain Diquat and other desiccants are applied under optimum conditions.