

# Control of Yucca By Aerial Application of Herbicides<sup>1</sup>

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*Yucca* (*Yucca glauca* Nutt.), also commonly called soapweed, beargrass, or Spanish bayonet, is a generally undesirable perennial that occurs on thousands of acres of rangeland in Nebraska and surrounding states. The plant grows to a height of 1 to 3 feet and possesses many long, thick, sharp-pointed leaves with thready margins (Figure 1). Robison (1961) described yucca as a xerophytic plant with a large deep root system that serves as a storage organ for food reserves and moisture which enables the plant to survive drought. The sharp-pointed leaves form a rosette that resists excessive transpiration loss under adverse conditions.

Aerial application studies conducted by Robison (1961) in Texas revealed that 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) and 2-(2,4,5-trichlorophenoxy propionic acid (silvex) gave the most consistent results of several herbicides applied. Treated areas produced an average of 1,831 pounds (oven-dry) of forage per acre compared to 846 pounds on untreated plots.

Preliminary yucca control studies were established by Shafer (1958) at Paxton, Nebraska. Herbicides used were 2-(2,4-dichlorophenoxy) propionic acid [2-(2,4-DP)], polychlorobenzoic

acid (PBA), 2-(2-methyl-4-chlorophenoxy) propionic acid [2-(MCPP)], and silvex, applied by a ground sprayer. Silvex was most effective, giving 98 percent yucca control at 2 lb/A.

This study was conducted to determine the most effective herbicide, herbicide carrier, and spray volume needed for aerial control of yucca in western Nebraska.

## Materials and Methods

Aerial applications of herbicides were made on a Dune sand soil for yucca control at Angora, Nebraska. The dunes are sharply rolling and separated in many places by steep slopes, varying from 30 to 100 feet in height. A small proportion is under active wind erosion in blow-out areas. Annual average temperature is approximately 48° F. Mean annual precipitation is 15.5 inches with the majority occurring in spring and summer.

Initial applications were made on June 5, 1958, with a Piper Super Cub. Each plot consisted of three flight strips, each 33 feet wide and 440 feet long (1 acre). Herbicide treatments consisted of the propylene glycol butylether (PGBE) ester of silvex at 1 and 2 lb/A in combination with nine herbicide carriers. One lb/A of the PGBE ester of 2,4,5-T in a 1:1 oil-water emulsion was included for comparison. Herbicide rates, carriers, and spray volumes per acre were applied as follows:

1. One lb/A 2,4,5-T in a 1:1 oil-water emulsion at 2 gpa
2. Two lb/A silvex in No. 2 diesel oil at 2 gpa
3. Two lb/A silvex in water at 2 gpa

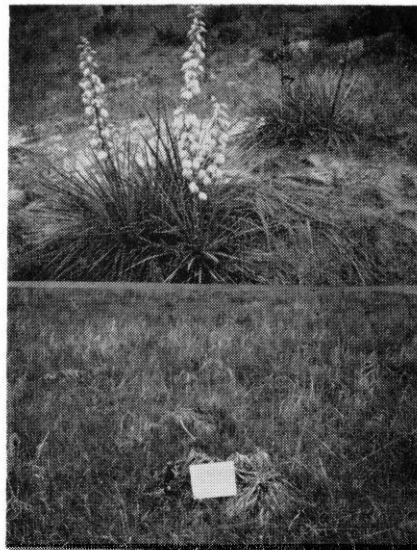


FIGURE 1. *Top*—Yucca in flower at Angora, Nebraska. June 18, 1963. *Bottom*—Control of yucca by application of single treatment of 2 lb/A silvex applied in No. 2 diesel oil at 5 gpa., June 17, 1960; photograph June 18, 1963. Note luxuriant native grass growth on treated area.

4. One lb/A silvex in water at 2 gpa
5. Two lb/A silvex in a 1:1 oil-water emulsion at 2 gpa
6. Two lb/A silvex in a 1:4 oil-water emulsion at 5 gpa
7. One lb/A silvex in water at 5 gpa
8. Two lb/A silvex in water at 5 gpa
9. Two lb/A silvex in No. 2 diesel oil at 5 gpa
10. Two lb/A silvex in water at 10 gpa

Yucca control observations were made in October, 1958, and June, 1959. Final control evaluations were made in September, 1960, on 10 yucca clumps selected at random in each plot by determining whether they were dead or alive. Percentage kill figures were then derived from these counts.

In 1960, a second set of one-acre plots was sprayed at Angora with a Piper Super Cub as before. Treatments of PGBE ester of silvex at 1, 2, and 4 lb/A. were applied in No. 2 diesel oil at 5 gpa total solution when yucca was flowering. Plots were

<sup>1</sup>Published with the approval of the Director as Paper No. 1464, Journal Series, Nebraska Agricultural Experiment Station. This research work was partly financed by the Nebraska Department of Aeronautics, Lincoln, Nebraska.

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treated initially on June 17, 1960. Repeat treatments on June 20, 1961, were the same herbicides and rates as original ones superimposed on one-half of the same plots. Percentage kill was determined by randomly selecting 15 yucca clumps in each plot and assigning a kill rating to each clump in a range of 0-10. No control was given a value of 0; complete kill, 10. The values obtained were converted to percentage kill.

A third experiment using different herbicide carriers and spray volumes was applied on June 20, 1961, to study their influence on yucca kill. Two lb/A of the PGEE ester of silvex was selected as the herbicidal treatment. Number 2 diesel oil, water, and water plus a surfactant (Multifilm X-77) were the three carriers used. Spray volumes were 2 and 5 gpa. Each plot was 2 flight strips (66 feet) wide and 240 feet long. Each treatment was replicated. Percentage kill was determined by randomly selecting 20 yucca plants or clumps in each plot which were evaluated in a similar manner for the June, 1960, study. After control evaluations were made the plots were retreated on June 18, 1962, with treatments identical to those applied in June, 1961.

### Results and Discussion

Observations made in October, 1958, four months after applications of silvex at Angora, Nebraska, revealed silvex at 2 lb/A applied in No. 2 diesel oil at 5 gpa gave most effective control. Silvex at 2 lb/A in No. 2 diesel oil at 2 gpa was considered the second most effective treatment. Silvex, at 2 lb/A, applied in a 1:1 oil-water emulsion at 2 gpa and silvex at 1 lb/A in water at 5 gpa, were ranked third. In June, 1959, 2 lb/A silvex applied in No. 2 diesel oil at 5 gpa remained the most effective yucca control treatment, with an estimated 35 percent kill. The remaining

yucca plants were very chlorotic and had not produced flower stalks. The next best treatment was silvex at 2 lb/A applied as a 1:1 oil-water emulsion at 2 gpa. The estimated kill was 30 percent with mostly chlorotic plants remaining. All other treatments produced less injury and kill. The plots receiving 1 lb/A of 2,4,5-T showed no apparent control. Evaluations of the plots on September 16, 1960, are presented in Table 1. Silvex at 2 lb/A, applied in No. 2 diesel oil at a total spray solution of 5 gpa, remained the most effective treatment at 80 percent control. Silvex, at 2 lb/A applied as a 1:1 oil-water emulsion, was also a relatively effective treatment.

The 1960 studies aimed to determine what rate of silvex was most effective with the No. 2 diesel oil carrier at 5 gpa. Re-

sults in Table 2 show that most effective control was obtained with silvex at 2 and 4 lb/A. Some regrowth, mostly small isolated shoots, took place the first year following treatment. Based on an actual plant volume or weight basis, control was better than indicated by values given in Table 2. It was difficult, one year after treatment, to predict if yucca regrowth would increase. In the study established in June, 1958, considerable regrowth occurred 2 years after a single treatment of silvex. With this information, retreatment was considered desirable for the plots treated in 1960. By retreating one-half of each plot with original treatments, single and repeat applications could be observed. Yucca control evaluations made in June, 1962, 2 years after original treatment, revealed 95 percent

**Table 1. Percentage kill of yucca from single application of 2,4,5-T and silvex in combination with herbicide carriers and volumes per acre at Angora, Nebraska. Treatments June, 1958; evaluated, September, 1960.**

Herbicide and carrier	Herbicide	Kill <sup>1</sup>
	(Lb/A)	(Pct)
2,4,5-T + 1:1 emulsion at 2 gpa	1	0
Silvex + No. 2 diesel at 2 gpa	2	30
Silvex + water at 2 gpa	2	60
Silvex + water at 2 gpa	1	30
Silvex + 1:1 emulsion at 2 gpa	2	70
Silvex + 1:4 emulsion at 5 gpa	2	50
Silvex + water at 5 gpa	1	10
Silvex + water at 5 gpa	2	30
Silvex + No. 2 diesel oil at 5 gpa	2	80
Silvex + water at 10 gpa	2	30

<sup>1</sup>Percentage kill was derived by evaluating at random ten plants. If any regrowth occurred following treatment, plants were considered alive.

**Table 2. Percentage kill<sup>1</sup> of yucca after single and repeated applications of silvex in No. 2 diesel oil at spray volume of 5 gpa.**

Herbicide	Lb/A	Time after application					
		Single application			Repeat application		
		3 mo.	1 yr.	2 yr.	1 yr.	2 yr.	3 yr.
(Percent)							
Silvex	1	67	45	76	87	75	74
Silvex	2	84	75	95	94	95	98
Silvex	4	91	70	95	98	94	86

<sup>1</sup>Percentage kill was determined by evaluating 15 yucca plants in each plot. A kill evaluation based on total top kill was assigned each plant with no top kill given a value of 0; and complete top kill with no regrowth as 10. Values for each plot were averaged and converted to percentage kill.

control was obtained when 2 and 4 lb/A silvex were used as a single application. Plots treated with 4 lb/A silvex showed no increase in yucca kill over those treated with 2 lb/A silvex. The 1 lb/A rate of silvex gave 76 percent yucca control. There were no major changes in control values from 2 to 3 years after a single application of silvex from June, 1962, to June, 1963.

Additional herbicides were applied in June, 1961, to study the influence of carriers and spray volumes on yucca kill in more detail (Table 3). No significant differences were found between the 2 and 5 gpa spray volume treatments. No 2 diesel oil tended to be superior to other carriers at 2 and 5 gpa in combination with 2 lb/A silvex as a single application. Evaluations of repeated applications of silvex showed improved yucca control in all plots.

### Summary and Conclusions

Preliminary studies of yucca control by aircraft applications revealed that silvex applied at 2 lb/A in No. 2 diesel oil at 5 gpa total spray solution gave the best yucca kill from a single application of all herbicides, carriers, and spray volumes used. A substantial amount of yucca regrowth was found in all plots two years following treatment

**Table 3. Percentage control<sup>1</sup> of yucca one year after single and repeat applications of 2 lb/A silvex in No. 2 diesel oil, water, and water plus surfactant carriers at spray volumes of 2 and 5 gpa.**

Herbicide and Carrier	Single application	Repeated application
	— — — — (Percent) — — — —	
Silvex + water at 2 gpa	85	98
Silvex + water + surfactant <sup>2</sup> at 2 gpa	69	97
Silvex + No. 2 diesel oil at 2 gpa	87	98
Silvex + water at 5 gpa	70	99
Silvex + water + surfactant <sup>2</sup> at 5 gpa	86	98
Silvex + No. 2 diesel oil at 5 gpa	93	99

<sup>1</sup>Percentage kill was determined by evaluating 20 yucca plants in each plot.

<sup>2</sup>Alkylaryl polyoxyethelene glycol (Multifilm X-77 at 0.1%).

indicating retreatment was necessary for best control.

In June, 1960, studies were conducted to determine the most economical and effective silvex rates to use in combination with No. 2 diesel oil. Results revealed that 2 lb/A of silvex gave as much yucca kill as 4 lb/A. Repeat applications one year after initial treatment did not improve control. Some yucca regrowth occurred in all plots. Total regrowth was considered small and lacked regenerative vigor as indicated in counts taken 1, 2, and 3 years after treatment.

In a herbicide carrier-spray volume study established in June, 1961, no differences were found in yucca kill between 2 and 5 gpa spray volume treatments. No. 2 diesel oil applied

as the silvex carrier tended to produce the best yucca kills from a single application. Repeated applications of identical treatments did increase kill.

For most economical and satisfactory results, yucca in western Nebraska should be treated with a single application of 2 lb/A silvex using No. 2 diesel oil as the carrier. Retreatment is expensive, consequently repeated applications should be made only if necessary. Sufficient regrowth to necessitate retreatment may not occur until several years after initial treatment.

### LITERATURE CITED

- ROBISON, E. D. 1961. Aerial application of herbicides for the control of yucca. Proc. 14th Ann. Southern Weed Conf.
- SHAFER, N. E. 1958. Use of aircraft in agriculture. Ann. Rpt. of Project 12-20. Nebraska Agr. Expt. Sta., Lincoln, Nebraska.

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