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Aerial Applications of Herbicides
on Post Oak and Black Jack Brush
in Oklahoma; Progress Report, 1952-1953.

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TESTS OF AERIAL APPLICATIONS OF HERBICIDES ON
POST OAK AND BLACKJACK BRUSH IN OKLAHOMA;
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The problem of converting much of Oklahoma's 10 million acres (3) of post oak and blackjack type of brush to grassland has created demand for a quick method of treating such brush, along with associated species and small trees. Because aerial spraying appeared to be a good possibility for treating large areas of brush (2), the value of airplane applications was studied in a number of tests on small areas from 1948 through 1951. In these earlier tests, excellent recovery of native grasses resulted where shade from the trees and brush was reduced (1). The herbicides used were primarily formulated for weed control.

With the advent of materials made especially for brush control and for spraying from airplanes, it was decided to try some large scale applications. This publication reports test applications made in 1952 and 1953. Groups cooperating in this work are noted in the acknowledgments, page 5.

How Tests Are Being Made

Information obtained from the earlier tests was used as a basis for establishing large scale airplane spraying investigations in 1952. For this study, four areas were selected in locations of productive land on which the brush was suppressing the growth of grass. One site was near Alex, another near Bristow, and two were northeast of Pawhuska. These investigations were made cooperatively with several agricultural agencies and ranchers. In addition, tests were made at the Red Plains Station and on a cooperator's ranch in the Oklahoma County Soil Conservation District.

Equipment Used. --The equipment used was a modified Stearman airplane. The modifications included an improved hydraulic-driven pump unit and a completely new wing section. The pump operated a boom which was equipped with 5 nozzles delivering 5 gallons of spray solution per acre in swaths of 33 feet. These modifications were made by the Aerial Applicator's Association and the USDA Aircraft and Special Equipments Center at Cimarron Field, Oklahoma.

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Herbicides Tested. -- The herbicides used were all formulations of low volatile esters. The amount of materials applied, the size of the areas, etc., were recorded in Tables 1 and 2. In addition, a new herbicide was tested in the springs of 1952 and 1953 at the Red Plains Station. It was 2(2, 4, 5-trichlorophenoxy) propionic acid in a low volatile formulation. The amount of acid used for the first treatment in 1952, as well as for retreatment in 1953, was 2 pounds per acre. Another test with the same material was made in 1953 on a cooperator's ranch in the Oklahoma County Soil Conservation District. It was applied on areas 5 acres in size at the rate of 1 pound per acre on one plot and 2 pounds on another.

This new herbicide was also compared with applications of 2, 4, 5-T and combinations of equal parts of 2, 4-D and 2, 4, 5-T in 1953 on areas adjacent to the studies near Alex, Bristow, and Pawhuska. The new chemical and the 2, 4, 5-T were each applied at the rate of 2 pounds per acre on 10-acre plots, while the combination of "D" and "T" was applied at the rate of 3 pounds per acre only on one 10-acre tract near Pawhuska.

Results

A high percentage of the brush was defoliated and prevented from making additional growth on the areas that were retreated. The data in Tables 1 and 2 indicate that two treatments are necessary to obtain satisfactory control of the oaks and associated species for maximum grass production. In areas where the post and white oak make up a high percentage of the brush, rates of 2 pounds per acre, followed with a retreatment of 1 to 2 pounds of 2, 4, 5-T, produced satisfactory results. However, in stands consisting mostly of the blackjack and black oak, the higher rates were necessary.

Where the same amounts of acid of 2, 4, 5-T and equal mixtures of 2, 4-D and 2, 4, 5-T were applied, the "T" alone was most effective. However, when one-third more acid of the mixtures was applied, the results were about equal. There was no apparent advantage with the same quantity of acid in different flights. The emulsion appeared to settle immediately on the leaves and twigs of the brush and did not drift as readily as oil solutions. In comparable amounts, the new herbicides, 2, 4, 5 propionic acid, gave slightly higher total defoliation and consequently increased grass production more than other herbicides tested in 1953. Fisher, et al. (4), also found that it was not as injurious to cotton as other herbicides.

These tests, as well as earlier results (2 and 3), all indicate that the most effective and satisfactory time to spray is when the plants have just developed full leaf size. Best results have also been obtained when applications were made on soil with moisture adequate for ideal growing conditions and when there was little or no wind but fairly high humidity.

Table 1. Effectiveness of foliage sprays of a low volatile ester of 2, 4, 5-T applied with an airplane on oak brush^{1/}.

Area ^{2/}	Pounds Acid Applied per acre in June ^{3/}		Percent Defoliation ^{5/}		Percent of Trees (Above ground growth) Completely Dead		Increased Production of Native Grass ^{6/} Percent
	1952	1953 ^{4/}	Post and White Oak	Blackjack and Black Oak	Post and White Oak	Blackjack and Black Oak	
C	1	1	83	65	44	16	175
D	2	1	89	70	50	16	244
E	2	2	89	79	60	31	213
	Average		87	71	51	21	211
A	1	-	58	31	19	3	167
B	2	-	70	49	33	18	174
F	2	-	65	47	32	11	157
G	2	-	75	54	34	16	202
H	3	-	70	60	30	18	210
	Average		68	48	30	13	182

^{1/} Results and averages from data accumulated on areas near Alex, Bristow, and Pawhuska. The counts were made September 21-25, 1953.

^{2/} The areas were 20 acres in size.

^{3/} The different amounts of acid were combined with sufficient diesel oil and 4 gallons of water to make 5 gallons of spray solution per acre. This material was applied on all areas except F and G. In fact, Area F was treated with the same mixture as Area A, except it received two treatments applied in separate flights. Area G was treated with the acid and sufficient diesel oil to make 5 gallons per acre.

^{4/} Applications made in 1953 were retreatments.

^{5/} Results were determined from observations of the degree of defoliation.

^{6/} Calculated from line transect measurements made on treated and untreated areas. The predominating grasses were big bluestem, little bluestem, Indiangrass, switchgrass, etc.

Table 2. Effectiveness of foliage sprays of a low volatile ester consisting of equal parts of 2, 4-D and 2, 4, 5-T applied with an airplane on oak brush near Pawhuska, Oklahoma^{1/}.

Area ^{2/}	Pounds Acid Applied per acre in June ^{3/}		Percent Defoliation ^{5/}		Percent of Trees (Above ground growth) Completely Dead		Increased Production of Native Grass Percent ^{6/}
	1952	1953 ^{4/}	Post and White Oak	Blackjack and Black Oak	Post and White Oak	Blackjack and Black Oak	
C	1.5	1.5	85	60	40	22	108
D	3	1.5	86	74	50	20	120
E	3	3	92	84	57	27	149
	Average		88	73	47	23	126
A	2	-	50	41	16	17	154
B	3	-	63	48	26	13	145
F	3	-	58	53	22	15	145
G	3	-	71	54	26	18	131
H	4.5	-	61	51	20	11	123
	Average		61	49	22	15	140

^{1/} The counts were made September 21-25, 1953.

^{2/} The areas were 20 acres in size.

^{3/} The different amounts of acid were combined with sufficient diesel oil and 4 gallons of water to make 5 gallons of spray solution per acre. This material was applied on all areas except F and G. In fact, Area F was treated with the same mixture as Area B, except it received two treatments applied in separate flights. Area G was treated with the acid and sufficient diesel oil to make 5 gallons per acre.

^{4/} Applications made in 1953 were retreatments.

^{5/} Results were determined from observations of the degree of defoliation.

^{6/} Calculated from line transect measurements made on treated and untreated areas. The predominating grasses were big bluestem, little bluestem, Indiangrass, switchgrass, etc.

Summary

The post oak-blackjack type of brush has been controlled and productive pastures developed where herbicides of the low volatile esters were properly applied.

1. The most satisfactory **results** were obtained with 2, 4, 5-T. The rate of application for the initial treatment was 2 pounds of acid in 5 gallons of spray solution per acre in flight swaths of 33 feet. Spray solutions consisting of oil and water emulsions settled immediately on the leaves and twigs of the brush and did not drift as readily as oil solutions.
2. For effective control, however, retreatments of 1 to 2 pounds per acre were necessary. It was usually best to retreat the first year after the initial applications. Other retreatments will depend upon the amount of competition from the remaining brush.
3. About the same degree of effectiveness was also obtained in similar treatments using a mixture consisting of equal parts of 2, 4-D and 2, 4, 5-T applied at the rate of 3 pounds per acre.
4. The most satisfactory time to spray is when the plants have just developed full leaf size, the soil moisture is ideal for growing conditions, and there is little or no wind but fairly high humidity.
5. Full grass production will be obtained more rapidly, and erosion more completely controlled, if sites are selected on deep fertile soil which has only light to medium brush coverage. The grass cover is more dense on areas where the shade from the woody vegetation is less. Under such conditions, a complete cover of grass is usually established in one to two years.
6. Therefore, through proper site selection and good management, the use of selective herbicides is the safest way of changing worthless brush land into valuable grassland.

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