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EXPERIMENTS IN CHEMICAL CONTROL OF BRIGALOW (ACACIA HARPOPHYLLA) SUCKERS IN SHEEP COUNTRY

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SUMMARY

Excellent control of brigalow suckers was achieved with two applications 12 months apart of emulsifiable 2,4,5-T butyl ester at 0·5 lb a.e. per acre in diesel distillate and in an emulsion of emulsifiable oil and water. Slightly inferior results were obtained with the same material in water alone and when emulsified with water and diesel distillate.

At this rate of 2,4,5-T similar results were obtained by using aircraft for both applications at 2½ Imp gal of mixture per acre, by using aircraft for the first application and a tractor-mounted misting machine delivering about 4 Imp gal of mixture per acre for the second application and by using a tractor-mounted misting machine for both applications.

Two aerial applications of 0·25 lb a.e. 2,4,5-T in diesel distillate gave excellent control.

The brigalow was a mixture of a large number of clumps of young suckers about 12 weeks after a burn plus some fairly openly branched 5-year-old suckers 2–3 ft tall.

The trial area was heavily grazed by wether sheep. Grazing was particularly severe from the time of the second application. The sheep grazed the treated suckers and ate new shoots and suckers. However, on the untreated plot sheep had little effect on the appearance and number of suckers present.

The results obtained are considered to be due to a combination of intensive grazing and chemicals. Undoubtedly the grazing improved the results and reduced the differences between the treatments.

A single aerial application of 0·125 lb a.e. picloram (potassium salt) in water gave no control and one aerial application of 0·125 lb a.e. picloram + 0·5 lb a.e. 2,4,5-T (both as triisopropanolamine salts) in water gave control similar to that obtained with 0·5 lb a.e. 2,4,5-T alone.

The trial was located in the Meandarra–Bungunya area of Queensland on moderately gilgaied, deeply cracking grey clay.

I. INTRODUCTION

Johnson (1964, p. 53) indicated that 2,4,5-T ester is an efficient and economical chemical for the control of brigalow (*Acacia harpophylla* F. Muell. ex Benth.). He pointed out that suckers in their first season of growth can be readily controlled by aerial spraying but that attempts to control older regrowth with this method often result in failure.

Pedley carried out a series of trials using 2,4,5-T in a knapsack misting machine and achieved good results on a mixture of suckers 1 year old or less and aged regrowth 3–4 ft tall by misting twice with an interval of 10 months between the applications These trials are summarized in Departmental Annual Reports (Anon. 1963, p. 20; Anon. 1964, p. 21).

The present experiments are an extension of this technique of repeated application using an aircraft and a tractor-mounted misting machine (tractor-mister) to apply the chemicals.

The experimental site is located at "Woodlands", 33 miles north of Bungunya and 110 miles south-west of Dalby, on an area of brigalow on which previous attempts at control had been unsuccessful. The soil is moderately gilgaied, deeply cracking grey clay (Isbell 1957, p. 96).

The area of mixed whipstick and tree brigalow plus scattered yapunyah trees (*Eucalyptus thozetiana* F. Muell.) was aerially sprayed in 1959 with 2,4,5-T from a height of 60 ft. A patchy top kill of the brigalow resulted and a crop of new suckers appeared; the yapunyah trees were not affected.

The present series of experiments was commenced in 1964 on the same site. For much of the trial period the experimental area was intensely grazed by sheep.

II. MATERIALS AND METHODS

Site preparation.—In April–May 1964, the standing woody vegetation on the 300 ac experimental site (Figure 1) was pulled down by two tractors drawing a large chain between them. Pulling was done first in one direction and then in the opposite direction. Using this technique all but the smallest brigalow suckers were knocked down. Tall trees adjacent to the experimental site were removed to facilitate accurate aerial spraying. During the period December 7 to 14, 1964, the area was burnt by a team of men with "fire-trailers". (A "fire-trailer" is a piece of pipe about 2 in. in diameter and about 3 ft long. One end is fitted with a screw top, the other end with a narrow curved spout about 0·5 in. in diameter and containing a loosely fitting asbestos wick. The tank is filled with diesel distillate or preferably kerosene, which is poured through the burning tip of the wick onto the trash to be burnt.)

The men moved across the paddock in a line, systematically lighting the trash as they went. The weather was hot and dry and a fairly clean burn was obtained. All that remained on the area were some fairly openly branched 5-year-old suckers resulting from the 1959 aerial spraying. These suckers were small enough (2–3 ft) to pass under the chain at the time of pulling and as there was little grass growth and trash near them they remained unburnt. A dense crop of new root suckers emerged on the area after the burning.

Fig. 1.—Experimental site prior to pulling. Emergent trees in background are yapunyah.

Chemicals and equipment.—Emulsifiable butyl esters of 2,4,5-T were used in four different carriers, viz. (*a*) water; (*b*) diesel distillate; (*c*) emulsified with diesel distillate and water; and (*d*) an emulsion of "Mobil Product 30B Special" and water.

The technique of repeated application was used for all 2,4,5-T treatments except one.

Picloram and picloram + 2,4,5-T were included in one experiment only and involved a single aerial spraying.

Formulations were:—

2,4,5,-T: "Farmco T40", an emulsifiable 40% w/v mixture of the butyl and isobutyl esters.

Picloram: "Tordon 22K", 24% w/v picloram as the potassium salt.

Picloram plus 2,4,5-T: A special formulation prepared by Dow Chemical (Australia) Ltd. containing 5% w/v picloram as the triisopropanolamine salt and 20% w/v 2,4,5-T as the triisopropanolamine salt.

Emulsifiable oil: "Mobil Product 30B Special", an emulsifiable wetting, spreading and sticking agent.

Herbicide rates are quoted in pounds of acid equivalent per acre.

Aerial application was by "Piper Pawnee" flying at a height of 10–12 ft above the ground, covering a swath width of 18 yd and delivering a total volume of $2\frac{1}{2}$ gal (Imperial) of mixture per acre. Tractor-misting was by "Marino Master Mister" (with its own engine) mounted on a wheeled tractor and driven across the plots at 4 m.p.h. on parallel tracks 22 yd apart. The application rate was about 4 gal (Imperial) of mixture per acre.

Methods of application and weather conditions.—

Experiment 1: Aerial spraying. Both applications were made by aircraft. The first application was applied in the morning of March 9, 1965 (overcast, max. 82°F, min. 74°F) and the second application in the morning of March 8, 1966 (sunny, max. 94°, min. 65–70°).

Experiment 2: Combined aerial spraying and tractor-misting. The first application was made by aircraft at the same time as the first application in experiment 1. The second application 12 months later was made by tractor-mister in the afternoon of March 2, 1966 (sunny, max. 98°, min. 65–69°) and in the mornings of March 3-4, 1966 (sunny, max. 90° and 88°, min. 70° and 65° respectively).

Experiment 3: Tractor-misting. Both applications were made by tractor-mister. The first application was made in the afternoon of February 19, 1965 (sunny, max. 97°, min. 72°). Strong variable breezes were experienced during the afternoon. The second application was made in the morning of March 4, 1966 (sunny, max. 88°, min. 65°).

The daily maximum and minimum temperatures were taken from surrounding official recording stations and are therefore approximate for the trial site.

Seasonal conditions.—The average annual rainfall for Flinton, 10 miles W.N.W. of "Woodlands" is 22 in. Table 1 shows the actual rainfall for both "Woodlands" and Flinton for the trial period. Rainfall was below average for most of the trial period.

Grazing.—Although grazing by sheep was not included in the original programme of experimentation, it was unavoidable due to drought and clearing operations undertaken by the owner elsewhere in the paddock.

The trial area of about 300 ac is located in a 1,600 ac paddock. At the start of the experiments the paddock was largely uncleared except for the experimental site. Grazing commenced soon after the initial applications. Observations made in May 1965 indicated that sheep had been on the area for some time; some clumps of treated young suckers on some plots had been stripped of most of their leaves and new suckers were being eaten as they emerged. About 350 sheep were in the paddock, this representing a grazing rate of about 1 sheep per acre on the trial area. Grazing continued at about this

TABLE 1

RAINFALL (IN POINTS) AT " WOODLANDS " AND FLINTON
100 points = 1 in.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1964									408	270	206	219	2,404
									*(409)	(197)	(77)	(82)	(1,960)
1965	175	†345	6	13	17	26	251	131	255	104	3	475	1,801
	(467)	(260)	(0)	(9)	(37)	(30)	(208)	(174)	(162)	(90)	(65)	(240)	(1,742)
1966	94	178	**321	24	0	238	47	559	21	187	84	99	1,852
	(54)	(145)	(325)	(15)	(16)	(381)	(48)	(440)	(15)	(209)	(75)	(131)	(1,854)
1967	133	67	226	0	186	378							
	(55)	(27)	(201)	(11)	(124)	(410)							
Average (33 years)	(350)	(307)	(236)	(112)	(106)	(117)	(150)	(102)	(99)	(186)	(235)	(200)	(2,200)

* Figures in brackets are those for Flinton 10 miles W.N.W. of " Woodlands ".

† 200 pt of this rain fell between the 1st tractor-misting and the 1st aerial spraying.

** All of this rain fell after the second applications were completed.

Timing: Burnt, mid December 1964.

Tractor-misting, 1st application in late February 1965.
2nd application in early March 1966.

Aerial spraying, 1st application in early March 1965.
2nd application in early March 1966.

Counts, March 1965 (experiment 3), May 1965 (experiments 1 and 2).
March 1966, all experiments.
June 1967 (final), all experiments.

rate until December 1965, at which time the sheep were removed. Grazing resumed in March 1966 at the rate of about 1 sheep per acre, and by May 1966 all available feed in the paddock had been eaten by the sheep.

In May 1966 the uncleared portion of the paddock was pulled. The trash from this pulling was burnt in November 1966 and 4,000 sheep were put in the paddock. This represents a grazing rate of $2\frac{1}{2}$ sheep per acre over the entire paddock. Intense grazing was imposed for the remainder of the trial period and afterwards.

The effect of grazing was accentuated by the poor seasonal conditions prevailing during most of the trial period.

Standing treated suckers were heavily grazed and emerging suckers and new shoots were eaten.

Plot size and method of sampling.—Plot sizes were as follows:—

Experiment 1: Aerial spraying, 30 ac and 15 ac.

Experiment 2: Combined aerial spraying and tractor-misting, 15 ac.

Experiment 3: Tractor-misting, 2 ac.

The treatments were not replicated.

Sampling was done by means of systematically arranged permanent quadrats, each 66 ft long and 6 ft wide (·0091 ac). Thirty-six quadrats were established in the 30 ac plots, 18 in the 15 ac plots and 4 in the 2 ac plots.

Quadrats in experiments 1 and 2 were laid out at right-angles to the line of travel of the aircraft and the tractor-mister. In experiment 3 they were inadvertently laid out parallel to the line of travel of the tractor-mister. The path of the tractor-mister and the quadrats roughly coincided. Quadrats laid out in this fashion are considered less reliable than those at right-angles to the line of travel.

Stems of brigalow suckers were counted as individuals when 6 in. or more away from their nearest neighbour. Groups of stems less than 6 in. apart were counted as one.

The initial count in experiment 3 was made in March 1965. In experiments 1 and 2 the initial count was not made until May 1965. At these first counts two types of sucker were present on the plots: (1) young suckers, mostly in clumps and up to 12 in. tall, which grew following the burn; (2) fairly openly branched 5-year-old suckers mostly 2–3 ft tall. They were defined as young and old respectively and counted separately. The grazed treated young suckers were included in the counts made in May 1965.

The second count in all experiments was made in March 1966. At that time an appreciable amount of fresh growth was present on most of the plots. Occasionally this fresh growth reached 15 in. in height but most was smaller. The suckers were again counted as young or old. The same classification of young and old was used at the final count in June 1967.

III. RESULTS AND DISCUSSION

(a) Sucker Control

A marked reduction in number of suckers was obtained on all plots treated with 2,4,5-T (Tables 2 and 3; Figures 2 and 3). Acceptable control was obtained on all plots given two applications of 0·5 lb 2,4,5-T, with the following exceptions:—

(1) Two applications of 0·5 lb 2,4,5-T in water when the first application was made by aircraft and the second application was made by tractor-mister.

(2) Two applications of 0·5 lb 2,4,5-T in water when both applications were made by tractor-mister.

(3) Two applications of 0·5 lb 2,4,5-T in diesel distillate-water emulsion when both applications were made by tractor-mister.

Acceptable control is taken to mean a reduction of a brigalow population to less than 500 suckers per acre. This is based on the statement by Johnson (1968, p. 30) that survival of 500 to 1,000 suckers per acre can lead to a serious reduction in productivity of pasture within 5 years.

Percentage survival 12 months after the first application was calculated and analysed for young and old suckers separately and for young plus old. Percentages of suckers surviving 15 months after the second application, based on initial counts taken in 1965, were also analysed, and the results of these analyses, using an inverse sine transformation, are shown in Table 4 for the total of young and old. Untreated plots, with survivals of greater than 100% in experiments 1 and 2 and 79% in experiment 3, indicate the natural survival conditions; they were not included in the analyses.

Plots of experiments 1 and 2 were in the same overall area and could therefore be analysed as one trial. Treatments, counts of suckers and equivalent mean percentages are shown in Tables 2 and 3. Table 4 gives the transformed means and differences necessary for significance, to enable comparisons to be made of the treatment results of these two experiments.

Treatments, counts of suckers, transformed means and equivalent mean percentages in experiment 3 are given in Table 5. Smaller plot sizes and differences in numbers of quadrats were too great to allow this experiment to be included in the overall analysis, and testing was carried out separately. Practical considerations caused this trial to have fewer quadrats than is desirable. Variation was extremely high and significance between treatments was not obtained. However, the results do show the tendency for the same trends as in experiments 1 and 2.

TABLE 2

EXPERIMENT 1, AERIAL SPRAYING: NUMBER OF SUCKERS PER ACRE AND EQUIVALENT MEAN PERCENTAGE SURVIVAL

Treatment	1965			1966			1967			Equivalent Mean %
	Young	Old	Total	Young	Old	Total	Young	Old	Total	
DOUBLE APPLICATION										
0·5 lb 2,4,5–T in distillate	4,883	1,026	5,909	2,185	113	2,298	52	0	52	0·10
0·5 lb 2,4,5–T in 10% distillate and 90% water ..	3,087	990	4,077	1,532	302	1,834	74	48	122	0·56
0·5 lb 2,4,5–T in 10% 30B and 90% water ..	4,605	470	5,075	2,102	208	2,310	34	0	34	0·11
0·5 lb 2,4,5–T in water	4,318	1,018	5,336	1,977	351	2,328	254	103	357	3·09
0·25 lb 2,4,5–T in distillate	3,814	813	4,627	1,485	117	1,602	0	0	0	0·00
SINGLE APPLICATION										
0·5 lb 2,4,5–T in distillate	3,996	1,363	5,359	1,368	134	1,502	660	48	708	8·27
0·5 lb 2,4,5–T plus 0·125 lb picloram in water ..	4,583	507	5,090	2,450	324	2,774	..	..	..	..
0·125 lb picloram in water	4,204	354	4,558	3,997	299	4,296	..	..	..	..
Untreated	4,957	954	5,911	4,541	684	5,225	5,268	746	6,014	

TABLE 3

EXPERIMENT 2, COMBINED AERIAL SPRAYING AND TRACTOR-MISTING: NUMBER OF SUCKERS PER ACRE AND EQUIVALENT MEAN PERCENTAGE SURVIVAL

Treatment	1965			1966			1967			Equivalent Mean %
	Young	Old	Total	Young	Old	Total	Young	Old	Total	
DOUBLE APPLICATION										
0·5 lb 2,4,5–T in distillate	2,695	641	3,336	1,516	141	1,657	0	0	0	0·00
0·5 lb 2,4,5–T in 10% distillate and 90% water ..	3,178	794	3,972	1,846	227	2,073	244	91	335	6·47
0·5 lb 2,4,5–T in 10% 30B and 90% water ..	1,681	696	2,377	569	165	734	7	55	62	0·26
0·5 lb 2,4,5–T in water	2,537	1,564	4,101	1,932	421	2,353	110	488	598	6·08
Untreated	4,957	954	5,911	4,541	684	5,225	5,268	746	6,014	

TABLE 4

EXPERIMENTS 1 AND 2: PERCENTAGE SURVIVAL 1965–1967 YOUNG + OLD

Treatment	Experiment 1, Aerial Spraying		Experiment 2, Combined Aerial Spraying and Tractor-misting	
	Trans. Mean*	No. of Quadrats	Trans. Mean*	No. of Quadrats
DOUBLE APPLICATION				
0·5 lb 2,4,5–T in distillate ..	0·031	36	0·000	18
0·5 lb 2,4,5–T in 10% distillate and 90% water	0·075	36	0·257	18
0·5 lb 2,4,5–T in 10% 30B and 90% water	0·034	36	0·051	18
0·5 lb 2,4,5–T in water ..	0·177	36	0·249	18
0·25 lb 2,4,5–T in distillate ..	0·000	18		
SINGLE APPLICATION				
0·5 lb 2,4,5–T in distillate ..	0·292	18		

—	Mean of 36 *v.* Mean of 36	Mean of 18 *v.* Mean of 18	Mean of 36 *v.* Mean of 18
Necessary differences for significance { 5%	0·077	0·109	0·095
1%	0·102	0·144	0·125
S.E. of difference	0·039	0·055	0·048

* Inverse sine transformation.

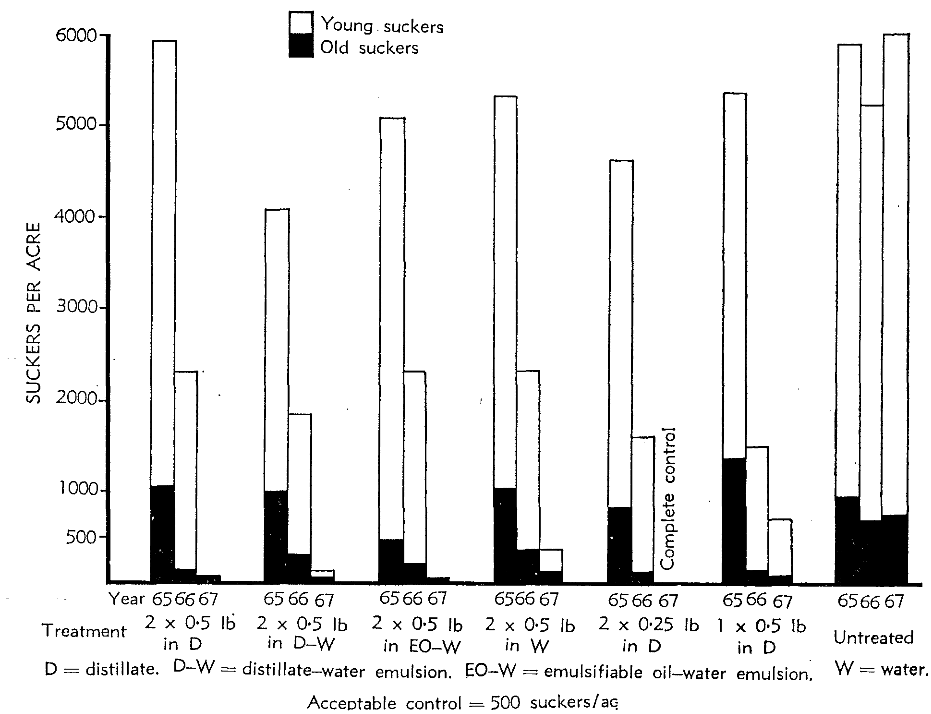

Fig. 2.—Experiment 1, aerial spraying: counts of suckers on 2,4,5-T treated plots.

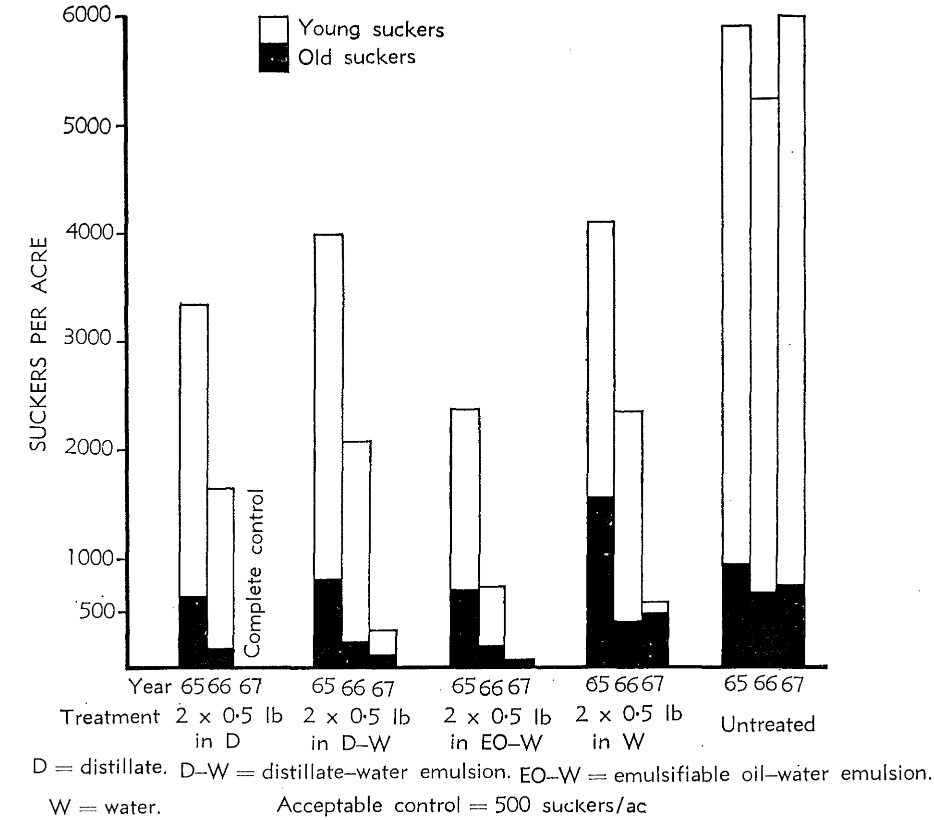

Fig. 3.—Experiment 2, combined aerial spraying and tractor-misting: counts of suckers on 2,4,5-T treated plots.

TABLE 5

EXPERIMENT 3, TRACTOR-MISTING: NUMBER OF SUCKERS PER ACRE, PERCENTAGE SURVIVAL 1965–1967 YOUNG + OLD TRANSFORMED MEANS AND EQUIVALENT MEAN PERCENTAGES

Treatment	1965			1967			Trans. Mean*	Equiv. Mean %
	Young	Old	Total	Young	Old	Total		
DOUBLE APPLICATION								
0·5 lb 2,4,5–T in distillate ..	2,365	715	3,080	110	27	137	0·170	2·88
0·5 lb 2,4,5–T in 10% distillate and 90% water	2,392	1,292	3,684	550	0	550	0·292	8·28
0·5 lb 2,4,5–T in 10% 30B and 90% water	6,077	220	6,297	110	27	137	0·099	0·98
0·5 lb 2,4,5–T in water	7,287	55	7,342	852	0	852	0·274	7·33
Untreated	2,475	1,169	3,644	2,558	330	2,888		
						S.E.	0·116	

* Inverse sine transformation.

TABLE 6

EXPERIMENTS 1 AND 2: PROPORTIONS (p) OF QUADRATS WITH ZERO COUNTS OF SUCKERS 1967

Treatment	Method*		No. of Quadrats	p	Significantly Greater Than	
	1st Application (1965)	2nd Application (1966)			5%	1%
a 0·5 lb 2,4,5–T in distillate ..	A	T	18	1·00	f–k	g–k
b 0·25 lb 2,4,5–T in distillate ..	A	A	18	1·00	f–k	g–k
c 0·5 lb 2,4,5–T in distillate ..	A	A	36	·86	g–k	g–k
d 0·5 lb 2,4,5–T in 10% 30B and 90% water	A	A	36	·83	g–k	g–k
e 0·5 lb 2,4,5–T in 10% 30B and 90% water	A	T	18	·83	g–k	h–k
f 0·5 lb 2,4,5–T in 10% distillate and 90% water	A	A	36	·72	h–k	h–k
g 0·5 lb 2,4,5–T in water	A	T	18	·50	k	k
h 0·5 lb 2,4,5–T in water	A	A	36	·39	k	k
i 0·5 lb 2,4,5–T in distillate ..	A		18	·28	k	
j 0·5 lb 2,4,5–T in 10% distillate and 90% water	A	T	18	·28	k	
k Untreated			18	·00		

* A = Aerial spraying.
T = Tractor-misting.

TABLE 7

EXPERIMENTS 1 AND 2: PROPORTIONS (p) OF SUCKERS REMAINING 1965 TO 1967

Treatment	Method*		p	Significantly Less Than	
	1st Application (1965)	2nd Application (1966)		5%	1%
a 0·25 lb 2,4,5–T in distillate ..	A	A	·0000	c–k	d–k
b 0·5 lb 2,4,5–T in distillate ..	A	T	·0000	d–k	e–k
c 0·5 lb 2,4,5–T in 10% 30B and 90% water	A	A	·0066	e–k	e–k
d 0·5 lb 2,4,5–T in distillate ..	A	A	·0088	e–k	e–k
e 0·5 lb 2,4,5–T in 10% 30B and 90% water	A	T	·0257	g–k	g–k
f 0·5 lb 2,4,5–T in 10% distillate and 90% water..	A	A	·0300	g–k	g–k
g 0·5 lb 2,4,5–T in water	A	A	·0670	i–k	i–k
h 0·5 lb 2,4,5–T in 10% distillate and 90% water	A	T	·0846	i–k	i–k
i 0·5 lb 2,4,5–T in distillate ..	A		·1323	k	k
j 0·5 lb 2,4,5–T in water	A	T	·1461	k	k
k Untreated			1·0176		

* A = Aerial spraying.
T = Tractor-misting.

Table 6 shows proportions of quadrats in experiments 1 and 2 with zero counts in 1967. This table in effect gives a picture of the distribution of the surviving suckers because of the systematic arrangement of the quadrats. Numbers of suckers have also been summed over all quadrats for each 2,4,5-T treatment in experiments 1 and 2 and the proportions of suckers remaining from 1965 to 1967 are shown in Table 7. Significance tests are given for the proportions.

(b) Carriers and Chemicals

In all experiments the best control was obtained when either diesel distillate or an emulsion of water and emulsifiable oil was used as a carrier for the 2,4,5-T.

In experiment 1 (aerial spraying), acceptable control was obtained with two applications of 0·5 lb 2,4,5-T in diesel distillate (Figure 4), in diesel distillate-water emulsion, in emulsifiable oil-water emulsion, and in water. However, the first three of these treatments were significantly better at 1% level than the fourth.

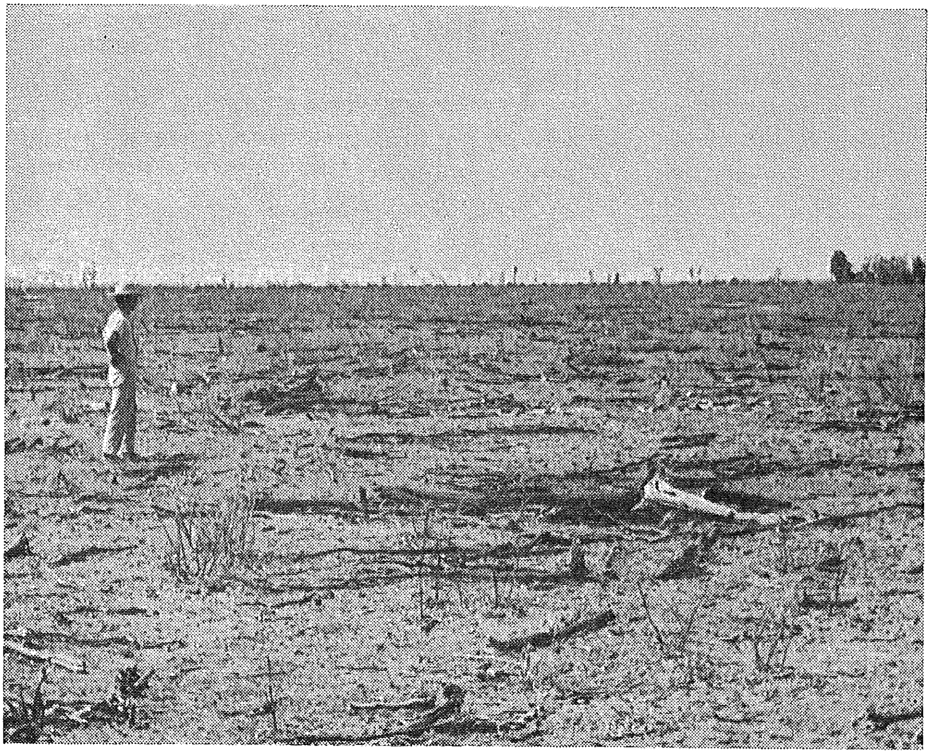

Fig. 4.—Plot treated aerially with two applications of 0·5 lb 2,4,5-T in diesel distillate.

In experiment 2 (combined aerial spraying and tractor-misting), acceptable control was obtained with two applications of 0·5 lb 2,4,5-T in diesel distillate, in diesel distillate-water emulsion, and in emulsifiable oil-water emulsion. When water was used as the carrier the acceptable control limit was just exceeded; in this plot the bulk of the suckers were old suckers in a group of quadrats. The treatments using diesel distillate or emulsifiable oil-water emulsion as a carrier were significantly better (at 1% level) than the other two.

In experiment 3 (tractor-misting) two applications of 0·5 lb 2,4,5-T in diesel distillate or in emulsifiable oil-water emulsion gave acceptable control and were better than two applications of 0·5 lb 2,4,5-T in diesel distillate-water emulsion or in water, although the differences were not significant. In this experiment a poor coverage of spray was obtained on some plots at the time of the first application due to variable wind conditions. However, the second application and extremely heavy grazing largely compensated for the poor initial application.

The location of experiment 3 was such that it may have been subjected to even more intense grazing than other parts of the trial area. This experiment was sited on 15 ac midway along the trial area and adjacent to the 15 ac untreated plot of experiments 1 and 2. It is not suggested that the sheep shunned the 15 ac untreated plot and only crowded through the site of this experiment as they grazed the paddock, but there seemed to be some tendency for this.

In experiments 1 and 2 the quadrats with the greatest proportions of zero counts were in the plots treated with two applications of 0·5 lb 2,4,5-T in diesel distillate or in emulsifiable oil-water emulsion. Under the conditions of these trials and on this type of sucker both the above treatments consistently gave acceptable control.

Results (unpublished) of trials on brigalow suckers (using tractor-misting and knapsack-misting machines) and field experience indicate that in most situations distillate is a more effective carrier for 2,4,5-T than emulsifiable oil-water emulsion.

One plot in experiment 1 was given two applications of 0·25 lb 2,4,5-T in diesel distillate. Complete control was obtained on this plot, indicating that in combination with intense grazing a low rate of 2,4,5-T can be effective on this type of sucker when applied by aircraft.

Picloram treatments (experiment 1) gave poor results. Picloram at 0·125 lb in water gave no control. When picloram was mixed with 2,4,5-T the reduction in number of brigalow suckers was comparable with that produced by 2,4,5-T alone at the same rate in the same carrier (water)—that is, about 40–50% reduction after 12 months, or five times the acceptable limit.

(c) Method of Application and Technique

Although good results were obtained with both aircraft and tractor-mister, the coverage of suckers obtained by aerial spraying was usually more complete and more uniform than that obtained by tractor-misting.

These trials indicate that, on sucker populations of mixed ages such as were treated here, the technique of repeated application gives more effective control than a single application.

(d) Effect of Grazing

Undoubtedly, the intense grazing improved the final results and reduced the differences between the treatments which might otherwise have become evident. Comparison of the plot aerially sprayed once with 0·5 lb 2,4,5-T in diesel distillate and the plot given two aerial applications of the same mixture shows that, although the sheep were able to sharply reduce the sucker population after the initial application, acceptable control was not achieved within the trial period without the second application. On the large untreated plot in experiments 1 and 2 (Figure 5) the sheep had little visible effect on the original population and the number of suckers remained relatively constant.

(e) Timing of Spraying

Johnson (1968, p. 30) stated that in seasons of average or below-average rainfall spraying should be done 5–6 months after burning to allow complete emergence of the suckers. This information was not available when this trial was done. It is not known what percentage of suckers had emerged at the

Fig. 5.—Untreated plot at conclusion of experiments.

time of the first spraying (10 weeks after burning for the tractor misting and 12 weeks after burning for the aerial spraying in this trial), but it is thought to be a fairly high percentage of the total emergence which took place in the 5 months after burning.

IV. ACKNOWLEDGEMENTS

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