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Influence of Time of Application of 2,4-D, 2,4,5-T and DDT on Kentucky Bluegrass Seed Germination and Pasture Weed Populations

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Influence of Time of Application of 2,4-D, 2,4,5-T and DDT on Kentucky Bluegrass Seed Germination and Pasture Weed Populations[1]

By Louis N. Bass and E. P. Sylwester

The bluegrass seed industry is continually faced with the problem of excessive amounts of weed material in the freshly stripped bluegrass seed which farmers bring to their drying yards for sale. If the weed material content is too great the seedsmen refuse to buy the bluegrass seed offered to them; however, they cannot refuse to buy all strippings which contain weed material or they will not have sufficient seed to meet the demand for processed Kentucky bluegrass seed.

There are two methods which can be utilized to reduce the amount of weeds present in the Kentucky bluegrass pastures namely (1) summer or fall mowing and (2) application of chemical weed control compounds.

It is well known that regular mowing will greatly reduce the weed population in a pasture by preventing many of the annual weeds from setting seed. Mowing will not eliminate perennial weeds, but application of certain chemicals will control such weeds.

Recent extensive use of 2,4-D and 2, 4, 5-T as weed and brush killing chemicals in Kentucky bluegrass pastures used for livestock and bluegrass seed production has given rise to certain pertinent questions concerning:

(1) The effect of time of application of such sprays on weed populations.

(2) The effect of these sprays on the viability of bluegrass seed harvested from such sprayed areas.

From the standpoint of weed and brush control it is, of course, desirable to kill the weeds and brush during relatively early stages of growth before they make much competition for underlying grasses, and before their presence in sprayed or unsprayed condition interferes too much with pasturing operations. Work done by Klingman and McCarty (2)[2] and McCarty (3) indicates the effectiveness of chemicals as compared to mowing or reseeding. Weed control chemicals, if they are to be effective, must of necessity be applied early in the season. This necessitates application at a time

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[2]Number in parenthesis refers to literature cited.

when the use of 2,4-D and 2,4,5,-T has been thought to be detrimental to the germination of Kentucky bluegrass seed harvested from such sprayed areas. Weed control spraying, when done early, may coincide closely with certain formative stages of Kentucky bluegrass flower and seed development, which could affect the viability of the mature seed. Since the rate of growth and development of the bluegrass flowering heads varies with the weather conditions which prevail each year, it was necessary, for this study, to select certain arbitrary dates for application of the weed control chemicals. The dates chosen and the stage of growth of the bluegrass flowering heads on each date were:

1954

(1) April 22—bluegrass head growth just starting.

(2) May 13—flower heads still in the boot but near emergence.

1955

(1) May 6—heads starting to show out of the boot.

(2) May 18—heads well out of the boot.

(3) June 3—heads mature or nearly mature.

DDT was included in this study in an effort to establish the best time of application for maximum control of bluegrass blight or "silvertop."

Materials and Methods

The DDT used in 1954 was "Warlasco" 25% emulsifiable concentrate manufactured by the Warren Douglas Chemical Company. Application was at the rate of one quart (½ lb. active ingredient) per acre.

The weed control formulations used in 1954 were: Dow Esteron 2,4-D (ester); Dow Esteron Brush Killer (50-50 2,4-D and 2,4,5-T ester); and Barco Amine 2,4-D. All formulations were four pound per gallon active material concentrates. These materials were applied at the rate of one pound of active ingredient per acre.

Applications of the spray materials were made April 22 and May 13, utilizing a tractor mounted field sprayer. Ten gallons of water were used per acre for all applications. When both DDT and a weed control chemical were applied to a given plot they were applied simultaneously. Spray materials from the same containers were used for both applications.

All test plots utilized in 1954 were one acre in size and were located southeast of Creston, Iowa. The fertilizer applied to one plot was furnished by the owner of the farm and was applied with a regular farm fertilizer spreader.

The DDT used in 1955 was State Fair Brand, a 25% active ingredient emulsion manufactured by the Johnson Chemical Company. Application was at the rate of one quart (½ lb. active ingredient) per acre.

The weed control formulations used in 1955 were the same as those used in 1954 except that Dow amine was substituted for the Barco amine. The weed killer materials were put on at the rate of one pound active ingredient per acre applied in 10 gallons of water.

Applications of the spray materials in 1955 were made May 6, May 18, and June 3 using the same spray equipment that was used in 1954. Spray materials from the same containers were used for all applications.

The plots used in 1955 were one half acre in size and were located southeast of Creston, Iowa.

All spray materials were applied both years at a time and in such a manner that wind drift was at a minimum.

Samples of seed were harvested from each test plot by means of a hand stripper. The stripped seed was carefully dried, hand threshed and blown to remove all light inert material. A portion of each seed sample was examined on a purity board and all heavy inert material, weed seeds, and other crop seeds were removed leaving only the pure Kentucky bluegrass seed which was used for the germination tests.

All germination tests were made according to the Association of Official Seed Analysts Rules for Seed Testing (1) by planting 8 x 100 seeds in petri dishes on fine silica sand moistened with a 0.2% KNO_3 solution. Four dishes were placed at 15°C. (night) and 30°C. (day) alternating temperatures to germinate and the other four dishes were placed at 10°C. for five days before being placed at the above alternating temperatures for germination. Approximately 100 foot candles of light were provided during the high temperature period each day. Total length of all germination tests was 28 days exclusive of the 5 days at 10°C. for the prechill tests.

The effectiveness of the weed and blight control sprays was evaluated by visual examination of each test plot.

Temperature and rainfall were tabulated for all dates when spray materials were applied.

Experimental Results

The complete absence of bluegrass blight in the test fields both years made it impossible to obtain information concerning the effects of time of application of DDT upon the control of this malady.

(Weed Control, 1954)

Early Spraying, April 22, 1954 (Bluegrass head growth just starting)

All plots sprayed with 2,4-D or "brush killer" formulations showed remarkable reductions in weed numbers with the exception of those treated with amine 2,4-D where inferior weed kills were observed. Weeds in control plots were considerably more numerous and more

Table 1

Summary, Dates, Amount of Treatment, Germination of Kentucky Bluegrass Seed and Kinds of Weeds Remaining—1954

Date of Treatment	Treatment and Amount	Germination Percentage	Weeds Present at Observation Time 1954
4-22-54	Control	69	Average of 82 ragweed plants per sq. ft. in this area (Ave. of 5 counts). Large amounts of whorled milkweed, vervain, yarrow, ironweed, dandelion, horsemint, sour dock, daisy fleabane. *Very weedy plot.*
4-22-54	DDT alone ½ lb/A	77	Large amounts of vervain, ironweed, yarrow, whorled milkweed, horsemint, dandelion, sour dock and daisy fleabane. Heavy stand of ragweed. *Very weedy plot.*
4-22-54	Ester 2,4-D, 1 lb/A	73	Traces of whorled milkweed, yarrow, ironweed, small amounts of ragweed, dandelion, horsemint, goldenrod, wild perennial groundcherries and horsenettle. *Relatively clean plot.*
4-22-54	Amine 2,4-D, 1 lb/A plus DDT, ½ lb/A	80	Large amounts of ironweed, dandelion, ragweed, whorled milkweed, wild perennial groundcherries, horsenettle, goldenrod, horsemint, wild vetch. *Weedy plot.*
4-22-54	"Brush Killer", 1 lb/A plus DDT, ½ lb/A	80	Traces of horsetail, (*Equisetum*), goldenrod, whorled milkweed, wild perennial groundcherries, horsenettle, ironweed, wild strawberry, horsemint, aster, ragweed. *Clean plot.*
4-22-54	Ester 2,4-D, 1 lb/A plus DDT, ½ lb/A	76	Traces of whorled milkweed, goldenrod, horsenettle, ironweed, dandelions, small ragweed. *Clean plot.*
4-22-54	Ester 2,4-D, 1lb/A plus DDT, ½ lb/A plus 250 lbs. 20-20-0	73	Traces of horsetail (*Equisetum*), dandelions, ragweed, horsenettle, vervain, whorled milkweed. Distinctly a heavier, thriftier, thicker, greener stand of grass. *Clean plot.*
	Average	76.5*	

*Control not included.

Table 1 (Continued)

Summary, Dates, Amount of Treatment, Germination of Kentucky Bluegrass Seed and Kinds of Weeds Remaining—1954

Date of Treatment	Treatment and Amount	Germination Percentage	Weeds Present at Observation Time 1954
5-13-54	Control	69	Black mustard, daisy fleabane, mare's-tail, ragweed, dog fennel, lambsquarter, dandelion, whorled milkweed, ironweed, groundcherries, plantain. *Plot extremely weedy.*
5-13-54	DDT, ½ lb/A	75	Ragweed, black mustard, dog fennel, lambsquarter, whorled milkweed, dandelions, ironweed, daisy fleabane, plantain, mare's-tail. *Plot very weedy.*
5-13-54	Ester 2,4-D, 1 lb/A	73	Traces of ragweed and goldenrod. *Extremely clean plot.*
5-13-54	Amine 2,4-D, 1 lb/A plus DDT, ½ lb/A	59	Large amounts of ragweed, dandelion, whorled milkweed, wild perennial groundcherries, horsenettle, goldenrod, smartweed, large milkweed, wild rose, dandelion, green milkweed, mare's-tail, daisy fleabane. *Very weedy plot.*
5-13-54	"Brush Killer", 1 lb/A plus DDT, ½ lb/A	57	Traces of small ragweed, ironweed, dandelion, vervain, whorled milkweed and ironweed. *Very clean plot.*
5-13-54	Ester 2,4-D, 1lb/A plus DDT, ½ lb/A	59	Traces of ragweed, goldenrod, some dandelions, vervain, whorled milkweed and ironweed. *Clean plot.*
	Average	64.6*	Average of two dates in 1954 = 70.55% germination.

*Control not included.

vigorous than in sprayed plots with the exception of those treated with the amine formulation where practically no differences were observed between the control and sprayed areas. Where DDT alone was used, no weed control was expected or obtained. All plots treated with 2,4-D or "brush killer" formulations, with the exception of the amine formulation, were remarkably weed free even though traces of weeds remained in all sprayed plots. Frequently only a very few weeds of the species indicated (Table 1) were found per acre. At the time of the early spraying, many perennial weeds were observed to be just emerging. This was particularly true of such perennials as horsenettle, vervain, horsemint, goldenrod, whorled milkweed, and others. The early spraying was much less injurious to these perennial weeds than was the later spraying. The few small ragweeds which were present in the sprayed areas at observation time were probably from seeds which germinated after spraying. ester and "brush killer" formulations gave much better weed control than the amine material.

Late Spraying, May 13, 1954 (Bluegrass heads still in boot)

Better weed kills were secured in all late sprayed plots than in earlier sprayed plots. Apparently almost no small ragweed seeds germinated after the late spraying. Also, all late sprayed plots were more nearly free of perennial weeds. These were injured much more by later spraying than by earlier applications. The performance of the amine 2,4-D was as disappointing in the last spraying as in the earlier application. The entire plots (one acre each) were examined and in all except the amine sprayed plots weed populations were significantly lower than in the check areas. Sometimes only a few weeds were present in the entire acre plot. Thus, the enumeration of weeds present in the sprayed areas must not be construed as meaning that large numbers of weeds were present, but rather the fact that the spraying had failed to produce complete eradication of the weeds concerned. Thirteen one foot square areas, selected at random in sprayed plots, had 0,0,1,1,1,0,2,4,0,2,0,2,4, ragweed plants, or an average of 1.3 ragweed plants per square foot compared to an average of 82 ragweed plants per square foot in untreated areas.

The results of the germination tests (Table 2) made on the seed harvested in 1954 show that the early spray applications, when growth of the bluegrass heads had just started, tended to increase the viability of the seed rather than reduce it. The germination of the seed from all areas sprayed April 22, 1954 averaged 7.5% higher than the germination of the seed from the control area. In two instances: (1) amine 2,4-D plus DDT and (2) "brush killer" plus DDT, seed from the treated areas germinated (11%) higher than the seed from the control area.

The germination of the seed harvested from the plots sprayed May 13, 1954, when the heads were still in the boot, was higher than that of the control for two treatments and less than that of the control for three treatments. The average germination of the seed from all treated areas was 4.4% lower than the germination of the seed from the control area. Seed from two of the treated areas germinated 10% lower and the seed from one treated area germinated 12% less than the seed from the control plot.

The differenecs between the germination of the seed harvested from the areas sprayed with the same materials on April 22, 1954 and those areas sprayed May 13, 1954 ranged from 0 to 23%. The greatest differences were for the seed from plots which received amine 2,4-D plus DDT, "brush killer" plus DDT, and ester 2,4-D plus DDT. The May 13 application of the above spray materials resulted in marked reductions in the viability of the seed harvested from the treated areas. There were no reductions in germination obtained for the plots which received DDT alone and ester 2,4-D alone. Since reductions in viability occurred only where the weed control chemicals were applied in combination with DDT one cannot be certain that the reduced viabilities were due to the action

Table 2

Kentucky Bluegrass Seed Germination Data for 1954
Weed and Blight Control Studies

Treatment	Date of Application		
	4-22-54	5-13-54	
	Head growth just starting	Heads still in boot	
	Germination Percentage		
1. Control	69	69	
2. DDT	77	75	
3. Ester 2,4-D	73	73	
4. Amine 2,4-D & DDT	80	59	
5. Brush Killer & DDT	80	57	
6. Ester 2,4-D & DDT	76	59	
7. Ester 2,4-D & DDT plus 250 lbs. 20-20-0 fertilizer	73	....	
Average % Germination	76.5*	64.6*	70.55*

*Control not included.

of the weed control chemicals alone. Perhaps interactions between the chemicals when applied in combination were responsible for the reductions in seed viability.

(Weed Control, 1955)

Early Spraying, May 6, 1955 (Bluegrass heads starting to show out of boot)

Good weed control was obtained in all 2,4-D and "brush killer" plots sprayed May 6, 1955. (Table 3) However, many of the perennials seemed to be injured less than in the later sprayed areas. All of the plots sprayed with 2,4-D and "brush killer" formulations

Table 3

Summary, Dates, Amount of Treatment, Germination of Kentucy Bluegrass Seed and Kinds of Weeds Remaining—1955

Date of Treatment	Treatment and Amount	Germination Percentage	Weeds Present at Observation Time 1955
5- 6-55	Check	85	Bull thistle, vervain, ragweed, whorled milkweed, mare's-tail, St. Johnswort, mountain mint, dandelion seedlings, horsenettle. *Weedy Plot.*
5- 6-55	DDT, ½ lb/A	89	Bull thistle, vervain, ragweed, whorled milkweed, mountain mint, mare's-tail, St. Johnswort, horsenettle, dandelion seedlings. *Weedy plot.*
5- 6-55	Amine 2,4-D, 1 lb/A plus DDT, ½ lb/A	84	Bull thistle, vervain, ragweed (trace), wild aster, wild indigo, St. Johnswort, horsenettle, dandelion seedlings (trace). *Clean plot.*
5- 6-55	Ester 2,4-D, 1 lb/A	82	Ragweed (trace), vervain, horsenettle, St. Johnswort, tract of dandelion seedlings. *Very clean plot.*
5- 6-55	Ester 2,4-D, 1 lb/A plus DDT, ½ lb/A	82	Vervain, horsenettle, St. Johnswort, ragweed (trace), trace of dandelion seedlings. *Very clean plot.*
5- 6-55	"Brush Killer", 1 lb/A plus DDT, ½ lb/A	84	Mountain mint, ragweed (trace), vervain, trace of dandelion seedlings. *Very clean plot.*
	Average	84.2*	

*Control not included.

Table 3—Continued

Summary, Dates, Amount of Treatment, Germination of Kentucy Bluegrass Seed and Kinds of Weeds Remaining—1955

Date of Treatment	Treatment and Amount	Germination Percentage	Weeds Present at Observation Time 1955
5-18-55	Check	87	Dandelions, vervain, bull thistle, ragweed, mare's-tail, whorled milkweed, horsenettle, St. Johnswort. *Very weedy plot.*
5-18-55	DDT, ½ lb/A	86	Ragweed, dandelions, mountain mint, bull thistle, vervain, St. Johnswort, goldenrod, horsenettle. *Very weedy plot.*
5-18-55	Amine 2,4-D, 1lb/A plus DDT, ½ lb/A	86	Very few dandelions (trace), very little ragweed (trace), very little vervain (trace), horsenettle, whorled milkweed. *Very clean plot, cleanest in series so far.*
5-18-55	Ester, 2,4-D, 1 lb/A	81	Perennial ground cherry, horsenettle, dandelion seedlings (trace), vervain (trace), whorled milkweed, wild indigo, St. Johnswort, ragweed (trace), mare's-tail (trace). *Very clean plot.*
5-18-55	Ester 2,4-D, 1 lb/A plus DDT, ½ lb/A	85	Dandelion seedlings (trace), vervain (trace), St. Johnswort, horsenettle, whorled milkweed. *Very clean plot, no ragweed.*
5-18-55	"Brush Killer", 1 lb/A plus DDT, ½ lb/A	80	St. Johnswort, whorled milkweed, horsenettle, vervain, perennial ground cherry. *Very clean plot, no ragweed.*
	Average	83.6*	

*Control not included.

Table 3 (Continued)

Summary, Dates, Amount of Treatment, Germination of Kentucky Bluegrass Seed and Kinds of Weeds Remaining—1955

Date of Treatment	Treatment and Amount	Germination Percentage	Weeds Present at Observation Time 1955
6- 3-55	Check	89	Ragweed, vervain, horsenettle, bull thistle, mountain mint, dandelions. *Weedy plot.*
6- 3-55	DDT, ½ lb/A	86	Ragweed, vervain, horsenettle, bull thistle, mountain mint, dandelions (many). *Weedy plot.*
6- 3-55	Amine 2,4-D, 1 lb/A plus DDT, ½ lb/A	89	Mountain mint, whorled milkweed, ragweed (trace), horsenettle, perennial ground cherry, vervain, goldenrod. *Clean plot.*
6- 3-55	Ester 2,4-D, 1 lb/A	88	St. Johnswort, perennial ground cherry, horsenettle, whorled milkweed, ragweed (trace). *Very clean plot.*
6- 3-55	Ester 2,4-D, 1 lb/A plus DDT, ½ lb/A	90	Horsenettle, sour dock seedlings, whorled milkweed, mountain mint, ragweed (trace), wild lettuce seedlings. *Very clean plot.*
6- 3-55	"Brush Killer", 1 lb/A plus DDT, ½ lb/A	91	Vervain, dandelion seedlings, horsenettle, sour dock, whorled milkweed, goldenrod, perennial ground cherry, ragweed (trace). *Clean plot.*
	Average	88.8*	Average of 1955 sprayings = 85.53% germination. (Controls not included)

*Control not included.

were cleaner than the check areas.

Medium Early Spraying, May 18, 1955 (Bluegrass heads well out of boot)

All of the plots sprayed May 18, 1955 showed better weed control for the perennial weeds. Most perennial weeds were just beginning to grow at the time of the early spraying. However, these weeds had attained a height of 2 - 4 inches at the time of the medium early spraying and thus were definitely injured more than when sprayed earlier. All 2,4-D and "brush killer" formulations resulted in cleaner plots than the check areas. (Table 3)

Late Spraying, June 3, 1955 (Bluegrass heads mature or nearly mature)

From the standpoint of weed control the late spraying resulted in the cleanest areas. (Table 3) Perennials such as dandelions, whorled milkweed, goldenrod, etc. seemed to be injured more by the June 3 spraying than by the earlier applications.

The germination data (Table 4) for the seed harvested in 1955 show that there were no extremely large differences between the viability of the seed harvested from the check plots and the viability of the seed from the treated areas. The time of application of some of the treatments seemed to have a slight depressing influence on the viability of the seed. Seed from the plot sprayed May 6, 1955 with ester 2,4-D and DDT germinated 8% less than the seed from the plot which received the same treatment on June 3, 1955. Seed from the plot treated with "brush killer" and DDT on June 3, 1955 germinated 11% higher than the seed from the plot which received the same treatment on May 18, 1955.

Temperature and rainfall data for the dates when spray applications were made are given in Table 5.

Table 4

Kentucky Bluegrass Seed Germination Data For 1955
Weed and Blight Control Studies

Treatment	Date of Application			
	5-6-55 Head starting to show out of boot	5-18-55 Heads well out of boot	6-3-55 Heads mature or nearly mature	
	Germination Percentage			
1. Control	87*	87*	87*	
2. DDT	89	86	86	
3. Amine 2, 4-D & DDT	84	86	86	
4. Ester 2,4-D	82	81	88	
5. Ester 2,4-D & DDT	82	85	90	
6. Brush Killer & DDT	84	80	91	
Average % Germination	84.2**	83.6**	88.8**	85.53**

*Average of three plots.
**Control not included.

Table 5
Weather Data For Days When 2,4-D, 2,4,5-T and DDT Treatments Were Applied to Kentucky Bluegrass Test Plots

Date	Temperature °F. high	low	Precipitation in inches
April 22, 1954	61	35	0.40
May 13, 1954	75	43	0.00
May 6, 1955	88	49	Trace
May 18, 1955	81	45	0.00
June 3, 1955	84	60	0.02

Discussion

Kentucky bluegrass seed processors are very interested in the practicability of spring application of weed control chemicals to Kentucky bluegrass pastures as a means of reducing the amount of roughage which must be processed to obtain saleable Kentucky bluegrass seed.

Many Kentucky bluegrass seed processors would aid farmers in spraying their pastures for weed control if they knew that such sprays would not seriously reduce the viability of the subsequent seed crop. Fall applications of weed control chemicals are known to adequately control pasture weeds. However, seedsmen hesitate to assist farmers in a fall weed control program because they have no assurance that the area treated will produce a seed crop the following spring. On the other hand if the weed control chemicals can be safely applied during the spring, particularly after the flower heads have emerged from the boot when one can determine the potential seed production of a given field, seedsmen will gladly assist the farmer providing the assisting seedsman can purchase the seed produced on the sprayed area.

The primary purpose of this experiment was to see what effects certain chemicals might have upon the viability of the seed crop, when applied at various times during the growth and development of the bluegrass seed heads. The experimental plots were large enough to permit use of tractor mounted spray equipment normally used by farmers.

Since the areas used were large and relatively uniformly populated with weeds it was felt that duplicate plots were not necessary to demonstrate the effectiveness of time of application of the spray materials upon control of weeds as well as the effects of the chemicals upon the viability of the subsequent seed crop. Each test plot was carefully checked during late summer for number and kinds of weeds present. The results of the survey showed that very early applications of the several compounds tested gave fair to good control of annual weeds but did not adequately control the perennial weeds. Spray materials applied during early May gave good to

excellent control of the annual weeds and good control of the perennial weeds while the applications made in early June gave excellent control of all broad leaf weeds.

The germination test results indicate that most spray applications had little or no effect upon the viability of the subsequent seed crop. However, (1) amine 2,4-D plus DDT, (2) "brush killer" plus DDT, and (3) ester 2,4-D plus DDT applied on May 13, 1954 seem to have brought about sizable reductions in seed viability, especially when compared with the viability of the seed from plots which received the same treatments April 22, 1954. Since ester 2,4-D and DDT did not bring about a reduction in seed viability when they were applied alone one can hardly assume that the reduced seed viability obtained from application of each of the above three combinations was caused by the action of any one chemical but rather was the result of interactions of the mixtures.

If one assumes that the reduced viability of the seed from each of the three test plots listed above was due to the interaction of the weed killer chemicals and DDT, then one would expect to obtain a reduction in viablility of the seed from all plots sprayed with those three combinations of materials, regardless of the date of application. However, the germination data presented previously shows that the three spray combinations in question did not seriously affect the viability of the seed harvested from plots treated at any time other than May 13, 1954. It would seem then that some factor or factors, in addition to the spray materials, must have contributed to the response of the bluegrass plants treated May 13, 1954. A careful check of available weather records (Table 5) indicated that perhaps the temperature at the time the spray materials were applied might have been a contributing factor because on May 13, 1954 the high temperature was 75° F. and the low was 43° F., while all the applications in 1955 were made on days when the high temperatures were 88, 81, and 84° F. respectively. However, the temperatures on April 22, 1954 were lower than on May 13, 1954 for the high was 61° F. and the low was 35° F. Further examination of the weather data revealed that on April 22, 1954 the area where the sprayed plots were located received 0.4 of an inch of rain. There was no measurable amount of precipitation recorded for any of the other spray application dates. The rain received on April 22 may have washed the spray material off before enough had been absorbed by the plants to affect the future seed crop. The rain may also account for some of the lack of control of perennial weeds by all the spray applications.

It seems then that the effects of the various spray materials and combinations of spray materials upon the viability of the subsequent seed crop were probably controlled largely by the weather

conditions which prevailed at the time of application.

SUMMARY

Weed control chemicals and DDT were applied to test plots in Kentucky bluegrass pastures near Creston, Iowa on April 22 and May 13, 1954 and May 6, May 18, and June 3, 1955 to determine the influence of date of application of such chemicals on (1) the viability of Kentucky bluegrass seed, (2) control of annual and perennial weeds, and (3) control of bluegrass blight.

The May 13, 1954 application of (1) amine 2,4-D plus DDT, (2) "brush killer" plus DDT, and (3) ester 2,4-D plus DDT produced marked reductions in the viability of the Kentucky bluegrass seed harvested from the treated areas. Earlier spraying had no marked effect on Kentucky bluegrass seed germination.

The weed control sprays applied on both 1954 dates controlled the broad leaved annual weeds very well. The perennial weeds were controlled better by the May 13th spraying except for the amine 2.4-D which did not give very good weed control for either application.

The germination percentages for Kentucky bluegrass seed harvested from all the 1955 treated areas were remarkably uniform. The largest differences in viability were obtained as a result of time of application of ester 2,4-D plus DDT and "brush killer" plus DDT. Seed from the plots sprayed June 3, 1955 exhibited the highest viability.

Control of annual broad leaved weeds was good for all treatments and times of application but control of perennial weeds was best for the applications made June 3, 1955.

Bluegrass blight was not present in the pastures used, therefore, it was not possible to determine the effects of date of application of DDT upon the control of this malady.

Weed control chemicals can be applied to Kentucky bluegrass pastures in the spring without seriously affecting the viability of the subsequent seed crop, provided weather conditions are right.

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