CHEMICAL AND MECHANICAL TREATMENT OF BUFFALO GRASS (BUCHLOE DACTYLOIDES) SEED TO IMPROVE ITS GERMINATION

CHEMICAL AND MECHANICAL TREATMENT OF BUFFALO GRASS (BUCHLOE DACTYLOIDES) SEED TO IMPROVE ITS GERMINATION

By

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INTRODUCTION

Buffalo grass (Buchloe dactyloides (Nutt.) (Engelm.) 2. is one of the most important native grasses of the Great Plains. Its value for pastures, erosion control, airports, lawns, parks, highways and for golf courses has long been recognized. Seed of buffalo grass is difficult to harvest and expensive to buy and field stands from moderate rates of seeding have been uncertain in the past.

Smith (4) reports that until about 1940, it is doubtful that more than 5000 pounds of buffalo grass seed had been collected in the United States. Since that date, many methods of collection have been employed by the various agricultural agencies and private individuals with such increasing success that an estimated 100,000 pounds of clean buffalo grass burs were harvested in the fall and winter of 1943-44. Although large quantities of buffalo grass seed are being harvested at the present time, seed prices are high and seeding results are not always successful.

The caryopsis of buffalo grass is enclosed in a cup-shaped structure commonly called a bur. These small, hard and nearly waterproof burs may contain one to five mature caryopses. These burs as generally harvested and sold to farmers for pasture planting germinate very slowly. Approximately 12 to 15% germinate the first year and about the same percentage the succeeding two or three years. This delayed germination of buffalo grass burs produces poor stands and farmers often become discouraged and plow up newly planted fields.

Seed treatment is necessary to overcome the natural dormancy of buffalo grass burs. For years this low germination was believed to

be due to the poor quality but in reality was natural dormancy. The purpose of this paper is to present data on treatment of buffalo grass burs to improve the germination. Many methods of treatment, including soaking in water, chemical solution and mechanical processing have been explored. The results of this study may be useful to the western farmers in revegetating abandoned farm land and in establishing new pastures.

REVIEW OF LITERATURE

Several different methods have been used to improve the germination of the caryopsis within the buffalo grass (Buchloe dactyloides (Nutt.) Engelm.) bur. Among these are soaking in tap water, prechilling and soaking or treating with chemical solutions.

Freyaldenhoven (1)[1] found that soaking buffalo grass burs in tap water from one to four days followed by immediate air drying, increased the germination. Burs soaked in 0.2% solution of KNO_3 for one to four days and prechilled for six weeks gave an increased germination over either untreated burs or burs pretreated by soaking in tap water for one to four days.

Pladeck (3) reports an increased germination was obtained from presoaking buffalo grass burs overnight in tap water when weathered burs were used. Soaking overnight in a 0.2% solution of KNO_3 was stimulating to germination. Prechilling increased the germination of unweathered burs. Soaking in tap water or 0.2% solution of KNO_3 did not increase the germination of unweathered burs.

Wenger (5) concluded that prechilling in a dry state materially increased the germination of all treated and untreated burs. Prechilling in a moist condition gave a better germination than prechilling dry untreated burs. In the case of soaked burs regardless of whether they were chilled or not, the samples soaked as long as 48 hours gave maximum germination in five days and nearly complete germination with-

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[1] Figures in parenthesis refer to "Literature Cited", p. 30.

in 14 days. Prechilling dry burs, either treated or untreated, for six weeks at 5° C. gave significant increases in germination.

Wenger (6) found that a weak solution of KNO_3 or KCl, or NH_4NO_3 was superior to water in treatment of new buffalo grass burs, especially where chilling followed soaking. Chilling always gave some additional stimulus regardless of the treatment used. Soaking burs 24 hours in a 0.5% solution of KNO_3 and then chilling at 41° F. for six weeks, raised the germination to at least 75.0% of their germinating capacity. Common salt will do nearly as well if variable chilling temperatures are employed after soaking. He further states that removing the hulls by mechanical processing with a hammer mill seems to hinder the establishment of proper moisture relations between the seed and the soil. Hulled seed gave good germination in the laboratory but has not given constant success in the field.

Smith (4) found that approximately five pounds of clean burs would yield one pound of clean hulled seed. Hulled buffalo grass seed germinated 70.0% to 75.0% in 8 to 12 days and produced 240,000 sprouts per pound. Untreated burs germinated 8.0% to 15.0% in 14 days and produced approximately 4,000 to 7,000 sprouts per pound. This means that a planting of five pounds of untreated burs an acre will result in two seedlings on three square feet, while one pound of hulled buffalo grass seed on an acre will give five to six seedlings on each square foot of land. The cost of seeding is reduced to approximately one-seventh by using hulled seed.

MATERIALS AND METHODS

The general methods used in this investigation are reported under materials and methods: however, at the beginning of each new phase of study, there is a brief discussion of the methods which apply to that particular section.

One hundred pounds of Kansas harvested buffalo grass burs were purchased by the Agronomy Department of Oklahoma Agriculture and Mechanical College. In February, 1946 the analysis made by the Oklahoma State Department of Agriculture showed a purity of 93.75%; germination 62.0%; inert matter 6.25%, and a trace of other crop seed. The burs were cleaned with a Clipper cleaner to remove foreign material before starting the experiment.

About February 15, 1946, 56 representative samples were placed in five ounce bottles for treatment. Two samples consisting of 200 burs each were taken at random from each bottle and dusted with Arasan before starting germination tests. Duplicate samples were tested under greenhouse and electric germinator conditions.

A mangelsdorf electric germinator was used for the laboratory germinations. The 200 seed samples were placed on water saturated 20-ply Kimpack crepe paper and placed in the germinator. The temperature of the electric germinator was alternated, 68° F. for nights and 78° F. for the days. Each day the germinator was checked to supply sufficient moisture for optimum germination. Counts were made on the second day and continued at two-day intervals for a period of 28 days. Immediately following each count the plumules and radicles were clipped off close to the burs to eliminate seedlings in the germinator.

Flats were filled with pure riversand and placed on soil filled benches in the greenhouse. All sandbox plantings were one-half inch deep and were sprinkled daily with water to insure sufficient moisture for maximum germination. Counts were made on the twelfth day and continued at 2-day intervals for 28 days. Immediately following each count the plumule was clipped off under the sand surface as close to the bur as possible. This eliminated the possibility of duplications in counting.

A Westinghouse refrigerator was used for prechilling. The temperature was held constant at 18° F. throughout all prechilling treatments.

The results from both electric germinator and sandbox tests were obtained from 200-bur tests with germination percentages expressed in terms of viable caryopsis germination.

An average of two caryopses per bur was found when the caryopses from a representative sample of 200 burs were counted.

A 20-inch Prater Hammer mill with swinging hammers was altered for processing native grass seed. A deflection plate was welded on each side of the hammer mill to prevent accumulation of seed on the screen flanges. The metal conveyer under the screen was removed and a four-cornered funnel, made from 16 gage sheet iron, was attached to the frame just below the screen. A 6-inch stovepipe was fastened to the fan housing and extended parallel with the base through the funnel-shaped attachment. The other end of the stovepipe was covered with an adjustable metal disc for regulation of the suction. A tee was put in the center of the stovepipe and extended downward almost to the bottom

of the funnel. A 3-inch pulley was used on the hammer mill to increase the speed of the fan which also increased the suction. The legs of the hammer mill were extended to permit room for a large bucket beneath the funnel to catch the seed and larger hulls.

The gradual reduction process of the Prater hammer mill was not changed. As burs enter the mill they meet the short, primary cruching blows of the first set of swinging hammers that start the reduction process. They pass in turn to succeeding sets of hammers, with each set increasing in length and consequent travel speed. These hammers successively strike faster and harder blows. The burs are hammered to the desired degree of fineness, breaking the burs apart so that separation of hulls and naked caryopses is possible. The crushed hulls and naked caryopses then sift through the screen and fall below where the suction from the fan through the tee blows dust and chaff out the hopper. The seed and larger hulls continue falling until they reach the bucket placed directly beneath the funnel.

The desired screen size will vary with quality of burs. Four different size screens were tested before finding the one that proved satisfactory. A 5/64 inch round hole screen was tried at varying speeds but proved unsatisfactory because the smaller burs sifted through unchanged. The 1/16 inch hole screen was tried by feeding the mill faster but the holes became plugged preventing seed and larger hulls from sifting through, resulting in considerable heating of the mill. A 3/32 inch round hole screen was found to do good work but was too slow for practical use. The 1/16 by 1/2 inch screen gave best results when the mill was fed slowly at 2000 r.p.m.

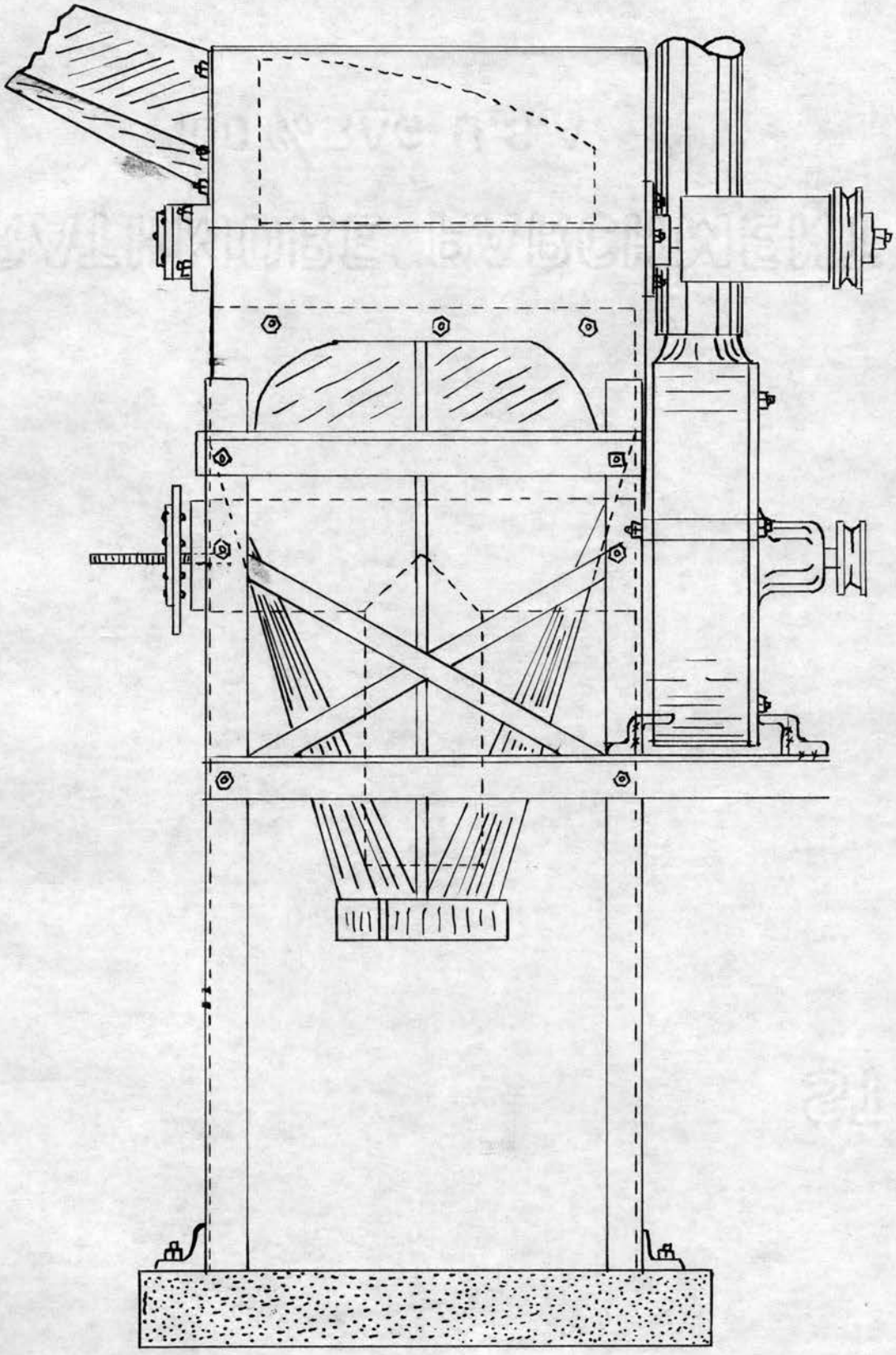

Figure 1. Prater Hammer mill Altered for Processing Seed.

Figure 2. Hammer Mill Ready For Operation.

The seed and hulls which were caught under the hammer mill were run through an ordinary fanning machine to remove the lighter hulls. This removed approximately one-half of the undesirable foreign material. The seed was then sifted with a small hole screen to remove the smaller hulls and ground up rocks. A larger screen was used to remove the large seed and hulls, and then the seed was run through a fanning machine again under increased windage, which removed the larger hulls allowing the heavy seed to fall through.

By feeding slowly and using a 1/16 by 1/2 inch screen, 30 minutes were required to feed 47 pounds of buffalo grass burs through the hammer mill. Eight pounds of clean seed with a purity of 86.32% was recovered from the 47 pounds of burs.

Figure 3. Hammer Mill Hopper For Collecting Dust and Chaff.

Figure 4. Blower For Cleaning Grass Seed.

DATA AND DISCUSSION

Soaked And Unsoaked Buffalo Grass Burs

Four samples of buffalo grass burs were soaked in tap water at room temperature. At the end of each 24-hour period a sample consisting of 200 burs was air dried. This gave samples of burs with the following treatments to be compared with the untreated burs: burs soaked 24, 48, 72 and 96 hours. Germination tests were started on all samples approximately two weeks later.

A noticeable variation in percentage of germination was found between the electric germinator and the sandbox test. (Table 1.) According to data obtained the longer soaking periods did not increase the germination. The highest germinations obtained were from the 24, and 96-hour treatments while the 72-hour treatment gave the lowest. Burs that received no treatment gave a 7.5% germination in the electric germinator and 1.5% in the sandbox test. Soaking the burs 24 hours gave a germination of 17.5% in the sandbox as compared to 7.5% in the electric germinator. From data obtained it appears that the germination of buffalo grass burs is a gradual process which requires an indefinite period of time. This gradual process is undesirable from the standpoint of artificial revegetation of cultivated land. In three out of four treatments a higher germination was obtained from the controlled conditions of the electric germinator. The peak of germination was reached about the 28th day. The data indicate a slight increase in germination by soaking the burs in tap water.

TABLE 1. GERMINATION RESULTS OBTAINED FROM SOAKED AND UNSOAKED BUFFALO GRASS BURS.

Treatment	Percent caryopsis germination									
	12 Days		16 Days		20 Days		24 Days		28 Days	
	S.B.*	E.G.**	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
None	0.5	3.5	0.5	5.0	0.5	5.5	0.5	7.5	1.5	7.5
Tap Water 24 Hrs.	8.5	3.0	10.0	3.0	11.5	6.0	15.0	6.5	17.5	7.5
48	3.5	3.0	3.5	4.0	4.5	8.5	4.5	8.5	4.5	10.0
72	0	6.5	0	7.0	0	8.0	0	8.5	0	10.0
96	2.0	8.0	4.0	9.0	4.0	14.0	6.0	15.0	7.5	17.0

* S.B. Refers to sandbox germination in the greenhouse.

** E.G. Refers to Mangelsdorf electric germinator.

CHEMICALLY TREATED BUFFALO GRASS BURS

Five samples were soaked in 0.4% solutions of NH_4NO_3, KCl, $NaNO_3$, NaCl, and KNO_3 for 24 hours at room temperature. Two samples were soaked in a 0.2% solution of KNO_3 for 24 and 48 hours respectively. This gave a direct comparison of the effect of five different chemicals of the same strength and two additional periods for 0.2% KNO_3 treatment. Immediately following the termination of the soaking periods, the samples were air dried. Germination tests were started immediately after air drying.

Observations on the seedlings showed that after eight days they began to emerge in the sandbox. This was much slower than the results secured under the controlled conditions in the electric germinator. According to data presented in Table 2, buffalo grass burs germinate very slowly and for an indefinite period of time.

The untreated sample gave 1.5% germination in the sandbox as compared to 7.5% after 28 days in the electric germinator. This much variation was common between the two methods of germination. It appears that the 0.4% solution of KNO_3 had a detrimental effect upon germination because very little increase was obtained between the 12 and 28-day, where in most cases the weaker solution of KNO_3 germinated much higher.

In comparing the seven different treatments the 0.2% solution of KNO_3 for 24 hours gave the best results. Burs soaked in a 0.4% solution of KCl or NH_4NO_3 for 24 hours showed very little response in germination. An increase in germination percentage was obtained from the 0.4% $NaNO_3$ and NaCl treatments.

Table 2.—GERMINATION RESULTS OF CHEMICALLY TREATED BUFFALO GRASS BURS.

Treatment			Percent caryopsis germination									
			12 Days		16 Days		20 Days		24 Days		28 Days	
			S.B.*	E.G.**	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
	None		0.5	3.5	0.5	5.0	0.5	5.5	0.5	7.5	1.5	7.5
NH_4NO_3	0.4%	24 Hrs.	0.5	3.0	1.5	3.0	1.5	4.5	1.5	4.5	2.0	4.5
KCl	0.4%	24 Hrs.	3.5	6.0	4.0	7.0	4.5	7.0	5.5	8.5	5.5	8.5
$NaNO_3$	0.4%	24 Hrs.	5.5	1.0	7.0	2.0	9.0	2.5	10.0	2.5	15.5	2.5
NaCl	0.4%	24 Hrs.	7.0	6.0	8.0	7.0	8.0	12.0	9.0	15.0	9.0	15.5
KNO_3	0.4%	24 Hrs.	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0
	0.2%	24 Hrs.	13.0	10.5	13.5	10.5	16.0	11.5	16.5	12.5	16.5	12.5
	0.2%	48 Hrs.	3.5	12.0	4.5	12.0	5.5	15.0	7.5	15.0	9.0	15.0

* S.B. = Sandbox germination in greenhouse.

** E.G. = Electric Mangelsdorf germinator.

MOIST PRECHILLING FOR THREE WEEKS IN VARIOUS STRENGTH SOLUTIONS

Samples were prechilled in solutions of KCl, NH_4NO_3, $NaNO_3$, NaCl, KNO_3 of 0.2%, 0.3%, 0.5%, and 1.0% strengths for three weeks.

It was observed that seedlings began to emerge on the eighth day in the sandbox and on the third day under the controlled conditions in the electric germinator. The dry prechilled samples gave very little response over the untreated samples as shown in Table 3. Prechilling in tap water showed a slight increase in the sandbox test.

The KCl treatments showed an increase in germination up to 0.5%, which seemed to be the peak and decreased as the strength of solution increased. There was very little difference in germination on the 12th day but thereafter the 0.5% treatment gave the highest results. The lowest germination was obtained from the 1.0% treatment which appeared to have retarded the germination. According to data obtained, the treatment with KCl has a range of 0.2% to 0.5% for increasing the germination. When the strength of treatment goes above this a decrease in germination can be expected.

Data obtained from the NH_4NO_3 treatment showed 0.2% and 1.0% solutions gave the lowest germination with 0.3% the highest. This, to a certain extent, indicates the range of treatment for optimum germination. The 0.3% solution gave 14.0% germination in the sandbox as compared to 7.5% which was obtained from the 0.5% treatment on the 28-day test. In all cases in which samples were treated with NH_4NO_3 a higher germination was obtained from the sandbox test. This may be due to the leaching effect encountered from sprinkling the sand with water.

Samples treated with various strength solutions of $NaNO_3$ showed

an increase in germination up to 0.5%. The 1.0% treatment gave no germination in either sandbox or electric germinator. This indicates the solution was too strong and the viability was killed. On the twentieth day there was very little difference in the percentage of germination for the different treatments up to the 1.0% solution. The highest germination was obtained from the 0.5% treatment which gave 24.5% in the sandbox on the twenty-eighth day. From the twelfth to the twenty-eighth day a steady increase in germination was noticed.

A decrease in germination was obtained from all samples treated with more than 0.2% solution of NaCl. This indicates a strong solution of NaCl is undesirable for treating buffalo grass burs to improve the germination percentage. On the twelfth day all treatments except the 1.0% solution gave practically the same germination. No outstanding increases were obtained from any of the NaCl treatments.

In the various treatments of KNO_3 there were no trends indicating a maximum strength solution. The weaker and stronger solutions alike increased the germination. In comparing the final results for the twenty-eighth day the highest germination was obtained from the 0.3% solution in the sandbox. In all cases the sandbox germinations were higher than in the electric germinator. The 0.2% solution gave the best results and the 0.5% solution treatment gave the lowest. The second highest came from the 1.0% solution treatment.

Table 3.--GERMINATION RESULTS OF PRECHILLED AND CHEMICALLY TREATED BUFFALO GRASS BURS.

Treatment		Percent caryopsis germination									
		12 Days		16 Days		20 Days		24 Days		28 Days	
		S.B.*	E.G.**	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
None (Not Prechilled)		0.5	3.5	0.5	5.0	0.5	5.5	0.5	7.5	1.5	7.5
Tap Water (Prechilled)		3.5	4.0	4.5	8.5	4.5	8.5	6.5	8.5	6.5	8.5
Dry (Prechilled)		0.5	4.0	1.0	5.0	1.5	8.5	2.5	8.5	2.5	8.5
KCl	0.2%	3.5	3.5	4.0	3.5	6.0	4.0	6.5	7.0	6.5	8.0
	0.3%	2.5	4.5	3.0	4.5	3.0	6.0	3.5	7.0	3.5	10.0
	0.5%	4.5	5.0	6.0	5.0	7.5	5.0	8.5	5.5	11.0	5.5
	1.0%	1.5	2.5	2.0	3.0	4.0	3.5	4.0	3.5	4.0	3.5
NH_4NO_3	0.2%	0	0	1.0	0	2.0	0	3.0	0	3.5	0
	0.3%	3.0	6.0	4.5	6.0	8.5	7.0	13.5	7.0	14.0	7.0
	0.5%	3.5	4.0	5.5	4.5	6.5	4.5	6.5	4.5	7.5	5.5
	1.0%	1.5	1.0	2.0	1.0	3.0	1.0	4.0	1.0	4.5	1.0
$NaNO_3$	0.2%	5.5	11.5	7.0	11.5	11.0	14.0	15.0	15.5	16.5	17.5
	0.3%	7.5	14.0	9.5	14.0	12.0	14.5	18.0	17.5	21.0	18.5
	0.5%	7.0	10.0	9.0	11.5	11.5	12.5	16.5	12.5	24.5	13.0
	1.0%	0	0	0	0	0	0	0	0	0	0

Table 3.—Contd.

Treatment		Percent caryopsis germination									
		12 Days		16 Days		20 Days		24 Days		28 Days	
		S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
NaCl	0.2%	6.5	5.0	7.0	7.0	7.5	10.5	10.5	10.5	10.5	12.5
	0.3%	6.5	1.5	7.0	1.5	7.0	2.0	8.5	2.5	9.5	2.5
	0.5%	6.0	2.0	7.0	3.5	8.5	3.5	9.0	4.0	9.0	4.0
	1.0%	2.5	1.0	4.0	2.0	5.5	3.0	5.5	3.5	6.5	3.5
KNO_3	0.2%	10.5	10.0	12.5	11.5	17.0	14.5	18.5	15.0	22.5	17.5
	0.3%	11.0	6.5	12.0	8.0	15.0	8.0	20.5	8.0	24.5	8.0
	0.5%	4.0	4.0	8.0	6.0	10.5	6.0	15.0	6.5	15.0	7.5
	1.0%	7.5	7.5	9.0	12.0	13.5	12.0	19.0	12.5	24.0	13.0

* Refers to sandbox germination.

** Refers to electric Mangelsdorf germinator.

MOIST PRECHILLING FOR SIX WEEKS IN VARIOUS STRENGTH SOLUTIONS

Solutions of KCl, NH_4NO_3, NaCl, KNO_3, and $NaNO_3$ of the following strengths 0.2%, 0.3%, 0.5%, and 1.0% were used. Samples were prechilled in the above mentioned chemical solutions for six weeks.

According to data presented in Table 4, on the KCl treatments with various strength solutions, as the strength of solution increased the germination decreased. All four treatments indicated that the germinations from the controlled conditions in the electric germinator were higher than the sandbox. The highest germinations were obtained with the 0.2% solution and the lowest with the 0.5% and 1.0% solutions. No outstanding final results were obtained from any of the different strength solutions.

The results indicate that as the strength of the solution increased the germination decreased. The 0.2% solution of NH_4NO_3 germinated 27.5% and 18.5% respectively as compared to 0.2% and 1.0% for the 1.0% solution in both methods of testing. The same trend of germination from increased solution strengths held constant from the 12th day until the final count on the 28th day. It appears that a detrimental effect was produced by the 1.0% treatment.

Of the four samples treated with $NaNO_3$ the highest germination was obtained from the 0.2% solution. It appears the stronger the solution the lower the germination. The trend found indicates that variation in germination held constant from the 12th day until the final count on the 28th day. Results indicate practically no difference between the sandbox and the electric germinator tests.

Data obtained from various treatments of NaCl indicate as the

strength of treatment increases the germination decreases. The highest final germination was obtained from the 0.2% solution treatment and the 1.0% solution gave the lowest. This trend held constant throughout the germination period. No outstanding results were obtained from the treatments with NaCl.

In treating with different solutions of KNO_3, no definite trend of germination was found. Samples treated with a 0.5% solution gave a 25.5% germination in the electric germinator which is the highest germination obtained. Both the 0.5% and 0.2% treatment gave increased germination. The variation between the different treatments held fairly constant throughout the germination period.

A comparison of the five different chemicals shows NH_4NO_3 with a 0.2% solution gave the highest germination with the 0.2% solution of $NaNO_3$ slightly lower. In four out of five cases, of the five treatments used, as the chemical strength of the solution increased the germination decreased. This held constant with all chemicals except $NaNO_3$ treatments. Prechilling dry did not increase the germination over the untreated sample. This indicates prechilling had no effect upon the germination. In most cases the higher the germination percentage on the 12th day the higher the final results on the 28th day.

Table 4.--GERMINATION RESULTS OF PRECHILLED AND CHEMICALLY TREATED BUFFALO GRASS BURS.

Treatment		Percent caryopsis germination									
		12 Days		16 Days		20 Days		24 Days		28 Days	
		S.B.*	E.G.**	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
None (Not prechilled)		0.5	3.5	0.5	5.0	0.5	5.5	1.5	7.5	1.5	7.5
Dry (Prechilled)		2.5	2.0	3.0	2.5	3.0	2.5	4.0	2.5	4.0	2.5
Tap Water (Prechilled)		2.0	4.5	2.0	8.5	2.0	9.5	2.0	9.5	3.0	9.5
KCl	0.2%	4.5	2.5	4.5	3.0	6.0	3.0	6.5	4.0	6.5	10.5
	0.3%	1.5	2.5	2.0	3.0	2.0	3.0	2.5	3.0	3.0	7.5
	0.5%	1.0	1.0	1.0	1.5	1.0	1.5	1.0	1.5	1.0	5.0
	1.0%	0.5	1.5	0.5	1.5	1.0	2.0	1.5	2.5	2.0	3.0
NH_4NO_3	0.2%	9.0	17.0	14.5	17.0	20.5	17.0	26.0	18.0	27.5	18.5
	0.3%	5.5	8.5	7.5	10.0	9.0	10.0	13.0	10.5	13.5	10.5
	0.5%	2.0	5.5	5.0	6.0	7.5	8.5	8.0	9.0	8.0	9.0
	1.0%	1.0	0.5	1.0	1.0	1.0	1.0	1.5	1.0	2.0	1.0
$NaNO_3$	0.2%	9.5	8.0	11.0	16.5	15.0	18.5	18.0	18.5	19.0	27.5
	0.3%	9.0	9.5	9.5	13.5	12.5	18.0	13.5	18.5	15.0	27.5
	0.5%	4.5	2.5	6.5	3.5	10.5	4.0	14.5	4.5	18.0	5.0
	1.0%	6.0	4.5	8.0	5.0	13.5	5.5	15.0	6.0	17.5	7.0

Table 4.--Contd.

Treatment		Percent caryopsis germination									
		12 Days		16 Days		20 Days		24 Days		28 Days	
		S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
NaCl	0.2%	5.0	1.0	5.5	2.0	9.5	5.5	9.5	9.0	12.0	9.5
	0.3%	3.0	2.0	3.5	2.0	5.5	5.5	6.5	8.0	6.5	8.0
	0.5%	2.0	1.5	2.0	1.5	3.0	5.0	3.5	5.0	3.5	5.5
	1.0%	1.0	0.5	1.5	0.5	1.5	0.5	2.0	0.5	2.0	1.0
KNO_3	0.2%	11.0	17.0	17.0	18.0	21.0	18.0	22.0	18.0	24.5	18.0
	0.3%	5.5	12.5	7.0	14.0	8.0	14.0	10.5	14.0	11.5	14.0
	0.5%	6.5	20.5	10.5	24.5	13.0	24.5	15.5	25.5	18.0	25.5
	1.0%	4.5	9.0	5.5	10.0	7.0	10.0	8.0	10.0	10.0	10.0

MECHANICALLY TREATED BUFFALO GRASS SEED

The hulls were removed from buffalo grass seed by mechanical processing with a hammer mill. Cleaned samples of the processed seed were placed in the electric refrigerator for six weeks at a temperature of 18° F. At the end of the six weeks period germination tests were conducted on the processed and prechilled processed seed in the sandbox and electric germinator.

According to data in Table 5, there was very little difference in germination between the samples mechanically treated and the processed prechilled samples. This indicates that prechilling neither increases nor decreases the germination of processed seed. On the twelfth day the peak of germination was reached in the electric germinator. Tests in the sandbox were much slower. Very little increase in germination was noticed between the twelfth and the twenty-eighth day of germination in the electric germinator.

On the twenty-eighth day the untreated caryopses gave 40.5% in the sandbox and 52.0% germination in the electric germinator as compared to the samples prechilled six weeks which gave 42.5% in the sandbox and 36.0% in the electric germinator. It is believed the low germination results are due to the poor quality burs.

Figure 5. (a) Processed (b) Unprocessed Buffalo Grass Seed.

TABLE 5. GERMINATION RESULTS OF BUFFALO GRASS SEED MECHANICALLY TREATED TO REMOVE HULLS

Treatment	Percent caryopsis germination									
	12 Days		16 Days		20 Days		24 Days		28 Days	
	S.B.*	E.G.**	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.	S.B.	E.G.
None	37.0	51.5	40.0	51.5	40.0	52.0	40.5	52.0	40.5	52.0
Prechilled 6 Wks.	37.5	36.0	39.0	36.0	42.5	36.0	42.5	36.0	42.5	36.0

* Refers to sandbox germination.

** Refers to electric Mangelsdorf germinator.

SUMMARY AND CONCLUSIONS

In the spring of 1946 germination tests were conducted at Oklahoma Agricultural Experiment Station on buffalo grass burs to study the effects on germination of the following treatments: soaking in tap water; soaking in chemical solutions; prechilling; prechilling in chemical solutions and mechanical processing.

In most cases, seedlings began to emerge on the eighth day after planting in the sandbox. Sprouting began on the third day in the electric germinator.

Soaking buffalo grass burs in tap water from one to four days followed by immediate air drying slightly increased the percentage of caryopsis germination. Soaking for 24 hours gave the highest germination in the sandbox test but the 96-hour soaking period gave the highest results in the electric germinator. This indicates no increase in germination by longer soaking periods.

Of the seven samples soaked in chemical solutions the 0.2% solution of KNO_3 gave the highest germination results. The $NaNO_3$ treatment gave increased germination in the sandbox but showed no response in the electric germinator.

No increase was obtained from prechilling buffalo grass burs dry for three weeks and very little response in germination was found from prechilling in tap water. The highest germinations from prechilling three weeks in chemical solutions were from the 0.3% KNO_3 treatment. A noticeable variation of percentage of germination was found between the electric germinator and the sandbox test.

Prechilling dry buffalo grass burs for six weeks did not increase

the germination. Very little increase was obtained from prechilling in tap water. In all chemical treatments, with the exception of $NaNO_3$, as the strength of the treatment increased the germination decreased. The most outstanding results were obtained from the KNO_3 treatments.

Much time and labor are required to remove the hulls from buffalo grass caryopses. In the mechanical treatment special equipment is essential for processing and cleaning. In addition to improving the germination, the emergence of the mechanically treated seed was decidedly more prompt and uniform in both the electric germinator and sandbox tests. In most cases quick uniform germination is believed to be a decided advantage in establishing stands.

In comparing germination results of chemically and mechanically treated buffalo grass caryopses, the mechanically treated sample gave approximately twice as many seedlings as the highest chemically treated sample.

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