AGRONOMIC CROP SCIENCE REPORT

Research Extension

EVALUATION OF AN ALTERNATIVE GRASS SEED HARVEST SYSTEM TO FACILITATE RESIDUE HANDLING 1/

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Introduction

Rapid straw removal from the field is an important part of any change in the present system of handling grass seed residues. The present harvest system includes cutting the grass at a relatively well-defined stage of maturity, which is in general the stage when the seed matures to a point of shattering. The straw is swathed and placed in rows and allowed to dry for 7-10 days before threshing. To utilize the straw after threshing, it must be collected and transported from the field to a central collection place or to the point of utilization.

It has been proposed that the harvest system be modified to provide for moving the straw and seed to a central point soon after cutting. The unthreshed straw would be made into loose bales after cutting. The material would then be moved from the field to a central point for threshing. This system allows the residue to be removed from the field shortly after cutting and permits field sanitation to start two to three weeks earlier than possible under the current system. In addition, the residue (including the chaff, a byproduct lost under the current system) would be available at a central point for further processing.

A number of potential problems with this system are immediately apparent. One immediate problem is how seed quality will be affected by enclosing the unthreshed material in a relatively high-moisture-content bale. The purpose of this study was to evaluate the collection and handling of material by this system and the effect on seed quality.

Methods and Materials

Four seed crops were included in this study: annual and perennial ryegrass, orchardgrass, and bluegrass. The seed crop was swathed at the

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1/ This study was financially supported by the Oregon Field Sanitation Committee. Assistance of Bruce Meland and Mary Haselow is acknowledged. EXT/ACS 15. 9/75.

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normal stage of development and allowed to dry naturally. At approximately two-day intervals the unthreshed material was baled with a Vermeer baler modified with a pan under the compressor belts to collect shattered seed. Bales were stored in an open shed until threshed several months later. The temperature within the bales was measured and recorded for several days or until the internal temperature stabilized.

Results

The baler and equipment used in the trials worked satisfactorily. However, if the unit is to be used on a regular basis, a major change in the system of collecting seed shattered during the baling process is needed.

The weather became an important factor in the trial, with measurable rain falling nine days during the baling period. (See Table 1.) Note that even standard harvest procedures were complicated by the rainfall.

Orchardgrass

The orchardgrass crop was cut on June 27 and allowed to dry for five days in the windrow before the first bales were made. At the time of baling, the moisture content of the straw in the windrow was 21 percent. There was no significant heating in the bales at this moisture level. There was a slight increase in the mean temperature in Bale #12 made on July 14 (see Table 2). This bale was made after 1.18 inches of rain had fallen on the crop in the windrow. However, the temperature did not affect the germination of the seed within the bale. Bales #10 and #11 were made on July 11 at the end of three days of rain. The moisture content of that straw going into the bales was 31 percent, but this higher percentage did not cause an increase in the temperature in the bales.

Annual Ryegrass

The annual ryegrass was cut on July 11 and allowed to lay in the windrow for four days before the first bales were made. Bales #17 and #18 were made four days after cutting, and Bale #19 was made nine days after cutting; between these days, 0.6 inches of rainfall fell. The increased moisture in the straw from the rain caused Bale #19 to heat to an average of 115° F. The seed from this bale germinated only 25 percent (see Table 3).

Perennial Ryegrass

The perennial ryegrass was cut on July 11 at the end of a rainy period. The material was allowed to lay in the swath for two days before the first bales were made. Bale #13 (see Table 4) heated only slightly, and the

germination was normal. Bale #14, made on the second day, and Bale #15, made on the fourth day, heated to 98° F. and 102° F., respectively. The germination of the seed from these bales was lowered. There were no bales of perennial ryegrass made on July 20 corresponding to annual ryegrass bale #19, which was wet and heated excessively. Bales #22 and #23 made on July 22 had a slightly elevated temperature, but seed germination was not lowered.

Highland Bentgrass

Table 5 shows germination of seed from the highland bentgrass bales. There was no increase in temperature in these bales, and the germination of the seed did not appear to be affected by the treatment.

Discussion

Table 6 shows the average germination of seed taken from the windrow as compared to seed taken from bales after threshing. In orchardgrass, annual ryegrass, and perennial ryegrass the germination of the seed from the bales was lower than the seed taken directly from the windrow by 6 percent, 15 percent, and 9 percent, respectively. This comparison suggests that the baling treatment did reduce the germination quality of the seed, even when the seed was not subjected to extremely high temperatures.

Table 7 shows the germination of seed taken from the bales and the swath at intervals. In nearly all cases, the longer the seed was in the windrow before baling, the higher the germination percentage. Although the seed was nearly mature at the time of swathing, the additional time that it was in the windrow allowed the seed to mature and reach a lower moisture content, which in turn enabled it to withstand the conditions in the bale. Heating in the bale can account for those cases in which the germination percentage did not improve as days in the swath increased.

Seed germination from annual ryegrass and perennial ryegrass bales did not reach the 90 percent minimum required by Oregon certification seed quality standards (table 7). The orchardgrass and bentgrass reached the 85 percent minimum germination required of these crops after 14 days in the swath. Baling straw with seed soon after swathing lowers in the seed quality below minimum certification standards, which seriously reduces its marketability.

Based on bale temperature measurements, temperatures up to 90° F. did not have a detrimental effect on seed germination. Average internal bale temperatures of 98° F. or greater resulted in a reduced seed viability. The highest average temperature recorded, 115° F., reduced seed germination to 25 percent.

Summary

An evaluation was made on alternative-grass-seed harvest system of baling unthreshed grass from the field shortly after swathing. The Vermeer baler is satisfactory for this operation with some modification to catch shattered seed.

Reduced seed germination resulted from baling under moisture conditions high enough to reduce shattering. This system has an adverse affect on seed germination quality. The average of all baled seed was below that of the seed taken directly from the windrow and not subjected to the baling treatment. Allowing the seed and straw to dry in the swath apparently provides time for essential seed maturation before exposure to bale conditions. Baling soon after swathing reduces seed quality below market standards.

Temperature conditions within the bale at or below 90° F. did not reduce seed germination. Mean bale temperatures above 98° F. reduced germination.

TABLE 1

Weather Conditions

June 27 - August 21, 1974

Date	Temperature Min. (°F)	Max. (°F)	Precip. (inches)
June 27	46	62	.15
28	43	67	
29	55	79	
30	57	92	
July 1	51	85	
2	44	66	
3	44	71	
4	55	84	
5	54	78	.15
6	50	68	.01
7	49	73	
8	53	72	.14
9	51	68	.87
10	52	61	.01
11	51	67	
12	44	69	
13	48	75	
14	45	83	
15	49	76	
16	50	70	
17	52	74	.43
18	50	69	.17
19	55	71	
20	55	75	
21	50	83	
22	49	82	
23	52	81	
24	50	75	
July 25	53	82	
26	54	84	
27	54	88	
28	55	91	
29	61	94	.03
30	56	93	
31	58	95	
August 1	54	96	
2	51	94	
3	52	92	
4	53	91	
5	51	89	
6	47	85	
7	44	78	
8	45	78	
9	45	79	
10	52	90	
11	44	87	
12	49	77	
13	48	72	
14	45	73	
15	43	78	
16	50	81	
17	47	86	
18	56	77	
19	56	72	
20	55	65	
21	49	73	

TABLE 2

ORCHARDGRASS 1/

Bale No.	Baling Date	Moisture 2/ (%)	Days in Windrow	Maximum Mean Temperature in Bale (°F.)	Germination		Bale Weight at Threshing (Lbs.)
					Before Baling (%)	After Baling (%)	
4	7/2	21	5	75		80.2	1475
5	7/2		5	69		95.3	1750
6	7/4	21	7	68		80.8	1425
7	7/4		7	78		81.8	1550
8	7/6	20	9	71		84.2	1610
9	7/6		9	79		83.4	1430
10	7/11	31	14	76	87	86.8	1550
11	7/11		14	74		83.8	1500
12	7/14	23	16	93	91	86.5	1175
33/34				70		85.7	----
MEAN					89	82.8	1496

1/ Cut June 27, 1974.
2/ Straw in Windrow.

TABLE 3

ANNUAL RYEGRASS 1/

Bale No.	Baling Date	Days in Windrow	Maximum Mean Temperature in Bale (°F.)	Germination		Bale Weight at Threshing (Lbs.)
				Before Baling (%)	After Baling (%)	
17	7/15	4	86	91	77.0	1525
18	7/15	4	94		75.3	1650
19	7/20	9	115	91	25.0	1350
20	7/22	11	96	94	77.0	1530
21	7/22	11	89		88.0	1550
26	8/12	32	69		90.3	1470
27	8/12	32	71		84.7	1175
30	8/12	32	71		88.7	1450
31	8/12	32	70		87.0	1370
MEAN				92	77.0	1452

1/ Cut July 11, 1974.

TABLE 4

PERENNIAL RYEGRASS 1/

Bale No.	Baling Date	Days in Windrow	Maximum Mean Temperature in Bale (°F.)	Germination		Bale Weight at Threshing (Lbs.)
				Before Baling (%)	After Baling (%)	
13	7/13	2	90	87	89.5	1180
14	7/13	2	98		61.3	1650
15	7/15	4	102	87	61.2	1725
16	7/15	4	81		84.3	1385
22	7/22	11	89	94	88.5	1325
23	7/22	11	92		86.0	1475
32	8/12	32	71		87.0	990
MEAN				89	79.7	1390

1/ Cut July 11, 1974.

TABLE 5

HIGHLAND BENTGRASS

Bale No.	Baling Date	Maximum Mean Temperature in Bale (°F.)	Germination After Baling (%)	Bale Weight at Threshing (Lbs.)
Venell				
33	8/12	70	78.0	----
36	8/21		89.0	1550
37	8/26		81.3	1500
39	8/27		84.0	1675
41			85.5	1850
42			87.0	1850
43			86.3	1600
MEAN			84.4	1671
Funrue 1/				
52	9/5	69	71.5	1360
53	9/6	95	79.0	1950
54	9/6	75	73.0	1670
55	9/7	71	77.0	1450
MEAN			75.1	1607

1/ Cut 9/4.

TABLE 6

Average Germination of Seed
from Windrow and from Bales

	Germination	
	Seed Taken from Windrow (%)	Seed from Threshed Bales (%)
Orchardgrass	89	83
Annual Ryegrass	92	77
Perennial Ryegrass	89	80

TABLE 7

Seed Germination from Bales and Swath

Crop	Days in Windrow	Bales (%)	Swath (%)	Seed Certification Minimum (%)
Orchardgrass	5	77.9	-	
	7	81.3	-	
	9	83.8	-	
	14	85.3	87	
	16	86.5	91	85
Annual Ryegrass	4	76.1	91	
	9	25.0*	91	
	11	82.5	94	
	32	87.7	-	90
Perennial Ryegrass	2	75.4	87	
	4	72.7*	87	
	11	87.2	94	
	32	87.0	-	90

* Heated.