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Results of HAY CRUSHING TESTS

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CURRENT TRENDS toward more livestock production in Alabama have stimulated demands for information concerning improved pastures and high quality silage, hay, and grain. The severe winters and dry summers of recent years have emphasized the need for an adequate reserve supply of good, stored feeds. It is generally accepted that pastures supply the cheapest feed for cattle. Yet a livestock program without standby and supplemental feeds is a risky undertaking. Further, in the interest of production economy, it is imperative that these stored feeds have high quality and that this quality be maintained during storage.

Hay is the basic stored roughage for the livestock producer. Hence, research is continually underway to discover practices that enhance its quality or reduce the risks during curing. Development of the hay crusher was one step toward better quality hay.

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DESCRIPTION of EQUIPMENT

The hay crusher (title picture) is power-take-off driven, and is towed by a two-plow tractor. It consists of a hay pick-up device and steel crushers that are adjusted by spring tension to crack

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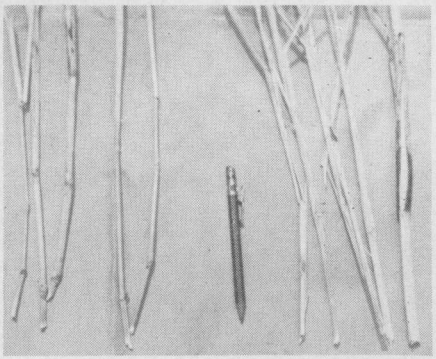

Figure 1. Crushed stems at right dry rapidly; at left are uncrushed stems.

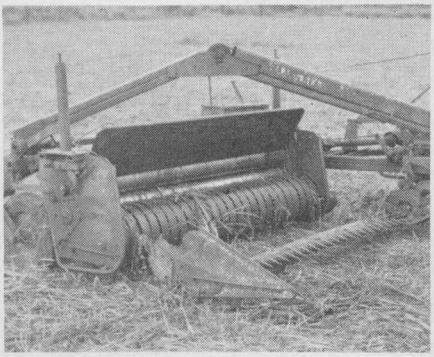

Figure 2. This hay crusher has mower blade attached as part of the unit.

the slow-drying hay stems (Figure 1). This cracking permits the stems to dry almost as rapidly as the leaves. Some crushers also have a mower blade attached as part of the unit (Figure 2).

EXPERIMENTAL RESULTS

Effect on curing time: Results from experiments conducted in 1952 on Johnson grass averaging 24 to 30 inches high showed that crushers considerably reduced the time required for field curing. (See chart below.) In one test made during excellent curing weather, the crushed hay cured to 19 per cent moisture in 24½ hours. Uncrushed hay cut at the same time was on the ground almost 71 hours and was baled at 31 per cent moisture. In this test, the crushed hay cured in about one-third of the time needed for the uncrushed.

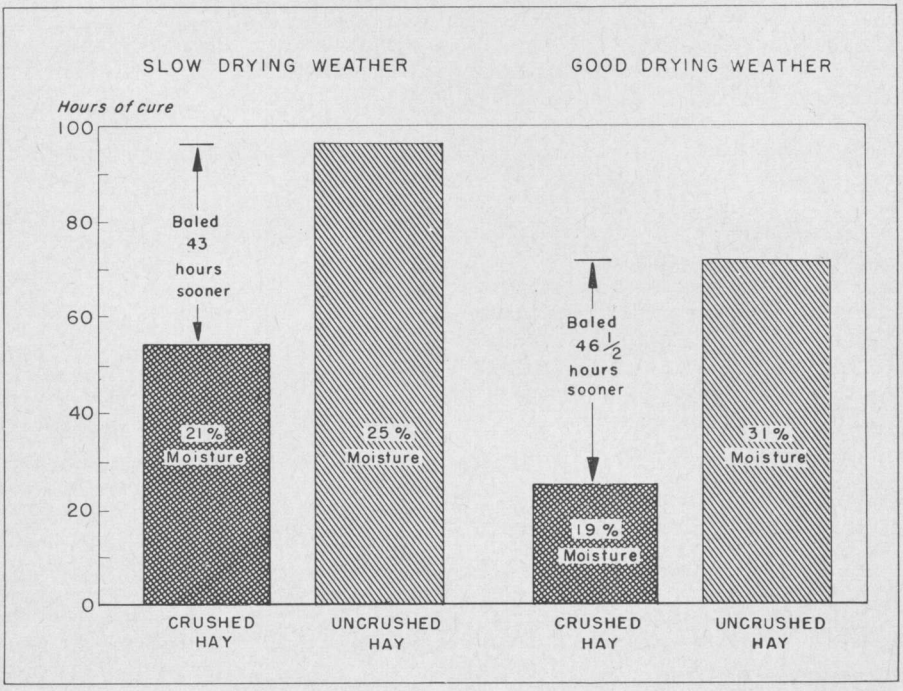

TABLE 1. CAROTENE CONTENT[1] OF JOHNSON GRASS HAY PRODUCED BY VARIOUS HAY-MAKING METHODS

Sample identity	Sampled at		After 5 months storage
	Cutting	Baling	
	Mg./lb.	*Mg./lb.*	*Mg./lb.*
Trial 1			
Uncrushed	77.0	12.0 (15.6)[2]	4.4 (5.7)
Crushed	77.0	15.0 (19.5)	5.1 (6.6)
Mower crushed	77.0	19.0 (24.7)	8.6 (11.2)
Trial 2			
Uncrushed	77.0	16.0 (20.8)	5.1 (6.6)
Mower crushed	77.0	38.0 (44.6)	10.8 (14.0)

[1] Expressed on dry matter basis.
[2] Values in parenthesis represent percentage of original carotene.
Note: After 5 months storage there were no significant differences in contents of moisture, protein, ether extract, and ash of the hays cured by different methods.

Another test was conducted during less favorable hay-curing weather. This time the crushed hay required 54 hours to dry to 21 per cent moisture. Uncrushed hay needed 97 hours to dry to 25 per cent moisture. Thus, the crushed hay cured in a little over half the time needed for the uncrushed.

Soybean hay harvested in 1951 showed similar results. Crushed soybean hay dried to 39 per cent moisture in 6¼ hours. The uncrushed hay tested 38 per cent moisture after 25 hours on the ground. It was noted that the crushed soybean stems dried almost as fast as the leaves.

These results and those reported by other researchers indicate that on the average the curing rate of thick-stemmed hay crops can be cut in half by the use of hay crushers. This general observation has been made by personnel of the Black Belt Substation where crushers have been in use for 6 years.

Effect on quality: The carotene content of the Johnson grass hay as given in Table 1 was determined after mowing, at time of baling, and after 5 months in storage. The crushed hay cured during excellent weather contained over twice as much carotene at baling as did the uncrushed hay. Crushed hay cured during less favorable weather contained 1/3 to 1/2 more carotene than did the uncrushed hay. At baling time, the crushed hays contained from 1/5 to 1/2 of the carotene that was in the crop at mowing time.

After 5 months storage all Johnson grass hay had less carotene than at time of baling. The crushed hay, however, still contained more carotene than the uncrushed.

Crushed soybean hay also showed considerably more carotene at baling time than the uncrushed. These data are given in Table 2. This was believed to be caused by more exposure to the weather, since the uncrushed hay lay on the ground longer than the crushed.

The moisture, protein, ether extract, and ash contents of all the hays after 5 months storage were not significantly different. There was some indication of a higher protein content in the crushed hay although the observations were too few to draw conclusions.

TABLE 2. CAROTENE AND PROTEIN CONTENT[1] OF CRUSHED AND UNCRUSHED HAY AT VARIOUS STAGES

Sample identity	Carotene		Protein	
	At mowing	After baling	At mowing	After baling
	Mg./lb.	*Mg./lb.*	*Pct.*	*Pct.*
Uncrushed	173	22	18.8	16.2
Crushed	121	54	19.2	18.6

[1] Expressed on dry matter basis.

The palatability of the crushed Johnson grass hay was indicated by mature brood cows at the Black Belt Substation. These cows consumed a daily 18-pound wintering ration of crushed hay, stems included. A year earlier, the same cows had rejected the dry, brittle stems of a 15-pound ration of uncrushed hay.

SUMMARY

In two tests the time required for crushed Johnson grass hay to field-cure was ⅓ to ½ of that required for uncrushed hay. Crushed soybean hay dried to 34 per cent moisture in about 6 hours. Uncrushed hay from the same field required 25 hours to reach this moisture level. In these tests the risk of unfavorable weather was reduced considerably by crushing, since the time required for curing was within the period covered by normal weather forecasts.

The carotene content of crushed hays was about twice that of the uncrushed. This was also true after storage for 5 months, although all samples had lost carotene. No differences in moisture, protein, ether extract, or ash were noted in Johnson grass hay after 5 months of storage. The crushed and dried soybean hay showed a slight advantage over uncrushed hay in protein content.