PUBLICATIONS

1995

Ryegrass Symposium Proceedings

1995

CHAPTER 9

RYEGRASS HAY, SILAGE AND GREENCHOP PRODUCTION

Sim A. Reeves, Jr., Agronomy
Texas A&M University Agricultural
Research and Extension Center - Overton

Introduction

Excess ryegrass in the spring makes excellent greenchop, silage or hay with high protein and energy when harvested at the proper stage of maturity. Because money has already been spent, it is a good economic practice to harvest this forage instead of allowing it to go to waste. Harvesting as a stored forage is a means of saving it for a time when feed will be short. Ryegrass is grown alone or in combination with small grain using the same agronomic and harvesting procedures.

Producers usually plant 1-2 acres per cow to provide sufficient forage for grazing in fall and winter when growth is slow. Excess forage results in the spring when ryegrass makes its most rapid growth. This forage can be harvested and saved for later use. Most ryegrass is overseeded on warm-season perennial grass sods. Excess ryegrass in the spring should be harvested as hay, silage , greenchop or shredded to allow the warm season grass to receive sunlight for growth. Allowing ryegrass to grow 2-3 feet tall in the spring can smother out large areas of the warm-season grass.

Maturity is the main factor in producing quality ryegrass forage. The boot, or early head stage, is the ideal stage to harvest ryegrass for quality forage production. Data collected at the Texas Agricultural Experiment Station in Angleton (Riewe and Parks, 1962) shows the effect of harvest date on forage quality (Table 1).

Harvesting ryegrass at the boot stage produced the highest number of leaves, crude protein and lowest fiber. The yield of ryegrass increases as the plants are allowed to mature but quality drops very fast. When small grains and ryegrass are grown together, the mixture should be harvested when the earliest maturing species reaches the boot stage for high quality. A producer should decide whether he wants quality or quantity. Due to poor drying conditions for hay production, ryegrass and small grains are usually harvested as silage at the boot stage and for hay production when the plants mature. Mature plants do not require as much time to dry in the field since they contain less moisture and drying conditions are usually better.

Table 1. Effect of stage of maturity on percent leaves stems, heads, protein, crude fiber and oven dry forage yields (Riewe and Parks, 1962)

Harvest Date	Percent			Crude Protein	Crude Fiber	Yield DM,lbs/ac
	Leaves	Stems	Heads			
3/21	91	9		14.2	20.8	2530*
4/1	73	22	5	11.5	29.5	3510**
4/17	41	34	25	8.0	31.1	4690
4/27	37	39	24	8.7	31.7	5510
5/5	30	32	38	8.2	33.8	5440

Angleton, 1961

* Second harvest May 5 yielded an additional 1720 lbs/ac

** Second Harvest May 5 yielded an additional 810 lbs/ac

Greenchop

Greenchop is a very viable option for dairies and feedlots that are in close proximity to the fields. Operations that haul feed to livestock can very readily use greenchop. Ryegrass and small grain mixtures can be used for greenchop any time there is sufficient volume to justify running the harvesters. The moisture content of ryegrass before the heading stage usually runs between 80-90%. High moisture content means that a lot of the weight of greenchop forage is water. The longer the haul, the more expensive the forage becomes per unit of dry weight of forage per animal. Ryegrass should be 6-8 inches, or taller, to justify harvesting. The taller the ryegrass, the more forage harvested at a cheaper cost. Ryegrass may be greenchopped from late fall through spring.

An ensilage harvester can be used to cut greenchop ryegrass. The harvester usually blows the forage into a feed wagon and the greenchop is then carried straight to feeding troughs for livestock consumption. Ryegrass can be harvested as long as there is sufficient forage and the soil is dry enough to hold the tractor and equipment. Harvesting on soil that is too wet will cause ruts in the field and reduce future harvests. The moisture of the greenchop will vary depending upon the weather. The number of harvests may run as high as 6-10 per season. This depends upon the volume of forage produced and livestock needs. Total season yields may be reduced by increasing the number of harvests.

The quality of greenchop is usually very high if the ryegrass is immature and the soil fertility level is high. Well fertilized ryegrass harvested at 6-8 inch height will usually run from 20-30% crude protein. The digestibility and energy values will also be very good. Once the plants advance beyond the boot stage, the quality of forage will decline quickly. Greenchop cannot be stored because heat buildup occurs from the high moisture forage from plant respiration. Therefore, greenchop should to be fed as soon after harvest as possible, especially in warm weather.

Silage Management

Ryegrass makes a big part of its growth in March, April and early May. Finding 5-7 days during this period to harvest and cure ryegrass at the proper stage of maturity for hay production can be difficult. Silage or haylage provides an opportunity to harvest ryegrass at the proper stage of maturity for the highest quality. One of the advantages silage has over hay production is that drying times are reduced from 5-7 days to 24 hours, depending on the weather (McCormik, 1993). The forage lost in storage is reduced from as high as 50% as hay to around 5% as silage. The greatest advantage is being able to harvest forage at the proper stage of maturity for optimal quality.

One disadvantage of producing silage is the increased cost of additional equipment needed to harvest, haul and pack silage. There also is the cost of plastic or some other material to cover the silage, depending upon the storage area.

There is a yield potential of 1-2 tons per acre of forage at the boot stage. The yield depends upon when the ryegrass was last harvested. Ryegrass can also be harvested for silage several times per year when it reaches sufficient height. The longer the interval between harvests, the higher the yields. There must be sufficient yields to justify running the harvesters and sufficient volume to justify filling a silage bunker or silo. Silage saves a higher percent of nutrients in the forage and helps reduce the fiber content. When stored properly, silage provides for long term storage of forages. Ryegrass for silage should be valued by its quality and pounds of nutrients recovered per acre--not on number of tons per acre.

The main factors in producing high quality silage are to harvest the crop at the right stage of maturity and to ensile in such a manner that minimum nutrient losses occur and maximum palatability is assured. Quality ryegrass silage is produced when the forage is harvested at the correct stage of maturity, with the correct moisture content, appropriate length of cut so the material can be packed and oxygen is excluded for aerobic fermentation. Moisture content in

harvested forage should be around 70% for a trench, bunker or stack silo, 50% for an upright silo and 40-60 for an air-tight silo (Sell, 1975). The moisture content is critical so that the forage can be packed tight but not allow for excessive leaching of nutrients and soggy, unpalatable silage. The length of cut should be around 1/2 inch. The drier the forage, the shorter the length of cut so the material can be packed. Higher moisture storage allows for a little longer cut. Good packing procedures of silage are essential to good silage storage. Oxygen needs to be excluded to reduce spoilage and excessive heat buildup. Silos should be filled as fast as possible and packed well to reduce molds and heat damage. The silo should be located in a convenient location for feeding and filling. Trench silo should be located where adequate drainage is possible.

A normal fermentation process is shown in Figure 1. Aerobic bacteria use the limited amount of oxygen present along with cell respiration. Carbon dioxide is released along with heat. The oxygen is replaced by CO_2. In the absence of oxygen, an aerobic bacteria use sugars from the plant to produce acetic acid as the plant material pH begins to decrease. Lactic acid is produced following acetic acid. The pH is lowered to 4 and below, stopping all bacterial action, and the silage remains stable until it is exposed to oxygen.

When the silo is opened or air is allowed to enter, the aerobic bacteria increase causing spoilage and excessive heat production. Once a silo is opened, the open face of the silage should be fed at a rate sufficient to prevent major spoilage.

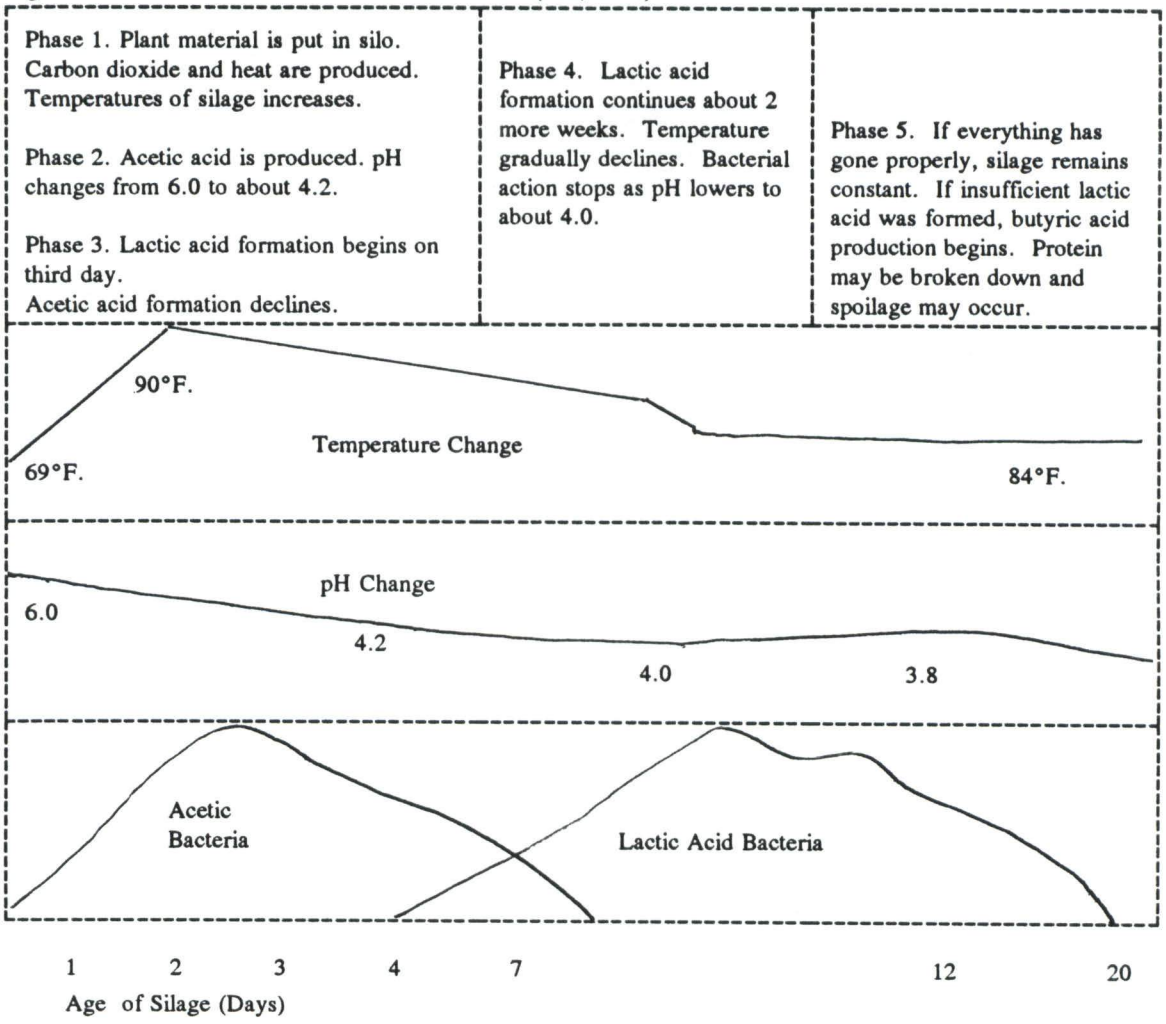
Haylage or Balage

Producer interest in hay crop silage (haylage or balage) has increased in the past few years. Haylage has the advantage over conventional silage of being able to harvest small quantities of excess forages that otherwise would be left in the field. Haylage also allows a producer to harvest crops at their highest quality with less machinery than is required for silage.

With round bale silage (balage), the only additional equipment needed is an adapter to the baler to handle moist forage and a machine to wrap plastic around the bale. The major cost increase over dry hay is the expense of wrapping the bale and the plastic. The plastic to stretch-wrap round bales usually costs from $3.50 to $5.00 (McCormik, 1994) a bale, depending upon the plastic.Round bales have been placed in individual plastic bags, long bale tubes, plastic sheets and stretch- wrap plastic. Disposal of the plastic at feeding has also been an environmental concern with users.

In Texas, a plastic with a good UV inhibitor is required to prevent breakdown of the

Figure 1. A Normal Fermentation Process (Sell, 1975)



plastic under high sunlight. A cheap plastic (low UV inhibitor) will last less than one year under Texas climatic conditions. Round bales must be tied with plastic or untreated sisal twine. Standard hay twine is treated with a rodenticide which can lead to premature deterioration of plastic wrap. Research conducted in Australia, Florida and the Southeast Research Station in Louisiana (McCormik, 1994) suggests that optimum dry matter for bale silage should range from 30-45%. Plastic coverings can be damaged by birds, animals, machinery and other occurrences, allowing air to enter the bale, which results in rotten, moldy and poor quality bales. Haylage must be kept in an oxygen-free environment to maintain the quality of forage baled.

Research was conducted by McCormik, 1993, on stretch-wrapped ryegrass round bales. Ryegrass was harvested at the boot stage and wilted to around 50% moisture. After four weeks of outdoor storage, the temperature increased from 80°F to over 170°F in unwrapped, wet bales.

Wrapped bales peaked at 95°F after 7 days and then returned to 80°F. After six months in storage, the unwrapped, wet ryegrass bales had lost 43.4% of their initial dry matter while those wrapped in 3mm and 4mm plastic lost 10.7 and 4.2%, respectively. Protein values averaged 15.8% for bale silage and 7.9% for conventional ryegrass hay.

Hay Production

Excess ryegrass, alone or in combinations with small grains, can be harvested as hay. Harvesting usually occurs in late April or May. The optimum time to harvest for quality is when a grass plant is at early boot to early head stage, but this occurs in early April when hay drying conditions are usually poor.

The average total yields of the top four commercial varieties in a variety test conducted at Overton (Ward, et.al., 1992-93) was 7696 pounds dry matter per acre. The amount of forage produced from the middle of March to harvest was a little over 2 tons per acre. This is usually the part of the ryegrass crop that is harvested for hay. Two tons of forage harvested as hay after grazing, or as greenchop for four months, provides an added bonus for growing the crop.

In a pasture where a producer would like ryegrass to reseed itself, the excess ryegrass may be cut in early boot stage around the 1st of May in East Texas. This will produce a quality ryegrass hay along with removing ryegrass from shading out the warm-season sod. Ryegrass will then regrow and produce a seed crop while growing with the warm season sod. Many producers delay harvesting ryegrass for hay until May to allow ryegrass to produce seed. Harvesting hay at this stage produces maximum yields but a lower quality. Hopefully, enough seed will survive to reestablish ryegrass in the fall. In years with a long, cool spring season, this excess ryegrass in May can cause a stunting and in some cases, a loss of warm season grass.

Ryegrass hay stored outside will lose quality if subjected to rainfall (McCormik, 1993). Ryegrass hay does not have sufficient leaves to form a thatch on the outside of the bale to shed water. As a result, water enters and quality and quantity of hay is reduced. Work by Nelson, et. al. (1983) showed that dry matter loss was high for ryegrass put up in round bales stored on the ground, gravel, tires and a rack. Ryegrass round bales stored for 12 months on the ground had losses approaching 40%. Storage on tires, gravel and racks without covers resulted in dry matter loss of 30% or more. There was only around 9% decrease in dry matter for ryegrass round bales stored in a barn for 12 months. Animal refusal losses during feeding of round bales was determined after seven months. Bales stored on the ground had the highest refusal of 22%. Ryegrass hay stored in the barn had around 4% refusal. Total hay loss from handling, dry matter

and animal refusal was 65% for ryegrass round bales after 7 months of storage on the ground. Hay stored in the barn had a total loss of 13% for the same time. The quality of hay stored in the barn remained about the same. The digestible dry matter was the highest for ryegrass round bales stored in the barn and the lowest for bales stored outside.

McCormik, Mike. 1994. Bale silage: Production, Storage and Feeding. Proceedings of Louisiana Forage and Grassland Annual Conference. Nov. 1, 1994 in press.

McCormik, Mike. 1993. Round bale silage--a new way to store Louisiana forages. The Louisiana Cattleman, p. 13,14,22. Dec. 1993.

Nelson, B.D., L.R. Verman and C. R. Montgomery, 1983. Effects of storage method on losses and quality changes in round bales of ryegrass and alfalfa hay. Louisiana Agricultural Experiment Station Bulletin No. 750. 1983.

Riewe, M.E. and P. F. Parks. 1962. The effects of harvesting at several stages of maturity of gulf ryegrass upon yield and physical and chemical characteristics of forage with ryegrass grown along and in combination with berseem or red clover. Texas Agricultural Experiment Station, Angleton Report. 1960-61.

Sell, W.H., 1975. Silage production, harvesting and storing. University of Georgia Cooperative Extension Service. Bulletin 716. Reprinted 2-75.

Ward, S., J. Crowder and L. R. Nelson. 1994. Ryegrass forage yields at Overton for 1992-93 and Four-Year Means. Texas Agricultural Experiment Station, Center Technical Report No. 94-1, 1994.