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SILAGE

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During the past few years scientific investigations into the principles underlying the preservation of green fodder in the form of silage have been undertaken both in Europe and America. As a result, new methods have been introduced and a more reliable product with considerable improvement in feed value can be obtained by the application of these methods. The use of mechanical aids for handling the heavy fodder has also been brought to a high degree of efficiency and where this equipment is available, much time and heavy labour can be saved.

Hay will continue to hold its place as the main source of winter feed and it is not suggested that hay should be replaced even in part by silage when conditions permit good hay to be made with certainty. But the conversion of green fodder into silage when the weather is unsettled is a sure way of securing the full value of the surplus growth and avoiding the losses which occur if the hay is spoilt by rain. This applies, in Canterbury, particularly to the early crops or the first cut of lucerne if the ground is wet and the weather unsettled at this period. Silage is a valuable feed for milking cows and for breeding ewes whenever a grazing shortage is liable to occur. Once they have become accustomed to it; all classes of stock eat good silage with avidity. It can be fed within three weeks of making and, if properly sealed, it can be stored for two or three years without deterioration. Finally, there is no risk of destruction by spontaneous combustion or by fire. While silage is easy to make, care and judgment are necessary in order to make good silage.

Principles of Preservation.

When green material rich in carbohydrates and proteins is stacked in a heap it ferments as a result of bacterial action and a rise in temperature occurs. The kind and amount of fermentation depends on several factors:—(1) The air supply, (2) the moisture content, (3) the proportion of soluble carbohydrates (sugars) to soluble proteins (nitrogenous materials). The most desirable type of fermentation is the one in which the soluble carbohydrates are mainly converted to lactic acid. There is less loss of nutrients, the product is palatable and the acid acts as a preservative which prevents undesirable bacterial action such as the decomposition of the protein compounds.

Lactic acid fermentation is favoured by the following conditions:

(1) The material should be rich in soluble carbohydrates in proportion to its protein content. Lucerne, vigorous growing pastures with a high proportion of clover and young grass, are too rich in protein to make the best quality silage by themselves. As a result of the decomposition of the proteins bad flavours may develop, i.e., putrefaction takes place. This can be prevented by the addition of materials in which carbohydrates predominate. Layers of more mature grass in the hay stage or cereals are suitable, but molasses is now being recommended. It provides a readily available source of sugar which is quickly converted to lactic acid. Oats and vetches cut at the flowering stage make a good mixture for silage. In general, the more immature the crop the higher the proportion of protein to carbohydrate and the greater the need for adding molasses. The crop should not be allowed to be-

come too mature, for while, in the case of lucerne, the composition for silage may be improved, yet the material becomes fibrous and stemmy with the result that it will not pack tightly and the silage will over-heat.

(2) The exclusion of air by tight packing causes the fermentation to stop at the lactic acid stage and the temperature does not rise much above 95 to 100 degrees F. When careful attention is not given to tight packing, the supply of air may allow the temperature to rise up to 120-160 degrees F. and this is accompanied by an excessive loss of nutrients. High temperature silage is associated with an over mature crop, with wilting the cut crop before stacking, with coarse stemmy crops and with uneven spreading and loose packing of the material in the stack. It is very important to tease out the heaps of herbage, spread it evenly and tramp firmly to the outer edge of the stack. With coarse material such as maize, grass and cereals in the hay stage, it is advisable to chaff prior to stacking. Special cutters and blowers have been designed for this purpose and are used when silage is made from such crops. The aim should be to exclude the air as much as possible and this is best accomplished by cutting the crop while still soft and succulent, by stacking immediately, and by tramping firmly.

(3) If too much moisture is present in the ensiled material there will be copious drainage from the stack and many valuable nutrients will be lost. This is likely to occur if the crop is young and the conditions within the standing crop are damp and humid. Such material should be allowed to wilt for a few hours before stacking. Silage can be made during inclement weather but it is not advisable to continue stacking when the cut crop becomes really wet.

It is obvious that all the conditions recommended for making the best quality silage cannot be accurately controlled and in practice a fair amount of judgment is necessary. An understanding of the principles outlined above, combined with actual experience, will enable the farmer to make a good quality product under the varying conditions which occur.

Crops for Silage.

The most popular silage crops in New Zealand are surplus pasture growth and lucerne. Any crop, however, which is grown for hay, can be used and of these, oats and vetches, or even oats alone and maize are equally good. Crops which are rich in protein such as lucerne, clover and young grass should be mixed with a more mature cereal or with molasses. Potatoes, sugar beet tops, kale and such like crops can also be used. Cabbages and rape do not make good silage. Potatoes have been made into silage by building a stack with layers about 3in. thick of raw potatoes, alternating with layers one foot thick of herbage. A second method is to cook or steam the potatoes and ensile them in a pit or any convenient, strong container such as a concrete pen; or for small quantities, oil drums are useful. The cooked potatoes should be tightly packed and sealed with a 1ft. layer of soil.

Stack Silage

The stack has been and is likely to remain the most popular method of storing silage. A certain proportion is wasted on the top and round the sides as a result of too much air gaining access to these parts. This is unavoidable but can be reduced to small proportions by making large circular stacks. In England and America, portable silos and sisal-kraft paper silos are being used to minimise this loss.

The size of the stack will depend on the quantity of material to be ensiled. After an estimate of the yield is made, (1 ton hay=3 tons silage), the following list of sizes and capacity will enable the farmer to select a suitable size for a particular crop. They have been calculated on a basis of mature silage weighing approximately 45lbs. per cubic ft.

Diameter in Feet	Capacity in tons
16	35 - 40
20	50 - 60
24	80 - 100
30	120 - 150

When stacking silage the walls must be kept upright and firm by tramping to the outer edge and the herbage should be teased out and not put on in lumps. The top should be kept level until the stack is completed when the sides can be built up higher than the centre. When a strong wind is blowing it

is advisable to hang a sheet on the windward side in order to prevent uneven settling.

Covering the Stack

A satisfactory method of covering and sealing the stack is to place a load of green material in the centre of the stack and, using this, build alternating layers of soil and green herbage around the raised edge. This will bind the soil and prevent it slipping off when the stack settles. A layer of soil about 1ft. thick should be used to cover the top of the stack. It is not necessary to place a layer of straw between the soil and the silage. Some prefer to fix a row of manure bags filled with soil around the outer edge. Others use wire netting or boards wired together to keep the soil from slipping off.

The use of Molasses.

The reasons for adding molasses to herbage rich in protein have already been given. The quantity used ranges from 1½ to 2½ gallons per ton of silage, the heavier application being used for the protein-rich material such as immature lucerne, clover and young grass, while the lighter application is used for these crops in a more mature stage of growth. An over dose of molasses is not detrimental, in fact it adds to the feeding value of the silage. Molasses costs about 1/- per gallon. It is best to dilute the crude molasses with an equal quantity of water a day or two before using and have it ready in a tank or oil drums when stacking commences. The solution is applied with a watering can or pump as the stack is being built.

Mechanical Aids. The green herbage is heavy to handle and silage making by hand is a very laborious undertaking. It is almost essential to use sweeps or a hay loader and a hoist of some kind if the work is to be done in a reasonable time. After cutting with a mower the crop can be windrowed with a side delivery rake and loaded on to waggons by hand or preferably with the aid of a hay loader attached to horse-drawn waggons or to the farm truck. Sweeps are more commonly used. At the stack a simple jib hoist or elevator is used to raise the heavy material on to the stack. With three waggons, a side delivery rake, hayloader, and grab stacker, a gang of 8-9 men can cart to the stack and make from 50-60 tons of stack silage in a day. By stacking in the paddock in which the material is grown and using a sweep and grab-stacker, about half this number of men will suffice.

Pit Silage

Where it is convenient to construct a suitable pit which can be filled from the top, a saving in handling can be effected and 2-4 men can do the work. An excavation in the side of a bank and open on the lower face is very suitable. The pit can be lined, provision being made for unloading at the bottom of the bank. When filling the pit it is advisable to heart up in building so that when settling occurs the material will be forced against the walls and this will help to reduce the spoilage. The pit should be sealed in a manner similar to that described for the stack. A bank can sometimes be utilised for tipping the herbage over the edge from sweeps or waggons and a stack may be built at the bottom.

Trench Silage

In flat country where the water table in the soil is not too high and where drainage is good, some farmers have successfully employed the trench method. The sides of the trench are given a slope of 1 in 8 or more if the soil tends to cave in and they may be lined with concrete. The most convenient depth is about 8ft. and width 8-10 ft. Such a trench will hold about 1½ tons of silage for each foot length. The material can be swept into the pit and the horses or trucks can be driven over the material thereby consolidating it. The pit is covered and sealed with a foot or more of soil.

Feeding Out

Silage is a considerably better feed than roots. It is particularly valuable for dairy cows in summer dry periods when succulent feed is scarce.

In the interests of economy, stock should not be given more silage than they can clean up at one feed. A full ration for an adult sheep is 5-6lbs. On fair grass 3lbs. a day should be sufficient. For dairy cows up to 80lbs. a day may be fed. At times silage may taint

the milk but this can be overcome by feeding directly after milking. Some difficulty may be experienced in getting stock to eat silage which is sour. This can be overcome by feeding out several hours prior to allowing the animals access to it. When feeding out, only part of the surface of the stack should be exposed at a time. A sharp spade is a very convenient tool for cutting the section required.

Conclusion

The modern technique of silage making gives a more reliable and more nutritive fodder. The new recommendations are, earlier cutting, exclusion of air by even spreading and firm tramping of the succulent material, and the addition of molasses to material rich in protein. The methods of building a stack, pit and trench to provide these conditions, are outlined.

Copies of this Bulletin may be obtained from the Secretary, Canterbury Chamber of Commerce, P.O. Box 187, Christchurch.

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