RESEARCHES REGARDING THE ACTION OF SOME INFLUENTIAL TECHNICAL FACTORS ON THE MAIZE SILAGE

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Abstract
Research aimed at highlighting the technical factors influence the quality of maize and silo losses.The material studied was corn silage from different regions of the silos respectively: CS - silage covered with waterproof foil and US - uncovered silage (covered with 20-30 cm of chopped straw) has been introduced corn in different stages of vegetation. Samples were collected from the surface of the silo (50 cm deep) CS1 and US1, from the centre of the silo CS2 and US2 and the laterally sides of the silo (70 cm from side walls) CS3 and US3. Following investigations, it was observed that if not met the technical principles of operation of a silo, resulted in two silos mass loss of dry matter of about 14% of the total mass of the CS silo and 12.25% in the US silo, which is equivalent to 56 t and 79 t milk respectively.

Key words: corn silage, density, influential factors, losses

INTRODUCTION

Corn harvested for silage is an important feed crop. The crop provides livestock producers with a high-yielding, relatively consistent source of forage and the animals with a highly digestible and palatable feed [12]. Crop managers are more closely monitoring crop maturities to ensure optimum dry matter levels at harvest. Harvesters adjust chop length, height and processing to deliver a potentially high quality feed to the storage structure. A great challenge to successful silage production occurs in the silo, an bunker. In a silo, microbial processes can be modified to enhance fermentation, through management practices such as harvest moisture, length of harvest period, oxygen exposure, and silage inoculation [9]. Optimum silage fermentation occurs in an oxygen free environment. More dense silage provides ideal conditions for rapid oxygen depletion at the start of fermentation and minimizes the introduction of oxygen back into the silage pack during storage and feed-out.

The production difficulty farmers often encounter is timing harvest so that the proper moisture for ensiling is obtained for the storage. If corn silage is too wet then yield is often reduced, silo seepage occurs and the silage is sour tasting resulting in lower intake by livestock. If corn silage is too dry then yield is often reduced, heat damage and mold more easily develops in the silo because fermentation is inadequate, and the silage has lower protein and digestibility. Maturity at harvest [9; 3; 6; 15] and cutting height at harvest [1; 2] also affect grain and stover content and subsequent corn forage quality. Density is also closely related to how conservation and feed quality. [13] noted that losses during storage silo was inversely proportional to its density. The one of most important factor affecting the efficiency of silage preservation is the degree of anaerobiosis achieved in a closed silo [16].

MATERIALS AND METHOD

The material used in the experiments was procured from a farm from Bacău county, respectively corn silage, consisting of corn hybrids for silage Monalisa and Florence and a hybrid for grain PR38V9, hybrids sold by Pioneer. Maize was sown in early May on three parcels, of which only two (plots planted with hybrid PR38V9 and Florence) were works of fertilization with manure (45t/ha) and without irrigation. Maize was harvested between 11.08 - 26.08.2007. The harvesting took place at a height of 10-12 cm from the soil in order to avoid the contact of the chopped mass with the soil and harvested mass was chopped at the dimension of 10 - 20 mm, condition in which the cobs were well fragmented and the beans broken. Samples of silage were taken from a silo covered with polyethylene film (CS)(closed on 18.08.2007 in the composition of which were introduced hybrids PR38V9 and Monalisa) and a silo uncovered (US), (covered with 20 cm chopped straw, which was introduced corn hybrids in Florence, Monalisa and PR38V9 and closed on 26. 08.2007). Samples were prepared for analysis in accordance with the rules in the standard: - SR ISO 6498/2001 (Fodders. Preparation of samples for analysis). Analysis of chemical composition took place in Laboratory of Faculty of Animal husbandry from Iaşi. For chemical determinations were performed using the standards: ISO 6496/2001 feed. Determining the moisture content and other volatile substances. Density in studied silos was calculated by weighing silo then recovered in 25 cm^3 was calculated for 1 m^3. Silo temperature was determined using Hanna HI 9063 portable thermometer.

RESULTS AND DISCUSSION

Green mass humidity is most important factor influencing the fermentation process is represented by the amount of water recovered in the plant at harvest. Humidity affects pasture pickling it depends on the amount of soluble sugars and what kind lactobacills load with the temperature or the use of silage preservatives (inoculated). Increasing the proportion of dry matter is accompanied by increased osmotic pressure and resistance with it of lactobacills. Microorganisms that are found in mass silo need water for growth and multiplication. A silo with a humidity above 75% will provide a biological activity increased, but at the risk of lower pH [7; 9; 11]. Wet silo stored in a horizontal silo is problematic during the compaction pressure causes elimination of water and with it the soluble sugars necessary for fermentation and a part of protein and minerals.

If the silo is too dry it does not ferment and therefore does not decrease the pH to optimum value (3.8 to 4.0), pH control the activity required to maintain aerobic bacteria and fungi [4] is difficult to say which is the optimum humidity.

As can be seen from the data presented in table 1 the amount of dry matter recovered in the two silos studied influence the processes of fermentation. Forage samples collected from the surface area of uncovered silo and near the side walls of the covered silo had a content of about 25% dry matter, which resulted in an increase in pH from 4.13 for 262 g/kg raw DM to 4,3 for an amount of 244.2 g/kg raw DM. You can also see that the pH value of other samples was within the desired range (3.9 to 3.98).

Table 1. The amount of dry matter and pH values in studied silos

Specification	*pH*	*DM* (g/kg raw)
SA1	3,9	328,3
SN1	4,13	262
SA2	3,92	285,2
SN2	3,98	319,4
SA3	4,3	244,2
SN3	3,97	319,8

CS- covered silage; UN - uncovered silage;
1 - samples collected at 50 cm from the surface of the silo;
2 - samples collected from middle of the silo;
3 - samples collected at 70 cm from the side walls;

Highest content of dry matter was found in samples collected from the surface of the covered silo 328.3 g/kg raw SU, which resulted in a lactic fermentation and a pH optimum of 3.9. Following tests carried out could be observed that the stability of fermentation processes produced only in regions where the amount of silage dry matter was 300 g/kg raw - 330 g/kg raw. So from those observed can be considered for silos studied optimal proportion of dry matter was 33%.

Fodder quality and nutritional value of fodder pickled greatly influenced from the size of which is subject chopping for ensilage. Usefulness of grain breakage during the chop is given from early release of starch from grain and better use of the animal feed due to increased digestibility of fodder pickled. Dimension on which the shredding was conducted between 1 and 2 cm which has enabled a proper compaction.

The best known method of filling the silo is progressive method, the silo is filled at an angle of 30 º - 40 º. This method of filling reduces air exposed surface thereby reducing degradation of the silo. Respect filling method that facilitates the process of compaction and anaerobes [11].

Filling the silo covered (CS) was carried out between 11.08 - 18.08.2007 period in which the silo was placed approximately 800 tonnes of maize green mass. Green mass was transported from 15 to 30 km with trailers of 25 tons, carrying an average 5 trailers per day. Filling the silo was not achieved soon because of the need for use of agricultural machinery and for other purposes. Normally the rate of filling a silo of 800 tons would be 40 tons per hour (respectively 20 hours to complete filling of the silo) in conditions in which the compaction was used a vehicle of 15 tonnes. The consequence of filling in the long time was unevenness of dry matter in silo mass and development butyric and acetic fermentation. Uncovered silo (U.S.) was filled in 11 days, its capacity is about 1200 tons. For filling uncovered silo for a filling rate of 40 t/h would be required 30 hours. Filling was interrupted by adverse weather conditions thus extending the closing time of the silo. Prolonged closure of the silo and the amount of precipitation fallen in the last days of filling the silo is also reflected by increased humidity from the top of the silo, which resulted in a butyric fermentation.

Compaction of the silo was done with a crawler tractor 15 tonnes throughout filling making breaks at night. Silo density influence with the amount of dry matter at harvest and chopping rate of mass loss silo. Density found in different regions of the silo covered (CS), highlights not just a desired compression. If you compare the values found in the silo CS with those presented by [5] it may be noted that the surface density of the silo and on the side is low (about 220 kg DM/m^3 and respectively 190 kg DM/m^3), which would generate losses, as shown, about 17% of dry matter. In the U.S. silo compared with CS silo surface density was lower by 60 kg DM/m^3 and the side was a 40% increase compared to the density of lateral regions of the siloCS.

The density of the two silos in the middle regions and based was 240 kg DM/m^3 and respectively 260 kg DM/m^3, values which correspond to losses of around 15 % of total dry matter (tab.2.).

Table 2. Density in studied silos - comparison

Specification	**Density (kg DM/m³)**				
	50 cm from the surface	170 cm above the ground (middle)	70 cm from the left side wall	70 cm from the right side wall	30 cm above the ground (base)
Covered silage (CS)	220 kg DM/m^3	240 kg DM/m^3	190 kg DM/m^3	200 kg DM/m^3	260 kg DM/m^3
Uncovered silage (US)	160 kg DM/m^3	240 kg DM/m^3	224 kg DM/m^3	200 kg DM/m^3	260 kg DM/m^3

Low density values found in the two silos can be attributed to factors such as long period in which the sealing silos, using a single tractor to settle the two silos, stopping work at night, during the silo absorbed air mass. Low density on the sides of silos may be caused and prevented passage of the tractor to the edges of the silo because of the danger of capsizing. An explanation of the low density of surface SN silo can be attributed uncovering silo.

It should be noted that any new methods of preservation or preparation of fodder determined the change of the physico-chemical feed, and losses arising from a change in nutritional value and more or less food behavior of animals.

In the silo uncovered US, the area surface which found a large amount of air caused by low density of this area occurs because of moldy fodder pickled. Quantity of fodde affected by moldy was 147 tonnes respectively 12.25% of the fodder, achieving a financial loss estimated as the equivalent of 78.5 tons of milk. We noted that development of moldy in pickled fodder was not arrested at low pH. This development took place in the middle silo SA where, although the pH was 3.92, lactic fermentation was slowed developing butyric fermentation in most. The amount of butyric acid to 0.63% of DMshows quite clearly that there clostridia fermentation caused by the most harmful fermentation (table 3.). Most times, high levels of butyric acid indicates a low nutritional value of silo, especially of protein, resulting and an increase in the amount of fiber.

Table 3. Fermentation acids determined in silos studied in relation to pH

Samples of corn silage	**Lactic acid % from DM**	**Acetic acid % from DM**	**Butyric acid % from DM**	pH
CS1	4,1	2,5	0,09	**3,90**
CS2	2,9	2,3	0,63	**3,92**
CS3	3,6	2,6	0,32	**4,30**
Average CS	**3,53**	**2,46**	**0,34**	4,04
US1	2,4	2,6	0,19	**4,13**
US2	4,7	1,6	0,08	**3,98**
US3	4,7	1,9	0,13	**3,97**
Average US	**3,93**	**2,03**	**0,13**	3,99
Literature dates*	**4 - 5**	**1,5 - 2**	**< 0,1**	**3,7 – 4.0**

* Shaver, 2001.
CS- covered silage; UN - uncovered silage;
1 - samples collected at 50 cm from the surface of the silo;
2 - samples collected from middle of the silo;
3 - samples collected at 70 cm from the side walls;

The fermentation takes place in any condition in the presence of oxygen. Therefore, the only practical remedy against mouldy is the fine grinding as fodder before the ensilage and compaction energy for the complete elimination of air. Losses due to alteration of pickled fodder by rotting or moldy was seen in the sides of the silo CS. Thus, in a silo leaky, loss caused by water leaking was about 112 tonnes were corespoding 24,570 UFL its resulting loss of 14% of the total mass of the silo.

CONCLUSIONS

1. Horizontal silo is the most used type of silage due to the low cost of implementation, ease of filling, the compaction (excluding edges) and the handling of light after opening.

2. Filling silo in 7 days (CS) and 12 days (US) respectively, correlated with a

corresponding compression, led to obtain a density of 190 - 200 kg DM/m3 in the sides of the silo CS, and 160 kg DM/m3 in silo US the surface, density which can cause dry matter losses of about 17% and 15% of the area.

3. Mode of recovery of silos, caused losses as: for uncovered silage, 50 cm from its surface has been altered, resulting in losses of 147 t silo, which amounts to approximately 35 thousand UFL, or 78 t milk; in the silo cover with foil, but in addition to edges that infiltrated water was recorded losses of 112 t silo, representing 25 thousand UFL or 56 t milk.

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