COMPARATIVE STUDY OF THE DYNAMICS OF BIOCHEMICAL PROCESSES IN ALFALFA PRESERVED USING BIOLOGICAL PRESERVES

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Abstract

This work presents the results of utilization of biopreparations Litosil and Bonsilage plus in preserving the alfalfa. A positive influence of these preparations has been demonstrated, especially of Bonsilage plus, in dynamics of the biochemical process during the period of preservation and the quality of the forage we have got. Biopreparations Bonsilage plus and Litosil contributed substantially in reducing of the volume of CO2 eliminated from alfalfa preserved with humidity of 73,5% to respectively 70,8 and 66,6% in comparison with control version without preparation.

Key words: biopreparations, alfalfa, biochemical process

INTRODUCTION

Agricultural livestock feed supplies high quality bulk is a basic condition for achieving the genetic potential of modern livestock production in practice.

Currently in many countries with advanced livestock forage conservation technology using bio-fermentation process to ensure changes in the desired direction in order to obtain a quality conserved forage with minimal nutritive substances [1],[3],[5].

Subject to conservation of mass culture are introduced special group of lactic acid-bacteria associative in influencing certain level immediately in the early stages of preservation. This influence is determined by acid-lactic bacteria replace less active epiphytic which are presented on the surface of high-stemmed plant mass activity of these bacteria in the composition of bio-products [3], [4].

A special significance dry mass content becomes subject to conservation, the factor that determines the priority of lactic acid-bacterial strains.

High efficiency of preparations created on acid-lactic bacteria osmotolerante stands only if the weak activity of epiphytic lactic acid-bacteria are observed in plants containing relatively high conservation (30% or more) of dry matter ([1], [4]. The conservation grasses with relatively low solids content (20-25%) of hay a quick task acidify successfully solved epiphytic microflora lactic acid-which in this case doesn't need help [5].

In our opinion the conservation of alfalfa is reasonable to use preparations of lactic acid-dry hiperconcentrats versatile composition which have a wide range of biochemical action.

Typically these preparations are requiring new generation of larger study on their effect on microbiological and biochemical processes that occur in alfalfa preserved in the dynamics and quality of feed produced.

MATERIAL AND METHODS

In laboratory conditions, were carried out research to assess the impact and use bio preservatives Bonsilage Litosil, addition to preserving alfalfa plant with initial moisture of 64.6 to 64.9%.

Experience scheme is presented in table 1.

Table 1 Experience scheme

Variant	The preparation used	dose
alfalfa without preparation	-	-
alfalfa + bio preservatives	Litosil	4 g/t
alfalfa + bio preservatives	Bonsilage plus	1 g/t

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For mass storage chopped alfalfa was used capacity glass (bottles) with a volume of 1 litre. Since the preparations were in powder form to be distributed uniformly they preventive were dissolved in water as instructions for use.

Litosil contains up to 55 billion/g of cells, lactic acid bacteria vital.

Bonsilage biological preparation plus is developed based on acid-lactic bacteria active high. It is only prepared to suppress the development clostridia a.2011 redistricted in Europe. Composition: *Pediococcus acidilactici*, *Lactobacillus poracasi*, *Lactococcus lactis* and agent-carrier-lactose.

After preservation, during storage of fodder, conserved variants were subjected to analysis in the dynamics of two days: the 2^{th}, 6^{th}, 8^{th}, 9^{th}, 13^{th}, 15^{th}, and the 23^{th}, the 30^{th} and 60^{th}.

To assess the quality of preserved mass analysis were performed as follows: moisture, dynamic content of organic acids (lactic, acetic, and butyric and drop free), pH index. Quality feed produced in dynamic indices was assessed by organoleptic (smell, colour, consistency) and after nitrogen content, crude protein, crude fat, crude cellulose and crude ash at the beginning, middle and end of shelf life.

In two special experiences was studied dynamic elimination of carbon dioxide (CO_2) of alfalfa meal preparations preserved with and without Bonsilage Litosil and more.

The first experience was studied to eliminate carbon dioxide dynamics in alfalfa conserved with 64.6 to 64.9 mass% initial moisture and humidity in the second - from 73.4 to 73.7%.

RESULTS AND DISCUSSIONS

Initial mass during ontogenetic development of alfalfa plants (in bud – the beginning of florescence) had withered after a short initial humidity - 61.83%, hygroscopic - 7.37%, total - 64.64% and dry - 35.36%. In the dry matter was found: 2.13% nitrogen, 2.25% crude fat, crude fiber 32.09% and 8.76% crude ash.

Average density or compactness of the mass storage capabilities built in (bottle) was quite high and amounted to control variant - 0.652, the version preserved in preparation alfalfa Litosil - 0.650 and Bonsilage plus - 0.653. So, basically, the initial mass of alfalfa was incorporated uniformly by weight and compacted the experimental and control variants confirms that subject to preserving alfalfa meal was well sunk, then the tightness satisfactory of have created optimal conditions for the desired fermentation -lactic acid.

Organoleptic characteristics of the feed produced were assessed immediately after opening and dynamic storage capacity during the storage of experimental and control variants. It was found that alfalfa preserved by colour is characterized as meeting the requirements of the standard class I Moldovan.

The experimental variants obtained during feed storage dominated sulphur, yellow plant stems, and green leaves with brown shades. In addition Bonsilage version preserved alfalfa forage colour was dark green or yellow.

Smell of alfalfa preserved during storage in all experimental variants as: on the second day after the initial mass conservation of alfalfa, then passed the fragrant pickles, pickled vegetables and fruit less or more pronounced without evidence of any bio preservative differences, depending on the applied or to the control variant.

The consistency of the initial plant was kept entirely unnoticed mould or mucus in the control variant and in addition Bonsilage variants Litosil and estimation of this index during the period of storage.

Dynamic index version control pH varied from 6.31 to 4.84 within the alfalfa preserved Litosil version 5.34 to 4.78, and the addition Bonsilage - 5.11 to 4.69. Most obvious dynamic index feed pH during storage is shown in figure 1 preserved

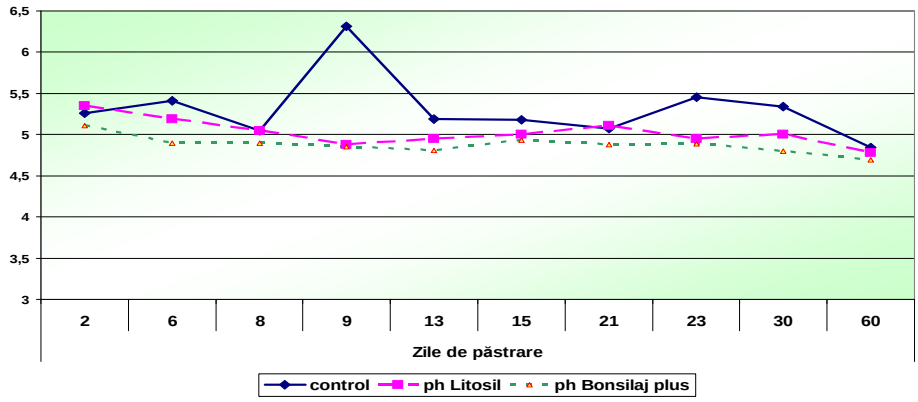

Figure 1 pH index dynamics

During fermentation the pH index decreased from the original version more intensive in alfalfa preserved by addition and slow Bonsilage control variant without preparation. Litosil preparation showed a lower intermediate-acting version Bonsilage pH index plus and witness during the observation period.

In line with changing pH index dynamic content accumulation and organic acids (lactic, acetic) was higher in the experimental variants and Bonsilage Litosil preserved alfalfa addition compared with alfalfa preserved version without applying preparations (fig. 2, 3, 4).

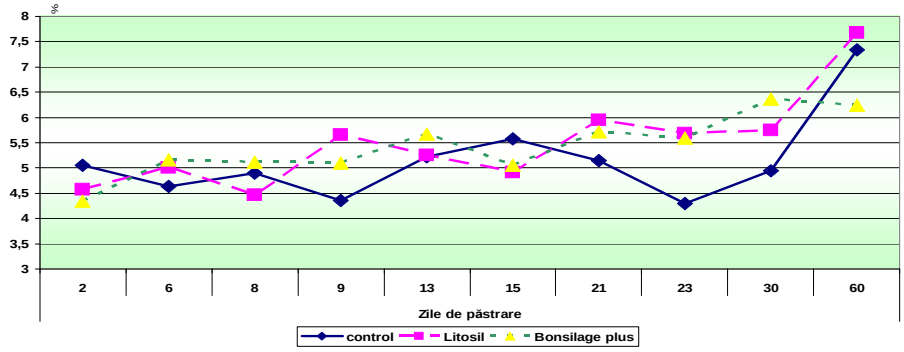

Figure 2 Σ dynamics of organic acids

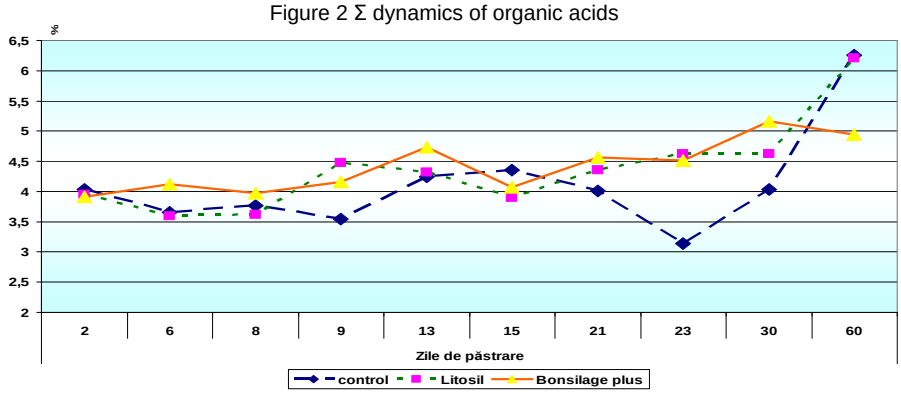

Figure 3 Dynamics content of acid lactic

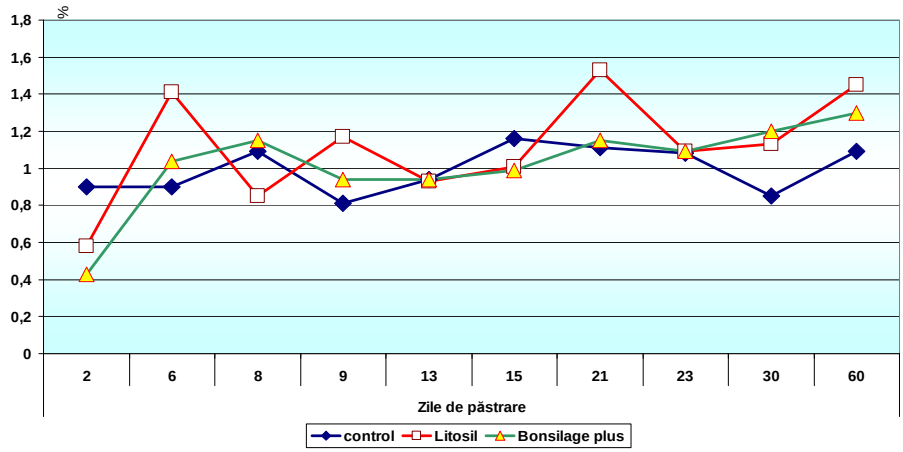

Figure 4 The dynamics of acetic acid

So preparations applied to conserve moisture alfalfa with 64.6% initial accumulation contributed to the increase of organic acids in feed preserved.

The amount of organic acids accumulated in all experimental variants is predominant lactic acid and 75-86% to 90% of acetic acid which also tells us about the high quality of feed produced.

Correlation of lactic acid was set free and in control variant ranged from 24.4 to 32.5 and from 67.6 to 75.6% corresponding to the version preserved alfalfa Litosil - 14.2 to 32.2 and 67.8 and 85.0%, and 22.7 to 38.4 and version 61.6 to 77.3% plus Bonsilage during storage up to 60 days.

Mentioned that lactic acid is found in the form set allowable feed consuming conserved forage.

Acetic acid also accumulated in the form attached as much more than in the free state during fermentation alfalfa. Significant changes in nitrogen content, crude protein, crude fat, crude cellulose and crude ash applied depending on the preparation compared with the control variant and shelf life of hay stored in airtight conditions were not detected.

During the recording dynamics of carbon dioxide elimination of alfalfa preserved without preparation - witness 35.4% dry matter content in the first three days of storage were 361 ml of CO_2 removed from the cured alfalfa meal preparation Litosil (35.3% dry matter) - 463 ml and preserved with Bonsilage addition of alfalfa (35.1% dry matter) only 259 ml. (table 2).

Within 10 days of evidence on variations removed from each respective conserved capacity weight 788, 477 and 281 ml of CO_2. The volume of CO_2 removed from the dry matter content compared to the version control was 10.20 ml/g in three days and 22.25 ml / g in ten days out.

The experimental version of alfalfa + Litosil volume of CO_2 eliminated formed within three days of evidence 13.11 ml/g and in ten days 13.52 ml/g and in version 7.38 respectively plus alfalfa + Bonsilage ml/g and 8.0 ml/g. These indicators expressed as a percentage of control variant was made subject to 100% have been in alfalfa + Litosil version during 10 days of record 60.7%, and in addition only version Bonsilage alfalfa + 30% compared to version control - alfalfa preserved without preparations, which also is considerably less and can be explained by the action of preparations on microorganisms that form in the process of fermentation gases.

According to table 2 also apply bio preservatives Bonsilage, Litosil and humidity to preserve the original 73.4 to 73.5% alfalfa in II experience and contributed considerably to reducing the volume of CO_2 removed from the preserved mass.

So if the version preserved alfalfa without preparation-witness during three days or 703 ml of CO_2 removed and 918 ml for 10 days

in natural moisture mass, then the same weight of alfalfa preserved with conservation bio prepared Litosil or eliminated after only 310 ml of CO_2 from gas was stopped on the second day after conservation. The option of preserving alfalfa with Bonsilage plus the elimination of gas lasted three days eliminated 270 ml CO_2. The volume of CO2 removed from the dry matter was expressed in 11.65 and 10.18 ml/g in three and ten days in the experimental variants with Litosil conservation and Bonsilage plus alfalfa compared with 26.73 and 34.90 ml/g in version control. The volume of CO_2 eliminated as a percentage compared to the control was 43.6% in three days and 33.4% in ten days out from alfalfa preserved with the preparation Litosil 38.0 and 29.2% respectively of alfalfa preserved with bio prepare Bonsilage plus.

So, bio-preservative Bonsilage plus Litosil is especially influential on lower volume of CO_2 removed from the mass of alfalfa preserved.

The data obtained are demonstrating experience in Figures 5 and 6.

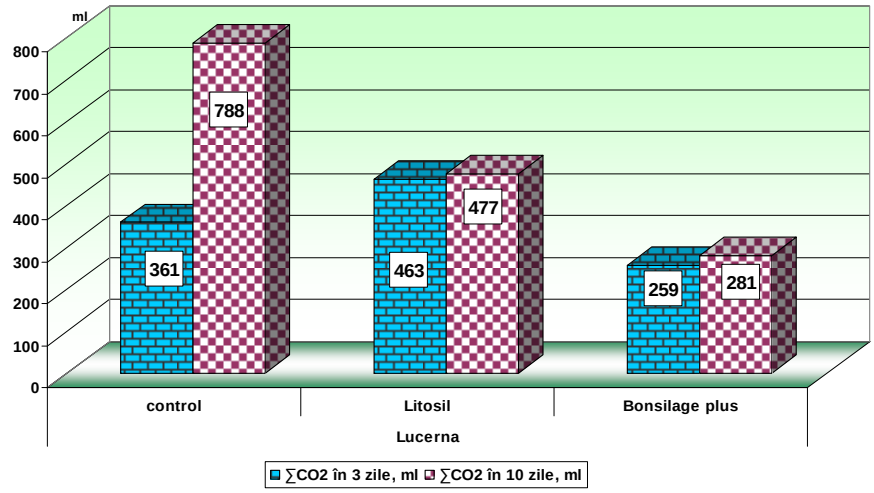

Figure 5 Dynamics of carbon dioxide elimination. (Humidity % 64.6-64.9)

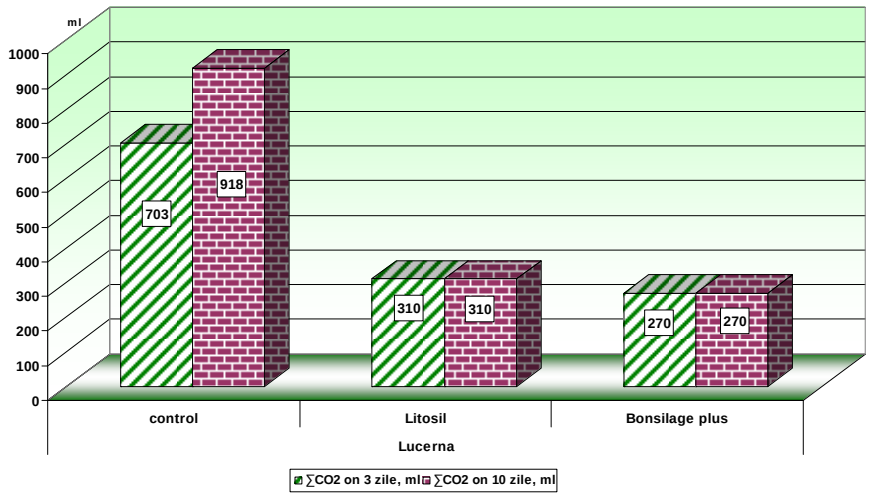

Figure 6 Dynamics of carbon dioxide elimination (humidity 73.4-73.7)

Table 2 Dynamics of carbon dioxide elimination (CO_2) in mass of alfalfa preserved

Variant of conservation		Embedded mass weight, g	Total moisture %	The dry matter, %	Day after conservation records										ΣCO₂ in 3 days, ml	ΣCO₂ in 10 days, ml	CO_2 removal from the dry matter volume, ml/g		In % compared to the control	
					1-a	2-a	3-a	4-a	5-a	6-a	7-a	8-a	9-a	10-a			in days			
					The volume of CO_2 eliminated, ml												3	10	3	10
Date of conservation – 01.06.2011																				
Alfalfa	control	655	64,6	35,4	175	83	103	-	195	102	80	38	8	4	361	788	10,20	22,25	100	100
	Litosil	658	64,7	35,3	229	214	20	-	14	-	-	-	-	-	463	477	13,11	13,52	128,5	60,7
	Bonsilage plus	655	64,9	35,1	-	229	30	-	15	5	2	-	-	-	259	281	7,38	8,00	72,4	36,0
Date of conservation – 03.08.2011																				
Alfalfa	control	650	73,7	26,3	375	190	138	128	82	5	-	--		-	703	918	26,73	34,90	100	100
	Litosil	650	73,4	26,6	310	-	-	-	-	-	-	--		-	310	310	11,65	11,65	43,6	33,4
	Bonsilage plus	650	73,5	25,5	50	70	150	-	-	-	-	--		-	270	270	10,18	10,18	38,0	29,2

CONCLUSIONS

1. In the raw material conservation experiences have been applied to alfalfa in tall compact indices (0.650 to 0.653) which ensured the tightness of feed storage capacities preserved optimum conditions for microbiological processes and especially the development of lactic acid-fermentation.

2. Comparative study of the dynamics of biochemical processes in alfalfa preserved the application of biological preparations showed that plus Bonsilage Litosil have positively influenced on organoleptic characteristic of the compound obtained (colour, smell, consistency), pH index, accumulation and content of organic acids (lactic and acetic).

Also note that the chemical composition of alfalfa forage conserved has not changed depending on the preparation used.

3. A more obvious action on the dynamics of biochemical processes also demonstrated compared bio preservatives Bonsilage Litosil preparation and conserved variant alfalfa without applying preparations.

4. Bio-preservatives Litosil, Bonsilage and influenced major addition to the reduction of CO_2 removal in alfalfa preserved with initial moisture 64.5% and 39.3% respectively 64.0 and 73.5% humidity initial mass respectively 70.8 and 66.6% compared with alfalfa preserved without the use bio-preservative version.

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