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BIOLOGICAL TREATMENT OF COTTON STALKS ENSILED WITH BERSEEM:
1- EFFECTS ON SILAGE FERMENTATION, PESTICIDES RESIDUES AND NUTRITIVE VALUE

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ABSTRACT

The present study was conducted to evaluate silage quality, concentration of pesticides residues, degradability and feeding value of silage containing cotton stalks (CS) and 1st cut of berseem (B) treated with or without inoculants of lactic acid bacteria, (LAB) and supplemented with or without dried yeast (DY). The silages were: 1- (CS + B) silage; 2- (CS + B) silage plus DY; 3- (CS + B) silage treated with LAB and 4- (CS + B) silage treated with LAB plus DY.

Silage treated with LAB leads to good quality silage. Concentration of pesticides residue in all silages were less than the limits of quantification (0.05 mg/ kg).

Diet containing silage treated with LAB and supplemented with DY had higher ($P< 0.05$) nutrients digestibility coefficients, feeding values, nitrogen utilization, effective degradability (%) of DM and OM. So, silage treated with LAB and supplemented with DY could be recommended for ruminants feeding during summer season.

Keywords: cotton stalks, berseem, inoculants (LAB), yeast culture, digestibility – degradability – sheep.

INTRODUCTION

In Egypt, the shortage of animal feeds and relatively high prices are the major problem in animal production. The available feedstuffs cover less than 60 % of the total requirements of ruminants (Ahmed, 1995). While, there is a large amount of agricultural by-products produced annually. These by-products are of a poor nutritive value due to their low nitrogen content, high fibre content, low digestibility and low palatability. During the last two decades various biological methods led to increase the nutritional quality of agricultural by-products and increase digestibility of the lignocellulose in ruminants. Ensiling of microbial treated materials had improved fermentation of several varieties of forage crops (Weinberg *et al.*, 2003). Inoculation with at least 10^5 lactic acid bacteria / g forage is needed to ensure consistent improvement in fermentation (Pitt and Leibensperger, 1987). Also, protein content would be elevated, to improve in dry roughage palatability and dry matter intake (El-Ashry *et al.*, 2001). Yeast is a rich source of vitamins, enzymes and having other co-factors which improves appetite and rumen environment (Besong *et al.*, 1996 and Putnam *et al.*, 1997). So, supplementing animal diets with small amounts of yeast appeared to improve the rumen digestibility of nutrients especially crude fibre, more activation of rumen microorganisms, and performance of animals and maintain health (Dawson, 1990 and Offer and Cruive, 1991).

One of the most popular by-products are cotton stalks, in Egypt about 2.50 million tons of cotton stalks are produced (Desouke and El-Nouby, 1990). The problem of such by-product, it was polluted with the pesticides treatments in order to prevent boll warms infection.

The objective of this work was to evaluate different biological additives to cotton stalks through ensiling with the 1st cut berseem and their effects on the concentration of pesticide residues on the supplemented materials.

MATERIALS AND METHODS

The experimental work of the present study was conducted at Noubaria Experimental Station and Animal Production Department, Faculty of Agriculture, Alexandria University.

Silage preparation and its quality:-

Cotton stalks (CS) were chopped into 2 – 3 cm, while first cut of berseem (B) (*Trifolium alexandrinum*, L.) was chopped into 3 – 5 cm and left for 48 hours for wilting. Chemical composition of CS and B is presented in Table (1).

Table (1). Proximate chemical analyses of cotton stalks and berseem (on dry matter basis, %).

Ingredients	(%)					
	OM	CP	CF	EE	NFE	Ash
Cotton stalks	88.84	5.51	48.57	1.70	33.06	11.16
The 1st cut Berseem clover	88.77	16.84	25.38	2.87	43.68	11.23

Two underground trenches (10 ton each) were filled with the chopped materials (1 CS : 2 B); molasses was added at 3 % (DM basis). An inoculant of *Lactobacillus plantarum* (4 X 10^6 cfu/g) and *Enterococcus faecium* (4 X 10^6 cfu/g) produced by Pioneer Hi-bred International, Inc was added at the rate of 1g/ 2 L water / ton of materials in the first trench while no additions were introduced in the second trench. The two trenches were covered tightly with plastic sheet after pressing of silage by a tractor, covered with 25 cm of soil layer to guarantee anaerobic condition and left for 90 days. In order to determinate the silage quality, twenty two polyethelein bags of 500 g were packed by chopped materials, eleven bags for each silage type. Two bags were opened at 0, 1 , 3 and 5 days, then at 1, 2, 3, 4, 5, 6 and 7 weeks of ensilage. Silage extract was prepared by extracting 25 g of wet silage in a blender with 100 ml of distilled water for 10 minutes. Then it was filtered through four layers of cheese cloths in order to measure pH (by Beckman pH meter), NH_3-N concentration (by magnesium oxide (MgO)) as A.O.A.C. (1995a) and total VFA (by steam distillation method, Warner, 1964). Lactic and acetic acids were determined by gas chromatography (England and Gill, 1983).

Concentrations of pesticide residues in cotton stalks and its silage were determined by gas chromatography to determine multiresidue quantitative of organo-halogen, organonitrogen and organophosphrous compounds (A.O.A.C., 1995b).

Digestibility and nitrogen balance trials :-

Four digestibility and nitrogen balance trials were carried out using three rams (45 ± 1.5 kg, in average) for each diet. Each trial lasted for four weeks, the first three weeks were as a preliminary period followed by one week for feces and urine collection.

Animals were offered silage *ad lib* twice a day (at 8.00 and 16.00 hr) and 600 (g/h/d) concentrate feed mixture (CFM). The four diets were: 1) silage without additive, 2) silage + 5 (g/h/d) of dried baker's yeast (*Saccharomyces cerevisiae*, 10^9 cfu/g) (DY) added to CFM, 3) silage treated with Pioneer inoculant (1132) and 4) treated silage + 5 (g/h/d) of DY added to CFM. Chemical composition of feeds, feces and urine were determined according to A.O.A.C (1995a) methods. Fibre fractions (NDF, ADF and ADL) were determined as described by Goering and Van Soest (1970). Collected data were subjected to one way analysis of variance as described by Steel and Torrie (1980). Significant differences among means were separated using LSD test according to Duncan (1955). Statistical processes were carried out using the General Linear Models adapted by SAS (2000) for PC. The chemical composition of silages, concentrate feed mixture and dried baker's yeast are presented in Table (2).

Table (2). Chemical composition of silages, yeast and concentrate feed mixture used (% on dry matter basis).

	(CS + B) silage[A]	(CS + B) LAB silage[B]	(CFM)[C]	(DY)[D]
OM	88.28	88.10	91.08	94.58
CP	9.95	10.04	16.21	46.32
CF	39.16	36.94	12.31	3.12
EE	2.13	2.19	2.92	0.98
NFE	37.04	38.93	59.64	44.16
ASH	11.72	11.90	8.92	5.42
NDF	66.49	64.08	51.93	———
ADF	47.85	43.85	34.14	———
ADL	11.60	10.92	4.89	———
Hemi.[1]	18.64	20.23	17.79	———
Cell.[2]	36.25	32.93	29.25	———

A: (cotton stalks + the 1st cut Berseem) silage (untreated silage).
B: (cotton stalks + the 1st cut Berseem) silage treated by lactic acid bacteria inoculum.
C: concentrate feed mixture. D: dried baker's yeast.
1: hemicellulose 2: cellulose

In situ trials :-

Three ruminally-canulated sheep were used for the *in situ* trials. Two polyester bags (7 X 15 cm) with pore size of 45 μm were used at each incubation time. Approximately 3 g of air-dried silage (ground to 2 mm) were placed in each bag. Bags were incubated in the rumen of each sheep and withdrawn after 3, 6, 12, 24, 48 and 72 h. After the bags were withdrawn from the rumen, they were rinsed in tap water until the water became clear, then they were squeezed gently. Microorganisms attached to the residual sample were eliminated by freezing at - 20°C (Kamel *et al.*, 1995). Zero-time washing losses (a) were determined by washing 2 bags in running water for 15 min.

The degradation kinetics of DM, OM and CP were estimated (in each bag) by fitting the disappearance values to the equation $P = a + b\ (1- e^{-ct})$ as proposed by Ørskov and McDonald (1979), where P represents the disappearance after time t. Least-squares estimated of soluble fractions are defined as the rapidly degraded fraction (a), slowly degraded fraction (b) and the rate of degradation (c), respectively. The effective degradability (ED) for tested silage were estimated from the equation of McDonald (1981), where $ED = a + bc/ (c + k)$, where k is the out flow rate assumed to be (0.03 / h for roughages) under the feeding condition in this study.

RESULTS AND DISCUSSION

Silage quality

Fermentation characteristics of untreated or LAB treated silages during the ensiling period indicated a successful processing (Table 3). Silages were yellowish green, having good smell and free from signs of molds,. Values of pH decreased with advancing ensilaging period to reach 4.37 and 4.03 at 7 weeks of treatment for untreated and treated silage, respectively.

The values indicated a good preserved silage. LinYu An *et al.* (2001) reported that pH value of inoculated silage with lactic acid bacteria (LAB) decreased in a comparison with the untreated one. The growth of LAB produced of organic acids which reduced pH value. Reduction of the DM, energy losses and solubilization protein (SP), increases silage bunker life. The changes in NH_3-N and VFA values indicated less rate of SP content, solubilization of true protein occurs in the silo due to the action of plant enzymes (proteases) (Beever *et al.*, 1986). However, fermentation characteristics are in agreement with privous studies reported by McDonald *et al.* (1995); Whiter and Kung (2001) and Niazi *et al.* (2002).

Table (3). pH, NH_3-N and VFA's of silages during the ensiling period (on DM basis).

Period	pH		NH_3-N (mg/ 100 gm DM)		VFA's m.mol/ 100 gm DM	
	Untreated silage	LAB-Treated silage	Untreated silage	LAB-Treated silage	Untreated silage	LAB-Treated silage
0 day	6.59	6.55	0.17	0.19	2.35	2.38
1 day	6.51	6.42	0.21	0.19	2.56	2.61
3 days	5.97	5.85	0.24	0.21	2.81	2.96
5 days	5.46	5.34	0.27	0.22	2.89	3.25
1 week	4.93	4.66	0.33	0.26	3.37	3.79
2 weeks	4.72	4.43	0.38	0.32	3.58	4.02
3 weeks	4.68	4.36	0.42	0.37	3.42	3.88
4 weeks	4.61	4.29	0.45	0.39	3.19	3.67
5 weeks	4.49	4.16	0.47	0.40	3.03	3.44
6 weeks	4.40	4.07	0.49	0.41	2.59	3.01
7 weeks	4.37	4.03	0.49	0.40	2.25	2.74

Concentration of pesticide residues:

The pesticides used in the treatments of cotton crop used in the present work are presented in Table (4). The limits of quantifications is mentioned as a safe limits for animals and human lives. It was clear that silage making is a good process to reduce concentration of residual pesticides in cotton stalks. Inoculation with LAB had more influence in that respect, whereas, it resulted in less concentration of residual pesticides than the limits of quantification (LOQ vs. 0.05 mg/kg). These effects could be explained by the role of LAB in solubilization of such chemicals in the silage bunker.

Table (4). Concentrations of pesticides residues (mg/ kg) in cotton stalks and its silage.

Compound	Trade name	*LOQ mg kg $^{-1}$	Residues (mg kg $^{-1}$)		
			Cotton stalks	Untreated silage	Treated silage
Profenofos	Selecron	0.05	0.15	< LOQ	< LOQ
Dimethoate	Dimethoate	0.05	0.09	< LOQ	< LOQ
Triazophos	Hostathion	0.05	0.77	0.05	< LOQ
Chlorpyrifos	Drosobane	0.05	< LOQ	< LOQ	< LOQ

* LOQ : Limits of quantification.

Digestibility and nitrogen balance trials:-

Nutrients digestibilities, nutritive value and nitrogen utilization of experimental diets are shown in Tables (5, 6 and 7). No significant differences were found among diets for the digestion coefficients of EE, ADL and hemicellulose. It was notice that inoculated silage and supplemented with DY resulted in higher ($P< 0.05$) digestion coefficients of OM, CP, CF, NDF and ADF compared to other silages. These could be related to the microbial activities which cause solubilization of carbohydrate esters of phenolic monomers in the cell wall (Jung *et al.*, 1983 a and b). Rooke *et al.* (1988); Smith *et al.* (1993) and Yan *et al.* (1996) reported improvements in nutrients digestibility coefficients as a result inoculants treatment or yeast supplementation.

Several factors affect the response of dairy cows to YC supplementation: stage of lactation, type of forage given, feeding strategy (TMR ot forage and concentrate given separately), and forage: concentrate ratio (Dawson, 1992 and Erasmus *et al.*, 1992). So, the improvement in digestion followed supplementation of YC could be related to its addition at time of concentrate feeding. However, Burghardi *et al.* (1980) found no improvement in apparent digestibility of DM, CF and CP with lambs receiving inoculants silage.

The improvement in nutrients digestibility followed the addition of LAB in the silage and supplemented of DY could be a result of better feed intake and feeding value (1192.09 g/d, 59.97 % TDN and 7.75 % DCP, respectively).

There are some information indicating that pesticides may alter the bacterial population in the rumen. Thus, they can affect the digestibility of dietary components and alter the end product of fermentation (Lowrey *et al.*, 1969). Fortunately, silage making resulted in hydrolysis of such pesticides which was reflected on less effect on digestibility by animals.

The increase of DMI by about 8.8 and 12.8 % could be due to supplementation of DY and its combination with LAB, respectively.

Table (5): Digestibility coefficients of the experimental diets fed to sheep (means ± SE).

Digestibility coefficients (%)	(CS + B) silage	(CS + B) silage +DY	(CS + B) LAB silage	(CS + B) LAB silage + DY
DM	56.11 ± 0.09^{c}	60.28 ± 0.79^{a}	57.72 ± 0.44^{b}	60.95 ± 0.67^{a}
OM	58.11 ± 0.52^{d}	60.52 ± 0.60^{c}	62.21 ± 0.17^{b}	64.88 ± 0.17^{a}
CP	54.01 ± 0.44^{c}	57.91 ± 0.51^{b}	56.52 ± 0.24^{b}	59.95 ± 0.64^{a}
CF	52.51 ± 10.32^{d}	56.82 ± 0.55^{b}	54.25 ± 0.11^{c}	60.37 ± 0.34^{a}
EE	60.74 ± 0.98	60.95 ± 0.50	61.40 ± 0.16	61.75 ± 0.48
NFE	62.05 ± 1.09^{b}	63.34 ± 1.49^{b}	67.89 ± 0.42^{a}	68.77 ± 0.20^{a}
NDF	54.95 ± 0.36^{d}	58.91 ± 0.79^{b}	57.25 ± 0.38^{c}	62.92 ± 0.11^{a}
ADF	50.37 ± 0.74^{d}	56.90 ± 0.49^{b}	53.44 ± 0.57^{c}	59.82 ± 0.10^{a}
ADL	12.77 ± 1.93	13.85 ± 0.46	12.55 ± 0.22	14.34 ± 1.33
Hemicellulose	65.25 ± 0.53	67.61 ± 2.45	65.08 ± 0.21	69.33 ± 0.37
Cellulose	59.28 ± 1.12^{d}	67.98 ± 0.53^{b}	64.02 ± 0.73^{c}	71.39 ± 0.35^{a}

a, b, c and d = means in the same row with different superscripts differ significantly (P< 0.05).

Table (6). Dry matter intake (g/h/d) and nutritive value (TDN and DCP) of the experimental diets (means ± SE).

Item	CFM plus			
	(CS + B) silage	(CS + B) silage + DY	(CS + B) LAB silage	(CS + B) LAB silage + DY
Dry matter intake (g/h/d)	1057.10 ± 12.67^{c}	1150.24 ± 7.96^{b}	1124.34 ± 3.32^{b}	1192.09 ± 12.43^{a}
Roughage: concentrate ratio	50 : 50	54 : 46	53 : 47	55 : 45
Total digestible nutrients (TDN %)	53.84 ± 0.33^{d}	56.14 ± 0.50^{c}	57.77 ± 0.25^{b}	59.97 ± 0.13^{a}
Digestible crude protein (DCP %)	7.07 ± 0.07^{c}	7.52 ± 0.06^{b}	7.31 ± 0.02^{b}	7.75 ± 0.08^{a}

a, b, c and d = means in the same row with different superscripts differ significantly (P< 0.05).

Table (7). Nitrogen utilization of sheep fed on the experimental diets (means ± SE).

Item	CFM plus			
	(CS + B) silage	(CS + B) silage + DY	(CS + B) LAB silage	(CS + B) LAB silage + DY
N-intake (g/d)	22.14 ± 0.20^{d}	23.91 ± 0.12^{b}	23.29 ± 0.05^{c}	24.67 ± 0.19^{a}
N-absorbed (g/d)	11.90 ± 0.01^{d}	13.91 ± 0.16^{b}	13.12 ± 0.06^{c}	14.74 ± 0.21^{a}
N-balance (g/d)	2.85 ± 0.09^{c}	3.89 ± 0.01^{b}	3.60 ± 0.14^{b}	4.42 ± 0.14^{a}
N-balance as % of N-intake	12.88 ± 0.53^{c}	16.26 ± 0.07^{b}	15.46 ± 0.63^{b}	17.90 ± 0.47^{a}
N-balance as % of N-absorbed	23.94 ± 0.79^{b}	28.19 ± 0.21^{a}	27.45 ± 1.01^{a}	29.98 ± 0.96^{a}

a, b, c and d = means in the same row with different superscripts differ significantly (P< 0.05).

Results of nitrogen balance trials indicated that dietary nitrogen utilization (% N balance of N-intake) was obviously higher (P< 0.05) with inoculant silage supplemented with DY (17.90 %), than its individual effect (16.26 and 15.46 %) for yeast and inoculants, respectively (Table 6). However, yeast supplementation had more pronouncing effect on DMI and N-utilization than that of inoculants effect.

Degradation kinetics :-

In situ DM, OM and CP degradability are presented in Table (8). It illustrated that washing loss fraction "a" of DM, OM and CP for silages were no significantly different (P< 0.05). The degradable fraction "b" of DM and OM, rate of degradation "c" and ED were significantly higher (P< 0.05) for inoculant silage supplemented with DY and uninoculant silage supplemented with DY. However, DY supplementation had more individual effect than LAB. This could be due to the more nutrients digestibility. This finding agrees with those reported by Williams *et al.* (1990); Erasmus *et al.* (1992) and El-Waziry *et al.* (2000). They reported an increase in protein flow from the rumen of sheep fed a diet supplemented with yeast culture. When LAB and DY were combined together, the soluble and unsoluble fractions increased and the effective degradability was also increased by about 29.7, 26.8 and 9.0 % for DM, OM and CP of the treated materials against the untreated one, respectively. These could be due to the synchronization effect of DY and LAB together on the function of the cell wall of such materials.

Table (8). Degradation kinetics of DM, OM and CP for single roughage in sheep fed the experimental rations (mean ± SE).

Item	CFM plus			
	(CS + B) silage	(CS + B) silage +DY	(CS + B) LAB silage	(CS + B) LAB silage + DY
<u>DM</u>				
a	18.33 ± 0.55	20.96 ± 2.20	18.52 ± 0.71	22.25 ± 0.36
b	32.99 ± 1.63 ^{b}	35.82±2.94 ^{ab}	31.94 ± 0.55 ^{b}	39.76 ± 1.87 ^{a}
c	0.0258±0.013 ^{b}	0.0325± 0.11 ^{a}	0.0281± 0.008^{b}	0.0346 ± 0.005^{a}
ED	33.58 ± 0.87 ^{b}	39.58 ± 1.92 ^{ab}	33.97 ± 0.94 ^{b}	43.54 ± 1.81 ^{a}
<u>OM</u>				
a	18.70 ± 0.25	21.29 ± 2.14	18.59 ± 0.71	22.84 ± 0.53
b	32.87 ± 1.71 ^{b}	35.61 ± 3.99 ^{ab}	32.61 ± 2.26 ^{b}	38.23 ± 1.74 ^{a}
c	0.0212±0.001^{b}	0.0254±0.003^{a}	0.0213±0.001 ^{b}	0.0271±0.006 ^{a}
ED	32.31 ± 2.32 ^{b}	37.62 ± 1.73 ^{ab}	32.13 ± 1.81 ^{b}	40.98 ± 2.21 ^{a}
<u>CP</u>				
a	12.94 ± 0.51	13.39 ± 0.32	13.71 ± 0.52	14.02 ± 0.47
b	32.47 ± 2.63	33.95 ± 1.02	31.61 ± 1.62	34.13 ± 2.29
c	0.0271±0.013	0.0299 ± 0.007	0.0260±0.016	0.0294±0.012
ED	28.35 ± 1.13	30.33 ± 1.29	28.39 ± 1.94	30.91 ± 1.61

a, b, c and d = means in the same row with different superscripts differ significantly (P< 0.05).

a: soluble fraction (%), b: potentially degradable fraction (%)

c: rate of nutrient degradation (% h^{-1}).

ED: effective degradability = a + [bc/c + k], where k is the out flow rate assumed to be 0.03/ hr.

So, it means that it is easier to achieve a balance between rumen undegradable and degradable proteins when cotton stalks and berseem are balanced together in one silage (Dhiman and Satter, 1997). They found that the silage containing a mixture of berseem and com had a balance between rumen undegradable and degradable protein.

The cost of each ton as DM or TDN of diets is presented in Table (9). The highest cost was found for the untreated and unsupplemented silage. The cheapest one was obtained with that contained treated and supplemented silage.

Table (9). Diets cost (LE/ ton), (LE/ total DMI) and (LE / kg TDNI).

Item	CFM plus			
	(CS + B) silage	(CS + B) silage + DY	(CS + B) LAB silage	(CS + B) LAB silage + DY
Cost of ration (LE/ total DMI)	0.73	0.79	0.77	0.83
Cost of ration (LE/ ton DM)	373.50	360.08	324.47	322.28
Cost of ration (LE/ ton TDN)	1282.37	1223.27	1185.40	1160.82

Conclusion

It could be concluded that cotton stalks could be ensiled with berseem. Treatment with LAB and supplemented with DY plus concentrate feed mixture could be used as ruminant forage during summer season. In addition, it seems that ensiling of cotton stalks reduced pesticide residues in the silage.

Inoculation of LAB seems to have more effectiveness in reducing these residues to be below the limits of quantification (LOQ). It is necessary to carry on more research for a long term feeding of such materials with analysis of metabolites; blood; milk and meat products of animals fed such materials.

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المعاملة البيولوجية لحطب القطن المسيلج مع البرسيم:
١ – التأثيرات على تخمر السيلاج وبقايا المبيدات والقيمة الغذائية

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أستهدفت الدراسة تقييم سيلاج حطب القطن مع البرسيم المصرى (الحشة الأولى) غيــر المعامــل أو المعامل باللقاح البكتيرى سواء بإضافة الخميرة الجافة النشطة أو بدون. وقد أشتمل التقييم تقدير معــاملات هضم المواد الغذائية ونسبة الأستفادة من ليتروجين العلائق المختبرة باستخدام ثلاثة كباش برقى (لكل عليقة) بينما أستخدمت ثلاثة نعاج مزودة بفستيولات الكرش لتقدير معدل التحلل للمادة الجافة والعضوية والبروتين فى الكرش وذلك فى كل معاملة من المعاملات التالية:

١- سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى)
٢- سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى) مع إضافة الخميرة الجافة النشطة.
٣- سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى) المعامل باللقاح البكتيرى.
٤- سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى) المعامل باللقاح البكتيرى مع إضافة الخميرة الجافة النشطة.

وتمت تغذية الحيوانات على السيلاج تغذية حرة بينمــا أعطــى العلــف المركــز بمعــدل ٦٠٠ جم/رأس/يوم وتم إضافة الخميرة الجافة النشطة بمعدل ٥ جم (رأس/ يوم).

وقد أشارت النتائج إلى ما يلى :-

- أظهرت تحاليل بقايا المبيدات المستخدمة فى رش نبات القطن وجود بقايا منها فى الحطب قبل المعاملــة وأنخفضت لتصل إلى أقل من الحدود المسموح بها بدرجة كبيرة بعد حفظ الحطب على صورة سيلاج.
- السيلاج الناتج كان جيد فى جميع المعاملات وإن كان أفضل نوعية مع المعامل باللقاح البكتيرى.
- كانت العليقة المحتوية على سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى) المعامــل باللقــاح البكتيرى والمضاف إليه الخميرة الجافة النشطة أعلاهم فى معاملات هضم المادة الجافة والمادة العضوية والبروتين الخام والألياف الخام والكربوهيدرات الذائبة ومستخلص الألياف المتعادل ومستخلص الألياف الحامضى والسيليلوز.
- معدل تحلل المادة الجافة والمادة العضوية للمصادر المالئة فى الكرش كان أعلاها فى العليقة المحتويــة على السيلاج المعامل باللقاح البكتيرى والمضاف إليه الخميرة الجافة النشطة وأقلها فى حالة العليقة غير المعاملة.
- ومن الوجهه الإقتصادية أدت المعاملات البيولوجية إلى خفض تكلفة العليقة.

وبصفة عامة فإن العليقة المحتوية على سيلاج (حطب القطن + البرسيم المصرى الحشة الأولى) المعامل باللقاح البكتيرى والمضاف إليها الخميرة الجافة النشطة يمكن التوصية بإستخدامها كعلــف مــالىء عصيرى فى فصل الصيف. خصوصا لدور عملية السيلجة فى خفض تركيز بقايا المبيدات المستخدمة فى مقاومة دودة لوز القطن ووصولها إلى تركيز أقل من تركيز الحدود الأمنة المسموح بها مع التوصية بمزيد من الدراسات على المدى الطويل عند التغذية على هذه العلائق لتتبع المركبات الميتابوليزمية الناتجة عنها فى الدم واللبن واللحوم فى الحيوانات المغذاة عليها.