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NUTRITIONAL AND ECONOMICAL FEASIBILITY OF USING REEDS (*ARUNDO DOMAX, L*) SILAGE COMPARED TO CORN (*ZEA MAYS L*) SILAGE AS SHEEP FEED.

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SUMMARY

The objective of the study was to evaluate reed silage (*Arundo Domax, L.*) in comparison to whole corn (*Zea mays L.*) or corn stalks (CSS) silage feed offered to sheep. Whole corn silage (WCS) was made without any additives and corn stalk silage (CSS) was prepared with adding 0.5% urea (46%) in addition to 5% molasses, while 5% molasses was added at processing reeds silage. Fifty Ossimi rams about 60-65 kg divided into three groups assigned at random to receive one of the three tested silages. Another five animals were received berseem hay (BH) to calculate the relative palatability (RP). Three animals selected randomly from each group which were fed on tested silages to set three digestibility trials. The results of silage quality shown that, the average pH values ranged from 4.10 to 4.40. Concentrations of acetic, propionic, iso-butyric, iso-valeric and valeric acid indicted good quality and well-preserved silages. Content of CP in CSS was lower compared to RSS and WCS, while EE, NDF, ADF, ADL and hemicellulose contents were higher. Other nutrients of different silages were comparable. Relative palatability, feed intake per kg weight, feed intake per $W^{0.75}$ and actual feed intake as % of offered feed were significantly higher with WCS compared with CSS except feed intake per $W^{0.75}$. The *in sacco* fractional disappearance of CP for CSS were consistently and significantly ($P<0.05$) greater till 9hrs of incubation compared to WCS and RSS. Washing loss (W) of CP was significantly higher with CSS compared to RSS and WCS. No significant differences were found among different silages for DM, OM, CP, CF and NFE digestibility. The digestibilities of EE, NDF and ADF were higher for the group fed WCS compared with that fed CSS, while no significant difference was found between WCS and RSS or between RSS and CSS. The nutritive value expressed as TDN was significantly ($P<0.05$) higher for WCS compared to CSS, while the difference was not significant between WCS and RSS. In the contrary, DCP for RSS silage was significantly ($P<0.05$) higher compared to the two types of corn silage, but WCS silage was higher compared to CSS. Ruminal liquor values of pH and NH_3-N were significantly ($P<0.05$) higher in sheep fed CSS compared to those fed RSS or WCA. Concentration of acetic acid was lower with feeding CSS, whilst butyric acid was significantly ($P<0.05$) higher with feeding CSS compared to RSS and WCS silage. Bacterial and protozoa counted were significantly ($P<0.05$) higher in sheep-rumen fed WSS or RSS compared to that fed WCS. Using cell wall constituents and DM degradability in simple and multiple regressions resulted in

good accuracy in predicting feed intake. The prediction equations for feed intake and DM digestibility were improved when included CP as an additional factor in regressions models. The cost of production of 1 ton of RSS and CSS was lower in comparison to WCS. In conclusion, RSS might be more interesting than WCS in terms of economical cost.

***Keywords**: reeds silage, corn silage, rumen degradability, feed intake, digestibility and blood parameters.*

INTRODUCTION

Corn production in Egypt is not enough for human consumption. It is therefore very important to search for alternative source of silage production rather than from whole corn for small holders in Egypt, since they depend on bread production from corn flour. In many parts of Egypt, especially water banks and coastal areas, reeds spread densely. Reeds grass contains as much or more crude protein, crude fat and mineral matter as many conventional forage crops. Fibre values were usually lower than for forages. Nour et. al. (1995) reported that reed grass is rich in protein content's and using as complete diet for dairy animals has positive effect on feed conversion efficiency as kg DM or kg TDN when compared with bean straw and/or berseem hay. Gabber et. al. (1999) concluded that reed grass had good palatability and could be of adequate feeding value for lactating goats when fed with CFM. Reeds silage may partially or fully substitute maize silage in beef cattle feedlots Ahmed et. al. (2002). It should be realized that the use of reed to feed livestock animals, may cause catching with some internal parasites especially animal fasciola (El-Nagar 1991). The use of reed in the form of silage leads to the elimination of such injury.

The aim of this research is to valuate and compare the nutritional value and the economics of using reed silage instead of corn silage for sheep.

MATERIALS AND METHODS

The present study was carried out at the Experimental House, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt.

The reed (*Arundo Domax, L.*) was collected at the height about 80-100cm from the channels ridges around El-Dakahlia area and corn plant (*Zea mays L.* - Hybrid Giza 310) was obtained from Agriculture Research Centre, Crops Research Institute. Reed grass (RG), whole corn (WC) and corn stalks (CS) were chopped into pieces measuring 2 to 3.5 cm then ensiled in plastic bags (25 kg /bag) for 45 days. Whole corn was ensiled without any additive (WCS) while corn stalk silage (CSS) was prepared by adding 0.5% urea (46% N) in addition to 5% molasses, and only 5% molasses was added during processing reeds silage (RSS). Silage quality and chemical composition of silage are shown in Tables 1and2.

Feed intake and relative palatability (RP) were determined using fifty Ossimi rams about 60-65 kg which were divided into three groups. The groups were assigned at random to receive one of the three tested silages. Another five animals were received berseem hay (BH) to calculate the relative palatability (RP). The rams were treated against internal parasites and confined in metabolic cages fitted with provisions for forage, water and

minerals blocks as supplements. Feeding silages was started at a level of 800 gm per day then gradually increased to *ad libitum* into two equal portions at 8 a.m. and 4 p.m. for two weeks as an adaptation period. Intakes and refused feed (RF) were daily recorded during four weeks after the adaptation period to determine the actual feed intake, taking into account evaporation loss. Feed intake (FI) was expressed as a ratio of the amount offered (FI/FO). Relative palatability indices were calculated as RP = (FI/FO) for silage / (FI/FO) for BH, where FI= amount of feed intake and FO= quantity of feed offered.

To determine the *in sacco* degradation characteristics of samples, 3 g of dry samples in duplicate after being milled to pass through a 2 mm screen were weighed in artificial fiber bags (5×8cm, pore size 40-60 microns) according to the method of (Mehrez and Ørskov, 1977). Six wethers fitted with rumen cannulas fed high quality berseem hay *ad libitum* were used to incubate the bags. Bags were withdrawn at 4, 9, 15, 24, 48, 72 and 96 hrs after incubation. The 0 hour measurement was obtained by soaking the duplicate bags of each sample in warm water (39 °C) for 1 hour. The 0 hour and incubated bags were washed with running tap water for 15 minutes using domestic washing machine and oven dried at 60 °C for 48 hrs. Dry matter, organic matter and nitrogen were determined according to the methods of A.O.A.C (1995). Ruminal nutrient disappearance data was fitted to the exponential equation $P = a + b\ (1-e^{-ct})$ (Ørskov and McDonald, 1979 and McDonald, 1981) to predict the degradation characteristics, where: P is the fraction degraded at time t, a is rapidly disappears fraction (i.e. represents zero time intercept), b is the potential degradable fraction that is not soluble and c is the rate of degradation of b. PD= a + b, PD denotes potential degradability. ED= a + bc /(c + kp), ED denotes effective degradability at an out flow rate (kp) of 0.05 h^{-1}.

Metabolizable energy (ME) was calculated using the method of Menke and Steingass (1988): ME (MJ/kg DM) = 14.78-0.014 ADF where ADF denotes acid detergent fiber.

Three sets of digestion and nitrogen balance trials were carried out using three animals selected randomly from each group which were fed on tested silages.

During the digestion trial, animals were fed at 06.30 and 18.30 hrs. Some sheep showed considerable diet selection during the digestion trials for therefore their RF was collected and analysed. Intake of dietary components (e.g. DM) was therefore calculated as: Intake = (component in FO × mass FO) – (component in RF × mass RF).

At the end of the digestibility trials, rumen fluid samples were collected using a stomach tube at 3hrs post feeding for two consecutive days. Composite feed, fecal and urine samples were chemically analyzed according to A.O.A.C. (1995). Chemical compositions of tested silages are presented in Table (2). Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined according to Goering and Van Soest (1970). Hemi-cellulose and cellulose were calculated as the difference between NDF and ADF, ADL orderly. Gross energy concentration (GE) was determined for both feed ingredients and feces using Gallen Kump ballistic bomb calorimeter (Catalog No. (CBB: 330-1010). Calcium and phosphor were determined by atomic absorption according to A.O.A.C. (1995).The values of pH for both silage and rumen liquor samples were determined using HANNA pH-meter (model HI 8424). Filtered samples were used to determined ammonia-N (Conway, 1978), concentration of SCFA's (Eadie *et al.* (1967), Molar proportions of SCFA's (Erwin *et al.* (1961). Silage lactic acid concentration was determined by the methods of Analytical Chemistry of Foods (1995). For counting protozoa the preparation of rumen content samples followed the procedure of Dehority (1984) and a 0.2mm deep chamber under 100 x magnification was used. Total

bacteria populations were counted in a Neubauer chamber under 1200 x magnification after the preparation of rumen content samples following the procedure of Warner (1962).

Analysis of variance (ANOVA) was carried out using the General Linear Model of SAS computer package (SAS, 2000). An F test of 5% probability level was used to test for significance differences between means, which were separated by Duncan's New Multiple Range Test (1955). Prediction equation of voluntary feed intake from fiber fraction digestibility or kinetics of DM degradability and prediction of DM digestibility from kinetics of DM degradability were calculated using (SAS, 2000)

RESULTS AND DISCUSSION

As shown in Table (1) WC grass energy was higher than these of RSS and CS, while OM and CP contents for CS and RS were lower compared to WC. Therefore molasses was added to RS while molasses with urea was added to enrich CS. Content of CP for different silage types was increased by 13.13, 25.63 and 73.16% for RSS, WCS and CSS, respectively. In contrary, contents of CF, NDF and ADF were lower than before ensiling. The decreasing in CF content and cell wall constituents were related to the fermentation that occurs in the silages. Crude protein of CSS was lower compared to RSS and WCS, while EE, NDF, ADF, ADL and hemicellulose contents were higher.

Table (1): Proximate analysis, cell wall constituents and some minerals for silage of reeds, whole corn and corn stalk silage.

Item	Before ensiling			After ensiling		
	RS	WC	CS	RSS	WCS	CSS
Chemical composition (%):						
DM	21.37	20.59	22.35	32.81	30.05	33.70
OM	90.14	92.00	90.30	89.88	91.99	90.15
CP	9.75	7.96	4.62	11.03	10.00	8.00
CF	31.61	27.41	35.89	28.74	24.69	29.91
EE	1.80	2.31	1.37	1.82	2.36	2.94
NFE	46.98	54.32	48.42	48.29	54.94	49.30
Cell wall constituents (%):						
NDF	52.39	52.17	56.00	47.63	47.00	54.17
ADF	25.63	28.35	33.40	24.12	23.00	32.00
ADL	4.41	4.56	7.32	4.01	4.00	6.00
Cellulose	21.22	23.79	26.08	20.11	19.00	26.00
Hemicellulose	26.76	23.82	22.60	23.51	24.00	22.17
Minerals (%):						
Ca%	0.17	0.20	0.14	0.16	0.18	0.12
P%	0.20	0.23	0.19	0.19	0.21	0.16
GE (Mcal/kg)	4.·61	4.620	4.050	4.204	4.280	4.235
ME (Mcal/kg DM)	3.446	3.437	3.420	3.451	3.456	3.425

RS: Reeds, WC: Whole corn, CS: Corn stalks, RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage.

Other nutrients contents of different silages were comparable. The chemical compositions of silages were comparable to that reported in the literature; for instance, El-Nagar (1991) reported CP content of RSS similar to the one found in this study. The CP content of RSS and WCS was also similar to that reported by Ahmed *et al* (2002) and

Bendary *et al.* (2001), but higher than that reported by Khinizy, *et al.* (1997) for whole green maize silage and Nour *et al.* (1995) for reeds grass. The CP content of the supplemented diets (CSS) was generally higher and can be considered adequate for supplying nitrogen to the rumen microbes, assuming that the CP is adequately degraded in the rumen. The NDF and ADF contents in CSS were higher than with RSS and WCS. A measure of the total fibre in the plant gives a guide to plant maturity.

Table (2): Chemical characteristic of silage quality.

Item	RSS	WCS	CSS
Basic pattern of silage fermentation:			
pH	4.33	4.10	4.40
Lactic acid (mmol/100ml)	4.31	4.40	4.02
SCFA's (mmol/100g DM)	2.51	2.73	2.15
SCFA's fractionation (mmol /100ml):			
Acetic	0.180	0.190	0.131
Propionic	0.020	0.008	0.023
Iso-butyric	0.020	0.010	0.011
Butyric	0.080	0.104	0.202
Iso-Valeric	1.870	2.380	1.704
Valeric	0.340	0.040	0.080
Nitrogen fraction:			
Total nitrogen (%)	1.76	1.60	1.28
Total NPN (%)	0.10	0.26	0.67
NH_3-N (mg/100 g DM)	0.02	0.05	0.37

SCFA's: short chin fatty acids, RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage.

Data of silage quality are presented in Table (2). Tested silages were free from mold, characterized with suitable fermentation characteristics, yellowish green color and good smell. The average pH values for silages ranged from 4.10 to 4.40 and concentrations of acetic, propionic, iso-butyric, iso-valeric and valeric acid indicted good quality and well-preserved silages. The results seem to be in the normal ranges of the good quality silage as reported by Bendary *et al.* (2001) and El-Emam (2001). The high NPN in CSS compared to RSS and WCS was mainly due to adding urea at ensiling of CSS.

Table (3): Feed intake from RSS, WCS and CSS silages (on DM basis).

Item	RSS	WCS	CSS	±SE
Offered feed (kg/h/d)	1.30	1.29	1.30	±0.021
Refused feed (kg/h/d)	0.25^{ab}	0.19^{b}	0.32^{a}	±0.024
Refused feed as % of offered feed	18.85^{ab}	14.78^{b}	24.26^{a}	±1.922
Relative palatability (%)	89.20^{ab}	93.66^{a}	83.25^{b}	±2.114
Feed intake per kg weight (g)	16.23^{ab}	17.04^{a}	15.15^{b}	±0.385
Feed intake per kg weight $^{0.75}$ (g)	46.08^{ab}	48.34^{a}	43.01^{b}	±1.181
Actual feed intake (kg)	1.06	1.10	0.99	±0.036
Actual feed intake as % of offered feed	81.15^{ab}	85.22^{a}	75.74^{b}	±1.922

a, b and c Means in the same row with different superscript are significantly different (P<0.05).
RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage.

Feed intake of different tested silages is given in Table (3). The group fed WCS had the lowest RF (0.19 kg/day) and RF as % of offered diet (14.78%) vs. (0.32 kg/day and 24.26%) for group fed CSS, respectively. Results of feed intake (FI) and refused feed (RF) in Table (3) pointed to good quality of WCS and RSS silage compared to CSS. This suggestion is in agreement with Wekesa *et al.* (2006), who reported that FI and RF depend on the quality of the basal diet. At the same time, relative palatability, feed intake per kg weight, feed intake per $W^{0.75}$ and actual feed intake as % of offered feed were significantly higher with WCS compared with CSS. These results are reflection of higher content of NDF, ADF and ADL in CSS (Table 2) and lower digestibility of NDF and ADF (Table 6). Also, the present data point to that palatability of RSS was comparable to WCS and better than CSS but the difference was not significant. The general increase in the total DMI from WCS and RSS could be attributed to the provision of supplements of protein and energy which improved rumen microbial activities.

Table (4): Dry matter, OM and CP disappearance for RSS, WCS and CSS silage at different incubation times.

Item	Incubation time (hrs.)						
	4	9	15	24	48	72	96
Dry matter (%):							
RSS	23.21	31.67	46.10	51.99	58.63	61.29	62.09
WCS	21.38	30.47	44.45	50.05	56.51	59.06	59.96
CSS	23.35	32.98	44.92	52.63	58.25	62.31	64.36
±SE	±1.300	±2.576	±1.870	±2.636	±3.195	±2.648	±1.765
Organic matter (%):							
RSS	25.55	34.80^{ab}	47.69	54.73	62.06	64.70	65.94
WCS	23.55	33.51^{b}	48.90	55.04	59.47	63.70	65.77
CSS	25.73	39.55^{a}	50.85	58.25	63.97	65.55	67.22
±SE	±1.497	±1.673	±1.804	±1.728	±1.461	±0.774	±1.152
Crude protein (%):							
RSS	21.09^{b}	29.79^{b}	43.29	48.90	55.04	57.53	58.31
WCS	20.96^{b}	28.60^{b}	41.63	46.97	52.94	55.53	56.23
CSS	30.11^{a}	42.19^{a}	40.15	45.20	51.04	53.55	54.20
±SE	±1.401	±2.208	±2.219	±3.461	±3.653	±2.950	±2.700

a, b and c Means in the same column for each category with different superscript are significantly different ($P<0.05$).
RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage.

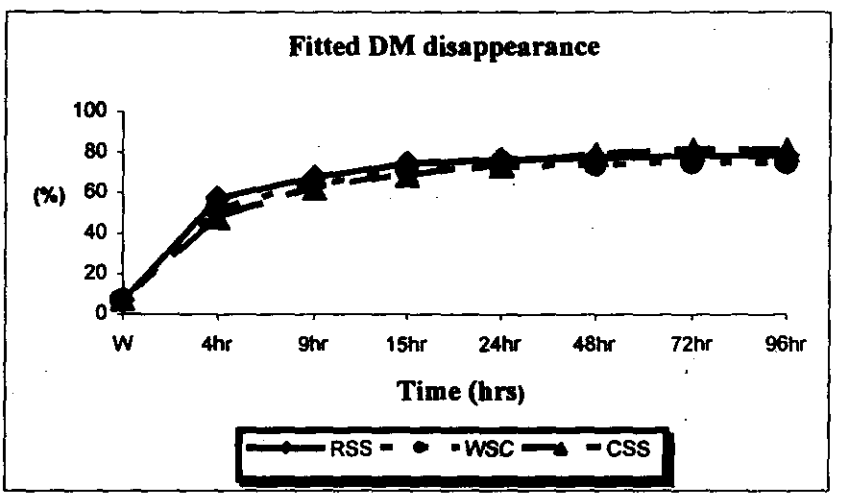
The average disappearing ratio of DM, OM and CP for all silage types (Table 4) were increased after 4hrs incubation. These changeable due to some nutrients such starch might not be degraded by microbes up to 16 h of incubation but it would get solubilized in the neutral detergent solution leading to underestimation of truly under graded residue (Makkar, 2004). The time16 h for concentrate feeds and 24 h for roughages might be a good compromise for routine feed evaluation (Makkar et. al. 1995).The *in-sacco* disappearance of CP for CSS were consistently and significantly ($P<0.05$) greater till 9hrs of incubation compared to WCS and RSS (Table 4) then were very close of different silages types. This result might be due to higher solubility of NPN in CSS as shown in chemical composition (Table 1). As shown in Table 5 and illustration in Fig. (1), washing loss (W) of CP was significantly ($P<0.05$) higher with CSS compared to RSS and WCS.

Disappearance of DM, OM and CP at other different intervals for different silages and /or PD, b, B, ED and UND were not significantly (P>0.05) different. Fitted data illustrated in Fig.1 referring to the results of fermentation are convergence in different kind of silages. Generally, this study is show that ensiling consistently increased total disappearance of DM, OM and CP in the rumen (Fig. 1).

Table (5): Ruminal degradation kinetics of RSS, WCS and CSS silage.

Item	W* (%)	a (%)	b (%)	c (%/h)	B (%)	PD (%)	ED (5%h^{-1})	UND (%)
Dry matter (%):								
RSS	6.90	18.57	62.09	0.077	73.76	80.66	56.22	19.34
WCS	6.58	17.10	59.96	0.073	70.48	77.06	52.69	22.94
CSS	7.17	18.68	64.36	0.08	75.87	83.04	58.29	16.96
±SE	±0.257	±1.289	±1.765	±0.009	±2.372	±2.622	±1.765	±2.473
Organic matter (%):								
RSS	7.58	20.44	65.94	0.082	78.80	86.38	61.40	13.62
WCS	7.56	18.84	65.77	0.075	77.05	84.61	58.30	15.39
CSS	7.88	20.58	67.22	0.088	79.92	87.80	63.44	12.20
±SE	±0.266	±1.521	±1.152	±0.006	±2.300	±2.209	±1.808	±2.210
Crud protein (%):								
RSS	4.92^{b}	16.87^{b}	58.31	0.083	70.26	75.18	53.26	24.82
WCS	4.60^{b}	16.77^{b}	56.23	0.074	68.40	73.00	50.33	27.00
CSS	10.64^{a}	24.09^{a}	54.20	0.084	67.65	78.29	58.07	21.71
±SE	±0.439	±1.321	±2.700	±0.012	±2.893	±2.959	±1.852	±2.960

a, b and c Means in the same column for each eategory with different superscript are significantly different (P<0.05).
RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage. B = (a + b) – W
±SE: standard error of difference. *W is washing loss (%). ED: effective degradability at (5%h^{-1}).



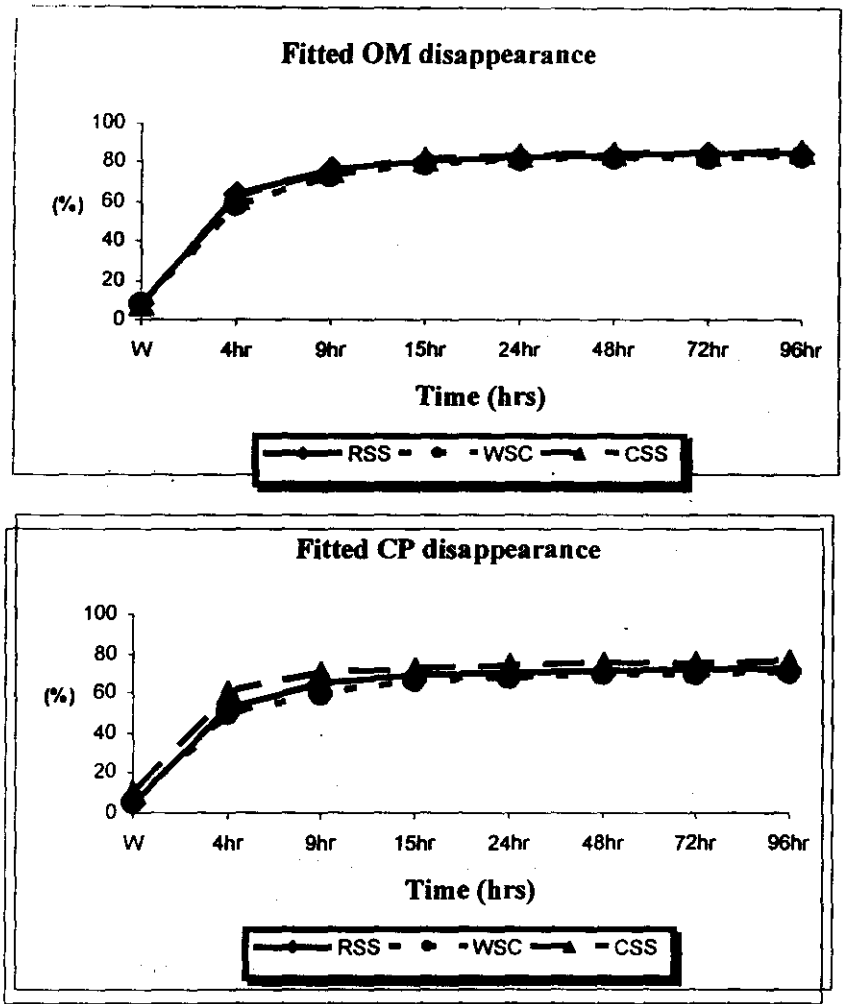


Fig. (1):- Fitted curve for DM, OM and CP according to equation ($P = a + b(1 - e^{-ct})$).

The results in Table (6) show that, there were no significant differences among different tested silages for DM, OM, CP, CF and NFE digestibility coefficient. These data are in agreement with those obtained from the *in sacco* studies (Tables 4 and 5) and as shown Fig. (1). The nearest values of nutrient digestibility were obtained by Gabr *et al.* (1999) when they fed lactating goats on reed or sorghum plants. The digestibilities of EE, NDF and ADF were significantly ($P<0.05$) higher for group fed WCS compared with that fed CSS, while no significant ($P>0.05$) differences were found between WCS and RSS or between RSS and CSS. These results could be considered a reflection to the high NDF and ADF content in CSS silage and decrease of feed intake. Similar trend was recorded by Ahmed *et al.* (2002) when Zaraibi bucks were fed on reed or whole corn silages. The nutritive value expressed as TDN was higher significantly ($P<0.05$) for WCS compared to CSS, while it was not significant compared to RSS. In the contrary, DCP for RSS silage was significantly ($P<0.05$) higher compared with the other two types of corn silage,

however, WCS silage had better DCP content than CSS. These data might be due to improve fermentation in the rumen where microbial count increased with feeding RSS and WCS compared to CSS. All the animals remained in positive N balance and values were convergence among all treatments.

Table (6): Nutrient digestibility, cell wall constituent and nutritive value (%) for RSS, WCS and CSS silage.

Item	RSS	WCS	CSS	±SE
Nutrient digestibility, (%):				
DM	64.93	65.31	63.04	±0.737
OM	67.59	68.00	66.02	±0.892
CP	62.08	63.00	61.17	±0.671
CF	62.45	63.62	61.57	±1.616
EE	75.05^{ab}	78.44^{a}	70.68^{b}	±2.038
NFE	71.75	70.42	69.11	±2.195
Energy	69.80^{a}	70.10^{a}	65.41^{b}	±0.580
Cell wall constituent digestibility (%):				
NDF	62.14^{ab}	63.60^{a}	60.03^{b}	±0.741
ADF	49.85^{ab}	50.70^{a}	46.94^{b}	±0.911
ADL	34.42	35.55	32.30	±4.012
Cellulose	74.74	75.80	78.93	±2.690
Hemicellulose	52.93	53.89	50.32	±1.348
Nutritive value, (%):				
TDN	63.68^{ab}	64.86^{a}	60.96^{b}	±0.811
DCP	6.85^{a}	6.31^{b}	4.88^{c}	±0.062
Nitrogen balance (g/h/d)	0.54	0.51	0.52	±0.166

a, b and c Means in the same row with different superscript are significantly different (P<0.05).
RSS: Reeds silage, WCS: Whole corn silage and CSS: Corn stalks silage.

Rumen parameters presented in Table (7) pointed to higher values (P<0.05) of pH and NH_3-N in the rumen of sheep fed CSS as compared to those fed RSS and WCS. These data may be attributing to higher level of SCFA's especially acetic acid with feed RSS and WCS also, increase content of NPN in CSS silage compared to RSS and WCS. In the contrary butyric acid was significantly (P<0.05) higher with feeding CSS compared to RSS and WCS silage. Bacterial and protozoa counted were significantly (P<0.05) higher in sheep-rumen fed WSS or RSS compared to that fed WCS.

Optimizing fermentation of forages in the rumen requires adequate ammonia N in the rumen to supply the N required for microbial growth (Leng, 1990).

Table (7): Basic pattern of rumen fermentation at feed RSS, WCS and CSS silage.

Item	RSS	WCS	CSS	±SE
pH	5.36^{b}	5.35^{b}	6.08^{a}	±0.135
NH3-N (mg/ dl)	9.66^{b}	9.56^{b}	14.42^{a}	±0.306
SCFA's (meq/dl)	11.33	12.02	10.75	±0.476
Bacteria count, (x 10^{9}/ml)	2.82^{a}	2.49^{b}	2.85^{a}	±0.082
Protozoa count, (x 10^{5} /ml)	9.71^{ab}	8.98^{b}	9.97^{a}	±0.268
SCFA's fractionation (%):				
Acetic	56.64^{a}	57.88^{a}	52.34^{b}	±0.855
Propionic	27.65	27.67	29.72	±0.649
Ac/Pr	2.05^{a}	2.10^{a}	1.76^{b}	±0.071
Butyric	15.70^{b}	14.45^{b}	17.94^{a}	±0.602

a and b Means in the same row with different superscript are significantly different (P<0.05).
RSS: Reeds silage, WCS: Whole corn silage, CSS: Corn stalks silage and SCFA's: Short chin fatty acids.

Table (8): Prediction of voluntary feed intake (YFI) from fiber fraction digestibility or kinetics of DM degradability and prediction of DM digestibility (YDMD) from kinetics of DM degradability.

Equation and factors used	r	RSD
Prediction of intake from cell wall and CP digestibility:		
YFI =118-0.087(NDF)	0.613^{**}	9.0
YFI =82-0.061(ADF)	0.320^{ns}	11.2
YFI =72-0.021(ADL)	0.064^{ns}	11.5
YFI =112-0.065(NDF)-0.051(ADF)+0.142(ADL)	0.654^{*}	9.3
YFI =42-0.053(NDF)+0.14(ADF)-0.21(ADL)+0.21(CP)*	0.713^{*}	8.6
Prediction of Intake from DM degradability:		
YFI =33.2*+0.50(a+b)	0.360^{ns}	11.0
YFI =35.5+0.10(a+b)+0.72(W)	0.451^{ns}	11
YFI =9.1+0,50(a+b)*+389(c)**	0.786^{**}	6.4
YFI =12.9-0.41(a+b)+317(c)*+0.076(CP)	0.782^{**}	6.1
YFI =10.0+0.40(W)+0.33(B)+411(c)**	0.759^{**}	7.0
Prediction of DM digestibility from DM degradability:		
YDMD =150+6.0(a+b)**	0.755^{**}	40.9
YDMD =134+7.0(a+b)**-1.1(W)	0.788^{**}	41.8
YDMD =170+6.0(a+b)**-290(c)	0.809^{**}	43.0
YDMD =139+7.43(a+b)**+169(c)-0.38(CP)	0.796^{**}	43.0
YDMD =153+5.72(W)**+6.39(B)**-187(c)	0.787^{**}	43.0

W: Washing loss (water soluble fraction); B: insoluble but fermentable matter [B = (a+b) - A]; a, b and c: constants in the exponential equation $p = a+b\ (1-e^{-ct})$, a+b= potential DM degradation, c = rate of DM degradation. r: Correlation coefficient; RSD: Residual Standard Deviation. Significance of contribution of additional terms to the model: *P< 0.05, **P<0.001 and ns=not significance.

The results of simple and multiple regression between intake or apparent DM digestibility *in vivo* of silage and fiber fraction digestibility or DM degradability are shown in Table (8). Using cell wall constituents and DM degradability in simple and multiple regressions revealed good accuracy in predicting feed intake. The prediction was further improved when CP was included as an additional factor in either feed intake or DM digestibility predicted. Based on such information, these data are in good agreement with (Khazaal *et al.* 1995) who fed hay to sheep. The results clearly show that accurate prediction of both intake and digestibility can be simply achieved from the characteristics of degradation of feeds.

The cost to produce one ton silage from RS, WC and CS were 100, 650 and 100 LE, respectively. Reed grass has been cut in shorter time than CS for silage making; therefore the cost of treatment was less than for WCS and CSS. Prices of TDN unit and DCP unit (LE) were lower for RSS compared to WCS and CSS. It is therefore recommended that using RSS could be preferable to corn silage especially in terms of energy and protein with the economic costs.

Table (9): Economical efficiency of feeding of RSS, WCS and CSS silage.

Item	RSS	WCS	CSS
Price of ton (LE)	100	650	100
Price of treatment /ton (LE)	50*	50	63
Total cost (LE)	150	700	163
Amount of TDN (kg/ ton)	673.10	715.41	601.68
Amount of DCP (kg/ton)	68.5	63.1	48.8
Price of TDN unit (LE)	0.22	0.98	0.72
Price of DCP unit (LE)	2.19	11.09	3.34

RSS=Reeds silage, WCS=Whole corn silage and CSS=Corn stalk silage. LE = Egyptian pound
Price of treatment = price of chopping and transferring. *Manufacturing costs include the addition of molasses.

In conclusion, the obtained data encourage adoption of using RSS as good feed for ruminant in silage form and could be nutritional and economically better than whole corn silage especially in terms of energy and protein.

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الجدوى الغذائية والاقتصادية لاستخدام سيلاج الغاب (اروند دوماكس) مقارنة بسيلاج الذرة (زى مايز) كغذاء للاغنام

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تهدف هذه الدراسة الى تقيم استخدام سيلاج الغاب مقارنة بسيلاج نبات الذرة الكامل بالكيزان او العيدان فقط من ناحية الماكول والمتحلل بالكرش والهضم والجانب الاقتصادى. صنع السيلاج فى اكياس بلاستيك سعة ٢٥ كجم حيث لم تتم اى اضافة على سيلاج الذرة الكامل بالكيزان فى حين تم اضافة ٠.٥٪ يوريا بالاضافة الى ٥٪ مولاس الى سيلاج عيدان الذرة , اضافة ٥٪ مولاس فقط الى سيلاج الغاب.

استخدم فى هذه الدراسة خمسة عشر كبش اوسيمى متوسط اوزانها ٦٠ – ٦٥ كجم وزعت على ثلاث مجموعات عشوائية. غذيت كل مجموعة على احد انواع السيلاج المختبرة. خمس حيوانات اخرى غذيت على دريس البرسيم لتقدير الاستساغة النسبية. ثلاث حيوانات من كل مجموعة من التى غذيت على السيلاج تم استخدامها فى اجراء تجارب الهضم.

اشارت نتائج جودة السيلاج الى ان درجة حموضة السيلاج الناتج تراوحت من ٤.١٠ الى ٤.٤٠ كما دلت تركيزات الاحماض الدهنية الطيارة على جودة السيلاج الناتج. كان محتوى البروتين فى سيلاج عيدان الذرة بدون كيزان منخفضا بينما محتوى مستخلص الاثير والالياف الذائبة فى المحلول المتعادل والحامضى واللجنين والهميسيليلوز كانت مرتفعة مقارنة بكلا من سيلاج الذرة الكامل والغاب وباقى المكونات كانت متقاربة.

أوضحت النتائج ان الحيوانات استهلكت كميات اكبر من سيلاج الذرة الكامل مقارنة بكلا من سيلاج الغاب وسيلاج عيدان الذرة. كما تشير النتائج الى ان الاستساغة النسبية والماكول لكل كجم وزن حى او لكل كجم $^{٠.٧٥}$ والماكول الفعلى كان مرتفعا معنويا لسيلاج الذرة الكامل مقارنة بسيلاج العيدان فيما عدا الماكول للوزن المرفوع للاس ٠.٧٥ .

اجريت تجارب الناصور الكرشى على عدد ٦ حيوانات مركب لها ناصور على الكرش وذلك عند الازمنة التالية: ٤ و٩ و١٥ و٢٤ و٤٨ و٧٢ و٩٦ ساعات على التوالى. اظهرت النتائج ان المختفى من المادة الجافة والبروتين لسيلاج عيدان الذرة استمر مرتفعا معنويا حتى مرور ٩ ساعات من التحضين بالكرش مقارنة بكلا من النوعين الاخرين كما ان المختفى من البروتين نتيجة الغسيل قبل التحضين كان مرتفعا معنويا لسيلاج عيدان الذرة مقارنة بالانوع الاخرى.

لم تظهر النتائج المتحصل عليها وجود اختلافات معنوية بالنسبة لمعاملات هضم كل من المادة الجافة والمادة العضوية والبروتين الخام والمستخلص الخالى من الازوت. فى حين ارتفعت معاملات هضم كل من مستخلص الاثير والالياف الذائبة فى المحلول المتعادل والحامضى بالنسبة لسيلاج الذرة الكامل مقارنة

بسيلاج العيدان فقط بينما لم تظهر اى اختلافات معنوية مقارنة مع سيلاج الغاب. نفس الامر كان فى القيمة الغذائية كمركبات غذائية مهضومة بينما البروتين المهضوم بالنسبة لسيلاج الغاب كان اعلا معنويا مقارنة بكلا النوعين من سيلاج الذرة الا ان سيلاج الذرة الكامل كان متفوق على سيلاج عيدان الذرة.

اوضحت نتائج حموضة الكرش وتركيزات الامونيا ارتفاعا معنويا عند تغذية الاغنام على سيلاج عيدان الذرة مقارنة بتلك التى غذيت على سيلاج الذرة الكامل وسيلاج الغاب. اشارت تركيزات الاحماض الدهنية الطيارة الى انخفاض تركيز حمض الخليك عند التغذية على سيلاج العيدان فى المقابل ارتفع تركيز البيوتريك معنويا ذلك بالمقارنة بتغذية سيلاج الغاب والذرة الكامل. اظهر العد الميكروبى زيادة فى العدد الكلى لبكتريا الكرش والبروتوزوا فى كرش الاغنام المغذاه على سيلاج الغاب وعيدان الذرة مقارنة بسيلاج الذرة بالكيزان. كما اشارت معادلات التنبؤ للماكول ومعاملات الهضم بان استخدام تحليلات جدر الخلايا واختفاء المادة الجافة قد اعطى نتائج طيبة الا ان النتائج كانت افضل عند اخذ البروتين فى الاعتبار. كما ان النتائج الاقتصادية تشير الى تفوق استخدام عيدان الذرة والغاب مقارنة بالذرة الكامل.

من نتائج هذه التجربة يمكن ان القول بانه يمكن استخدام سيلاج الغاب وعيدان الذرة كمصادر علفية بدلا من سيلاج الذرة الكامل.