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ORIGINAL ARTICLE

Effect of addition Triticale on the Degradability kinetics of Potato plant waste silage

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ABSTRACT

The objective of this investigate was effect of different levels of triticale on potato plant waste silage degradability byGas production. This technique by mixtures of filtered rumen liquid of five Holstein male cattle in times of 0, 2, 4, 6, 8, 12, 24, 48, 72 and 96 hours were performed. The resultreported that gas volume at 16h and 24h incubation of control treatment, were33.7 ml/200mg DM and 39.05 ml/200mg DM respectively. The gas test, from soluble fraction ($a_{c\%}$), and from insoluble fraction ($b_{c\%}$), rate constant of gas production during incubation ($c_{c\%}$) and the potential gas production ($a+ b_{c\%}$) contents of control treatment were 11.1, 47.7, 0.02 (ml/h) and 58.1 ml/200mg DM, but for treatment 6% were 21.9, 55.25, 0.04 (ml/h) and 77.15 ml/200 mg DM. According to data, potato plant waste silage could use as an excellent source of dietary nutrient in ruminant animals.

Key Words: *Triticale, Silage, Degradability, Rumen Liquid, Gas Test, Ruminant.*

INTRODUCTIN

Advances in technology have resulted in an improved standard of living in parts of the world. Thus, of differences in the rate of population increases, developed rural have useful many from these advances. Developing countries are demanding an improved standard of living and almost the first condition to be improved is the supply of an enough ration. Therefore, the failure of crops due to adverse weather and invasions of predators, thus a rapid rate of population increase may causes widespread misery and death. Unfortunately, this situation represents unresolved problems in the Third World. Thus, is put on increasing food supplies in traditional as well as other ways. Traditional ways include the exhaustion of soil and sea to yield more food, by the help of high-yielding crop varieties and the use of fertilizers and irrigation. In addition to these traditional ways, alertness to the problems of waste disposal and its efficiency has been regularly postulated. Waste is generated particularly with agricultural and industrial of the population, Including wholesalers and consumers. Today's, we are being confronted by the challenge to dispose or reuse these byproducts. The efficiency as waste needs urgent study because the recycling and reduction of waste can reduce pollution and improve the present situation with creating new feeds from waste. The upping costs and pressures related by waste disposal stress the need for a reappraisal of the efficiency of waste, which directly or indirectly for ruminant animals and poultry feeding. Present-day experiments thus most include investigate on the management of waste, its technology and subsequent feeding value for ruminant animals. The rapid change in modern ruminant animals and poultry implies scrutiny in the experiments on nutritional estimated by respect to the target ruminant animals and a low-technology approach. Researches on plant and process design of specific waste streams or effluent treatment of wastewater involve nutritional estimated of digestibility, feeding value, bio-hazards and feasibility for waste management and efficiency. Although, scientific interest action in view of these investigate has to be generated from various disciplines of scientific experiments.

To address problems related by poverty and food shortages, scientists are researching alternative food sources and estimating present land use and efficiency of food. Therefore, feeding grains to ruminant animals is questioned because man, a mono gastric, can use grains directly. On the other hand, ruminant animals are characterized with their ability to convert low quality roughage to products that are useful to meat, milk, natural fibers, and leather. Thus, almost any crop residue can be fed to ruminant animals, the

residues of maize, sugar cane, grain sorghum, soybean, wheat and vegetables are usually involved in animal feeding

The first essential stage when deciding to utilize any product as feed is to prevent losses resulting from the presence of toxins and poisons. Poisoning can range from acute cases where ruminant animals die when ingesting the poison, to low levels of poisoning where the consequence of ingesting a deleterious substance can only be measured as negative effects on performance. Poor growth or a reduced ability to fatten can be the sole indicators that there are problems. Thus, Methods should be elaborated and introduced in agricultural practice for preparation and preservation of by-products produced on farm. Ensiling of feed components, this effective method is in use in most countries. Silage is always better used by ruminant animals than straw or hay.

Three common methods including*; In Situ*, *In Vivo* and *In Vitro* techniques have been used in evaluated the nutrient value of diets. The *In Situ* method provides excellent test for the initial estimate of rations and for improving our understanding of the processes of degradation that occur in the rumen (Maheri-Sis et al (2008).

The *In Vitro* gas test technique developed with Menke et al (1988) is a positive method for the rapid screening of diet to assess their potential as energy sources for ruminant animals, which the volume of gas produced, reflect the end result of the fermentation of the substrate, microbial biomass. Gas test technique has been utilized with Blummel et al (1999), to evaluated gas test at different incubation times, and results obtained could report the model of fermentation of feedstuff.

The objective of this investigate was to evaluate the Potato Plant Silage of degradability by the gas production.

METHODS AND MATERIAL

Silage preparation and sampling

The experiment was arranged as a completely randomized design with 3 replications. The fresh Plant Potatoes was collected from Khorasan of Iran; it was manually chopped and treated withtriticale at 0, 2, 4, and 6% plant potatoes. Silos were stored in the dark at ambient temperatures (20°C) and opened after 55 days of ensiling.

Chemical Analysis

Dry matter (DM) was determined by drying the samples at 60^{o}C overnight and Ash by igniting the samples in muffle furnace at 600^{o}C for 6h and Nitrogen content was measured with the Kjeldahl technique (AOAC, 1990).

Crude protein (CP) was calculated as N×6.25 (Van Soest et al, 1991).

Non-Fibrous Carbohydrate (NFC) is calculated using the equation of (NRC, 2001), NFC=100 – (NDF + CP + EE + Ash).

All chemical analyses were carried out in triplicate.

InVitro Gas Production

The samples were incubated in the rumen fluid in calibrated glass syringes following the procedures of [8] as follows. 200mg dry weight of the sample was weighed in triplicate into calibrated glass syringes of 100ml in the absence and presence of level 0, 2, 4 and 6% samples. The syringes were pre-warmed at 39°C before injecting 30ml rumen fluid-buffer mixture into each syringe followed by incubation in a water bath at 39°C. The syringes were gently shaken 30min after the start of incubation and every hour for the first 10h of incubation. Gas test was evaluated as the volume of gas in the calibrated syringes and was recorded before incubation 0, 2, 4, 6, 8, 16, 24, 48, 72 and 96 hours.

All samples were incubated in triplicate with three syringes containing only rumen fluid-buffer mixture. The net gas productions for samples were determined with subtracting the volume of gas produced in the blanks. Cumulative gas production results were fitted to the model of (Ørskov and McDonald, 1979).

$P = a + b (1-e^{-ct})$

Where P, is the gas production at time t. thus, a, gas production from soluble fraction (ml/200mg DM), b, the gas production from insoluble fraction (ml/200mg DM), c, the gas production rate constant (ml/h), a+ b the potential gas production (ml/200mg DM) and t is the incubation time (hours).

Statistical Analysis

Data on apparent gas test parameters were subjected to one-way analysis of variance using the analysis of variation model ANOVA of SAS (2000). Multiple comparison tests used Duncan's multiple-range test. Significance between individual means was identified using the Duncan's multiple range tests. Mean differences were considered significant at ($P<0.01$). Standard errors of means (SEM) were estimated from the residual mean square in the analysis of variance.

RESULTS AND DISCUSSION

Chemical composition of used plant potato and silage is shown in Table1. The effect of incubating the materials*In Vitro* during 0, 2, 4, 6, 8, 16, 24, 48, 72 and 96 hours by different levels of triticale on gas test and the parameters estimated from gas test is shown in Table 2.

Table1: Chemical (DM) composition of potatoes plant and fermentation properties of different treatments (%).

Item	DM%	CP%	EE%	NDF%	ADF%	Ash%	pH	Ca%	P%	CF%	GE%	Mn%	Mg%	Lactat(mMol)
Tri_C	28.2	11.01	2	32.7	28.1	3.9	5.9	4.6	0.2	14.52	3310	0.06	4.03	1.47
$Tri_{2\%}$	28.23	11.5	3.3	40.07	31.6	4	5.5	4.75	0.2	14.89	3320	0.06	4.07	1.92
$Tri_{4\%}$	28.9	12.9	3.5	42.8	32.02	4.05	5.1	4.79	0.2	15.11	3393	0.061	4.08	2.35
$Tri_{6\%}$	29.88	14.1	3.53	42.9	34.08	4.32	4.95	4.91	0.2	16.5	3405	0.09	4.09	2.98

DM, Dry matter; CP, Crude protein; EE, Ether extract; NDF, neutral detergent fiber; ADF, Acid detergent fiber; CF, Crude fiber.

Tri_c = Non Triticale

$Tri_{2\%}$= added 2% Triticale

$Tri_{4\%}$= added 4% Triticale

$Tri_{6\%}$= added 6% Triticale

Table2: Incubation different time of different treatments.

Incubation Time	Tri_C	$Tri_{2\%}$	$Tri_{4\%}$	$Tri_{6\%}$	Pr>F	SEM
2	7.4	8.5	9.5	10.5	<0.0001	1.25
4	18	23.8	26.6	29.01	<0.0001	1.65
6	25.85	30.03	34.02	35.94	<0.0001	1.66
8	28.09	33.6	38.9	40.8	<0.0001	1.89
16	33.7	36.7	40.4	41.81	<0.0001	1.09
24	39.05	41.76	45.5	49.1	<0.0001	1.21
48	45.1	46.03	49.95	50.15	<0.0001	1.07
72	51.45	53.1	61.3	64.07	<0.0001	1.7
96	60.9	65.8	73.8	75.5	<0.0001	2.4

Tri_c = Non Triticale

$Tri_{2\%}$= added 2% Triticale

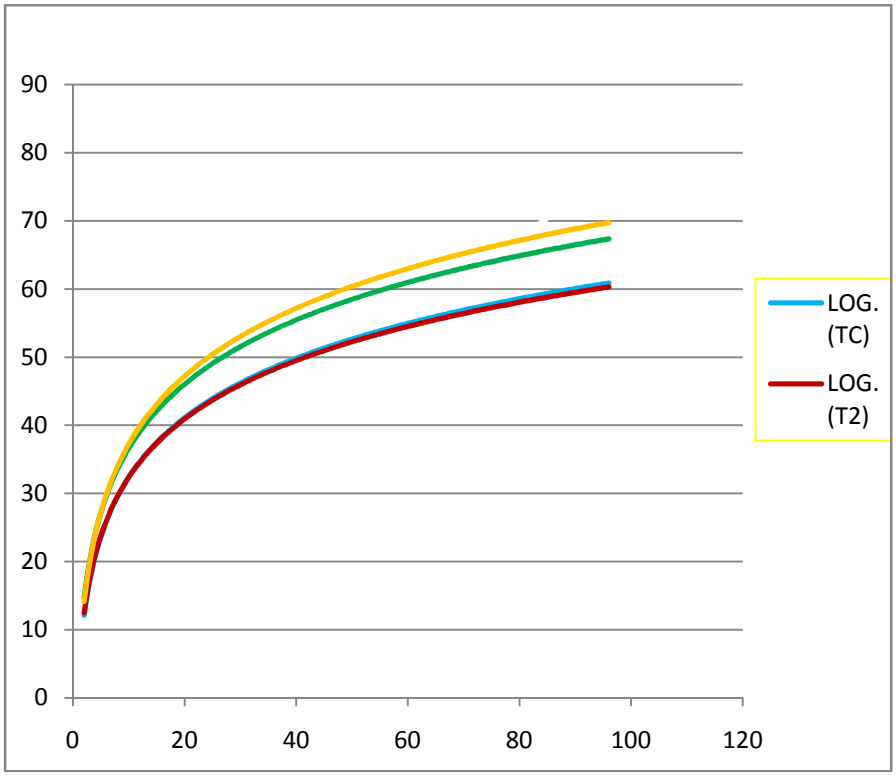
$Tri_{4\%}$= added 4% Triticale

$Tri_{6\%}$= added 6% Triticale

The results suggested that gas volume at 2h incubation (for 200mg samples), were 7.4 and 8.5 ml/200mg DM for samples with 0 and 2% Triticale, also, 9.5 and 10.5 ml/200mg DM for samples with 4 and 6% Triticale (1 ml/30ml buffered rumen fluid), respectively. Gas volume at 4h incubation (for 200mg dry samples), were 18 and 23.8 ml/200mg DM for samples with 0 and 2% Triticale, also, 26.6 and 29.01 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively. Gas volume at 6h incubation (for 200mg dry samples), were 25.85 and 30.03 ml/200mg DM for samples with 0 and 2% Triticale, although, 34.02 and 35.94 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively. Gas volume at 8h incubation (for 200mg dry samples), were 28.09 and 33.6 ml/200mg DM for samples with 0 and 2% Triticale, also, 38.9 and 40.8 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively. Gas volume at 16h incubation (for 200mg dry samples), were 33.7 and 36.7 ml/200mg DM for samples with 0 and 2% Triticale, although, 40.4 and 41.81 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively. Gas volume at 24h incubation (for 200mg dry samples), were 39.05 and 41.76 ml/200mg DM for samples with 0 and 2% Triticale, also, 45.5 and 49.1 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively. Gas volume at 48h incubation (for 200mg dry samples), were 45.1 and 46.03 ml/200mg DM for samples with 0 and 2%

Triticale, although, 49.95 and 50.15 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively.
Gas volume at 72h incubation (for 200mg dry samples), were 51.45 and 53.1 ml/200mg DM for samples with 0 and 2% Triticale, also, 61.3 and 64.07 ml/200mg DM for samples with 4 and 6% Triticale(1ml/30 ml buffered rumen fluid), respectively. Gas volume at 96h incubation (for 200mg dry samples), were 60.9 and 65.8 ml/200mg DM for samples with 0 and 2% Triticale, although, 73.8 and 75.5 ml/200mg DM for samples with 4 and 6% Triticale (1ml/30 ml buffered rumen fluid), respectively.

Fig1. *Invitro* gas production volume of Plant potatoes silage treat by Triticale at different incubation time.



The study volume of gas production increased with increasing time of incubation. Also, there're other models available to describe the kinetics of gas production, the Ørskov and McDonald (1979); Maheri-Sis et al (2008) was chosen thus relate of its parameters by Intake and Degradation characteristic of alfalfa and concentrate diets have been documented.
Gas volume is an efficiency parameter from which to predict digestibility, fermentation end product and microbial protein synthesis of the substrate by rumen microbes in the gas test technique (Maheri-Sis et al (2008).
Gas volumes also have shown a close relationship by feedstuff intake (Blummel *et al* 1999) and growth rate in calve (Maheri-Sis et al (2008).
The soluble fraction (a) makes it easily attachable with ruminal microbes and leads to much gas test. The gas volumes at asymptote (b) have the advantage for predict feed intake.
The gas production for control treatment from soluble fraction (a), the gas production from insoluble fraction (b), rate constant of gas production during incubation (c) and the potential gas production (a+ b) contents of samples were 11.1 (ml/200mg DM), 47.7 (ml/200mg DM), 0.02 (ml/h) and 58.8(ml/200mg DM), but for level treated by 2% Triticale were 14.9 (ml/200mg DM), 48.8 (ml/200mg DM), 0.03 (ml/h) and 63.7 (ml/200mg DM).
Also, for level 4% from soluble fraction (a), the gas production from insoluble fraction (b), rate constant of gas production during incubation (c) and the potential gas production (a+ b) contents of samples were 21.5 (ml/200mg DM), 55.2 (ml/200mg DM), 0.04 (ml/h) and 76.7(ml/200mg DM), while for level treated by 6% Triticale were 21.9 (ml/200mg DM), 55.25 (ml/200mg DM), 0.04 (ml/h) and 77.15 (ml/200mg DM).

Table3: Degradation parameters of different treatments

Degradation Parameter	$Tri_{C\%}$	$Tri_{2\%}$	$Tri_{4\%}$	$Tri_{6\%}$	Pr>F	SEM
a(mg/g)	11.1	14.9	21.5	21.9	<0.0001	2.69
b(mg/g)	47.7	48.8	55.2	55.25	<0.0001	1.96
Potential Degradability (a+b) (mg/g)	58.8	63.7	76.7	77.15	<0.0001	4.24
c(ml/h)	0.02	0.03	0.04	0.04	<0.0001	0.01

Tri_c = Non Triticale
$Tri_{2\%}$= added 2% Triticale
$Tri_{4\%}$= added 4% Triticale
$Tri_{6\%}$= added 6% Triticale

Rezaei et al (2011) estimated effect of 3doses clove methanolic extract (0, 0.5 and 1 ml) on degradability, of Soybean meal and suggested gas volume at 48h incubation (for 200mg dry samples), soluble fraction (a), insoluble but fermentable fraction (b), potential gas production (a+ b) and rate constant of gas production (c) of Soybean meal were 71.240, 1.767, 70.880, 72.647 ml/200mg DM and 0.100 ml/h, gas volume at 48h incubation (for 200mg dry samples), soluble fraction (a), insoluble but fermentable fraction (b), potential gas production (a+ b) and rate constant of gas production (c) of clove methanolic extract (1ml) were 22.717, 8.914, 19.516, 28.429 ml/ 200mg DM and 0.051 ml/h, respectively. Gas volume at 72 and 96h incubation (for 200mg dry samples), of Soybean meal were 72.24 and 74.360 ml/200mg DM, while for clove methanolic extract (1ml) were 25.383 and 29.130 ml/200mg DM, respectively.

EdalatiNasab and Naserian (2013) suggested that, increased barley in silage,CP amount increased, which might be due to higher CP concentration in potato silage treated by barley.

Increase in amount NDF of silages with increase potato silage treated by barley.

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