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Nutritive values and utilisation of passion fruit peel silage for dairy cows

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Abstract
The studies were undertaken to evaluate the potential utilisation and nutritive values of silage made from passion fruit peel by using nylon bag and gas production techniques. The treatments were as follows:
1) Passion fruit peel silage (Group I); 2) Passion fruit peel ensiled with 3% urea + 10% rice straw (Group II), 3) Passion fruit peel ensiled with 4% rice bran (Group III), 4) Passion fruit peel ensiled with 4% corn (Group IV) and 5) Passion fruit peel ensiled with 1% formic acid + 10% rice straw (Group V). It was found that the CP contents varied from 11.76% (Group III) to 6.05% (Group V). The potential degradability (A+B) and effective degradation (ED) from Group IV, III and I were higher than by Group II and V respectively. The prediction values of ME and NE by gas production technique from Group III (10.09 and 7.20 MJ/kg) were higher than from Group I, IV, II and V (9.88 and 6.09, 0.22 and 5.70, 8.07 and 5.19, 8.35 and 3.77 MJ/kg, respectively).

Introduction
The passion fruit peel, a manufacturing by-product from the can industry, is every year from July to February widely used as roughage for dairy cows by farmers in Chaipragan District, Chiang Mai Province, Thailand. During that period there is also a lot of other fresh roughage such as grass, corn stover etc. It would therefore be better if the farmers could conserve the passion fruit peel in form of silage and feed it to the animals during the dry season (February-May). This experiment was carried out to find suitable methods to conserve the passion fruit peel as silage for dairy cows.

Materials and Methods
The experiment was conducted with the following treatments: 1) passion fruit silage (Group I), 2) passion fruit ensiled with 3% urea + 10% rice straw (Group II), 3) passion fruit ensiled with 4% rice bran (Group III), 4) passion fruit ensiled with 4% corn (Group

IV) and 5) passion fruit ensiled with 1% formic acid + 10% rice straw (Group V). The chemical composition of the samples were analysed by proximate analysis (A.O.A.C., 1975) and detergent method (Van Soest, 1982). The nylon bag technique (¬rskov and Mc Donald, 1979) and *in vitro* gas production technique (Menke and Steingass, 1988) were used to estimate the degradability and energy values of feed samples, respectively.

Results

The CP contents varied from 11.78% (Group III) to 6.05% (Group V) (Table 1).The potential degradability (A + B) and effective degradation (ED) of Group IV, III and I were relatively higher than those of Group II and V (Table 2) The prediction values of ME and NE by *in vitro* gas production technique from Group III (10.09 and 7.20 MJ/kg) were higher than from Group I, IV, II and V (9.88 and 6.09, 9.22 and 5.70, 8.07 and 5.19, 8.05 and 3.77 MJ/kg, respectively (Table 3).

Table 1. Chemical composition of passion fruit peel silage from 5 treatments.

Groups	DM	OM	CP	EE	NDF	ADF	HC	CL	ADL	CC
	---------- % of DM ----------									
I	14.46	83.31	9.97	1.28	48.23	42.01	6.22	38.16	3.85	51.77
II	19.41	52.69	11.67	1.01	45.11	38.53	6.58	35.78	2.75	54.89
III	16.04	86.16	11.78	3.04	44.85	39.76	5.09	34.21	5.55	55.15
IV	14.13	84.73	8.47	3.46	57.13	43.66	13.47	41.28	2.38	42.87
V	17.55	81.73	6.05	1.78	56.12	43.56	12.56	41.45	2.11	43.88

DM: dry matter, OM: organic matter, CP: crude protein, EE: ether extract, NDF: neutral detergent fibre, ADF: acid detergent fibre, HC: Hemicellulose (NDF - ADF), CL: cellulose (ADF - ADL), ADL: acid detergent lignin, CC: cell content (100 - NDF)

Table 2. Degradability parameters of passion fruit peel silage from 5 treatment using NEWAY program

	I	II	III	IV	V
Fraction A (%)	38.11^{a}	35.45^{d}	36.87^{b}	35.56^{c}	30.75^{e}
Fraction B (%)	43.86^{ab}	38.85^{b}	48.40^{ab}	56.65^{a}	44.00^{ab}
A+B (%)	81.97^{abc}	69.30^{c}	85.16^{ab}	90.21^{a}	74.75^{bc}
c (% h^{-1})	0.052^{a}	0.089^{a}	0.043^{a}	0.041^{a}	0.035^{a}
Lag Phase (h)	4.63^{a}	4.05^{a}	3.38^{a}	3.60^{a}	4.35^{a}
Fraction a (%)	27.02^{ab}	20.50^{b}	29.62^{a}	24.62^{ab}	23.40^{ab}
Fraction b (%)	54.00^{ab}	48.81^{b}	55.55^{ab}	65.60^{a}	51.34^{b}
ED (0.02 h^{-1})	65.03^{a}	56.63^{a}	66.58^{a}	68.95^{a}	56.53^{b}
(0.05 h^{-1})	54.35^{a}	50.58^{a}	54.95^{a}	55.00^{a}	45.48^{b}

^{abcd} means in the same rows with different superscripts are significantly different ($p<0.05$)
A: water soluble fraction, B: insoluble but fermentable fraction, A+B: potential degradability of dry matter, c: degradation rate, a: immediately soluble fraction in the rumen, b: rumen degradable fraction, ED: effective degradation of dry matter

Table 3. Organic matter digestibility (OMD), metabolisable energy (ME, MJ/kg) and net energy lactation (NEL, MJ/kg) of 5 treatments.

Group	Gas production (ml/200mg)	Crude ash (……g/kg……)	Crude protein	ME (MJ/kg)	NEL (MJ/kg)	OMD (%)
I	35.91	88.67	99.7	9.88[b]	6.09[b]	57.65[b]
II	19.21	95.35	116.7	8.07[e]	5.19[d]	45.00[e]
III	39.74	80.13	117.8	10.09[a]	7.20[a]	61.40[a]
IV	50.23	71.00	84.7	9.22[c]	5.70[c]	56.94[c]
V	51.99	92.70	60.5	8.35[d]	3.77[e]	46.10[d]

[abcde] means in the same column with different superscripts are significantly different ($p<0.05$)

Conclusions

It was found that passion fruit peel ensiled with 4% rice bran, passion fruit peel ensiled with 4% corn and passion fruit peel silage without any additives showed promising values and are therefore suitable methods to extend to the farmers.

References

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