Performance of Dairy Cattle with Dietary Supplementation of Rumensin, Garlic peels (Allium sativum) and Organic Mineral

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ABSTRACT : The objective of this research was to determine milk production and quality of dairy cattle and feed digestibility of dairy cattle feed that was supplemented with rumensin, garlic peels (*Allium sativum*) and organic minerals. The research was conducted corresponding to three treatments including basal feed with 0.3g/head/day rumensin (T0), basal feed derived from BBPTU-HPT Baturraden combined with 30 ppm/kg DM garlic peels (T1), and basal feed combined with 30 ppm/kg DM garlic peels and mineral organic (1.5 ppm Cr, 0.3 ppm Se and 40 ppm Zn-lisinat) (T2). Data were subject to analysis of variance in completely randomized design (CRD) with 7 replicates. The results showed that supplemented rumensin, garlic skin and organic mineral did not significantly affect ($P>0.05$) nutrient intake (DM, OM, CF and CP), nutrient digestibility (DM, OM and CF), and milk production and quality. However, treatment significantly affected ($P<0.01$) crude protein (CP) digestibility.

Keywords: Garlic skin, organic mineral, nutrient digestibility

INTRODUCTION

Rumensin belongs to ionophore which is effective to improve feed efficiency. Ionophore lowers acetic proportion and increases propionic proportion in rumen and affects CH_4 production. Some studies demonstrated that inhibiting methane production using ionophore did not last long (Johnson and Johnson, 1995). One of the overcoming strategies was utilizing herbal plants.

Garlic (*Allium sativum*) is prevalent plant for bacteria agent to repair microbe ecosystem in cattle digestive tract especially in the tropics (Wanapat *et al*., 2013). Garlic contains organosulfur like allicin ($C_6H_{10}S_2O$), diallyl sulfide ($C_6H_{10}S$), diallyl disulfide ($C_6H_{10}S_2$), allyl mercaptan (C_3H_6S) (Lawson, 1996). Busquet *et al*. (2006) stated that supplementing garlic was proven effective to decrease acetic acid and increase propionic acid compared to Yuca extract, tea tree oil and Cinnamaldehyde. Garlic also lowered methane and volatile fatty acid ratio (CH_4:VFA). Garlic skin contains 7-time concentration polyphenol than garlic bulb (Kim *et al*., 2009), and allicin belongs to poliphenol expected to lower methanogen.

Recent result indicated that supplementing mineral Cr, Se, and Zn with garlic powder improved in vitro rumen efficiency (Prayitno and Hidayat, 2013) and goat milk production (Prayitno *et al*., 2014). The objective of this research was to determine milk production and quality and feed digestibility of dairy cattle with rumensin, garlic skin (*Allium sativum*), and organic mineral (Cr, Se, and Zn) dietary supplementation.

MATERIALS AND METHOD

Twenty one prepartum FH dairy cattle aged one month on second lactation weighing 644±72 kg was allotted in individual cages with conventional feed comprising of Napier grass : concentrate (70:30) as basal feed (12.85% CP, 23.95% CF, 63.9% TDN). The treatments consisted of T0: basal feed with 0.3g/head/day rumensin, T1: basal feed derived from BBPTU-HPT Baturraden combined with 30 ppm/kg DM garlic peels, and T2 : basal feed combined with 30 ppm/kg DM garlic peels and mineral organic (1.5 ppm Cr, 0.3 ppm Se and 40 ppm Zn-lysinate). Feeds were given two times a day at 06:00 and 13:00. Milking was performed two times a day at 04:00 and 15:00 postpartum for 6 weeks. Feed and feces collections were under total collection method for 5 days, oven-dried at 40°C for 48h to determine dry matter, then composited and ground. Milk production was recorded at each milking.

RESULTS AND DISCUSSION

3.1 Feed Consumption

The research demonstrated there was no different dietary DM, OM, CF and CP intakes. Similarly, Wanapat *et al*. (2013) stated that herbal plant supplementation did not affect nutrient digestibility except crude protein. It was supported by Yang *et al*. (2007) who did not find difference in dry matter consumption after dietary supplementation using mixed essential oil or garlic oil. Furthermore, Odongo *et al*. (2006) revealed no consumption difference in feed supplemented with monesin (ionophore) with control feed because feed nutrient composition was not changed.

Table 1. The effect of supplementing rumensin, garlic peels and organic mineral in dairy cattle feed on dry matter, organic matter, crude fat and crude protein

Daily Consumption parameter (kg/head)	T0	T1	T2
Dry matter (DM)	10.13±1.77[a]	9.76±1.84[a]	9.34±0.44[a]
Organic matter (OM)	8.15±1.44[a]	7.88±1.46[a]	7.50±0.37[a]
Crude fat (CF)	0.20±0.04[a]	0.19±0.04[a]	0.19±0.01[a]
Crude protein (CP)	1.35±0.22[a]	1.42±0.31[a]	1.29±0.02[a]

T0 : basal feed with 0.3g/head/day rumensin, T1 : T0 + 30 ppm/kg DM garlic peels, and T2 : T1 + organic mineral (1.5 ppm Cr, 0.3 ppm Se and 40 ppm Zn-lysinate). Values bearing different superscripts within column are significantly different ($P<0.05$).

3.2 Nutrient Digestibility

The results showed that supplementing rumensin, garlic peeels and mineral (Cr, Se dan Zn) into dairy cattle diet did not significantly affect nutrient digestibility except forcrude protein. It was in line with Wanapat *et al*. (2013) and Prayitno *et al*. (2013) that supplementing garlic could lower crude protein digestibility. Protein digestibility was closely related to nitrogen digestibility, and higher protein digestibility in T1 was in accordance with Spears (2990) that ionophore like rumensin could increase protein digestibility 3.5% due to the improved nitrogen absorption (Muntifering *et al*., 1980).

Table 2. The effect of supplementing rumensin, garlic peels and organic mineral in dairy cattle feed on dry matter, organic matter, crude fat and crude protein digestibilities

Digestibility parameter (%)	T0	T1	T2
Dry matter	73.59±4.26[a]	73.63±9.05[a]	71.16±7.30[a]
Organic matter	76.11±2.87[a]	76.77±8.37[a]	73.08±7.01[a]
Crude fat	77.27±10.30[a]	73.00±22.15[a]	74.49±11.56[a]
Crude protein	92.71±2.68[c]	79.49±6.71[a]	81.70±6.63[ab]

T0 : basal feed with 0.3g/head/day rumensin, T1 : T0 + 30 ppm/kg DM garlic peels, and T2 : T1 + organic mineral (1.5 ppm Cr, 0.3 ppm Se and 40 ppm Zn-lisinat). Values bearing different superscripts within column are significantly different (P<0.05).

3.3 Milk Production and Quality

The result indicated, there was no significant difference among treatments on milk production and quality (P>0.05). Supplementing mineral and garlic peels could not improve milk production assumedly due to the negative effect from the combined two materials. Also, rumensin supplementation could not improve milk production, as supported by Odongo *et al* (2007) that milk production resulted from dietary supplemention with 24mg/kg DM rumensin did not affect the control feed (19.7 vs 19.1 kg/day). Furthermore, Indrijani (2001) stated that besides feed factor, milk production was influenced by genetic factors, environmental factors, and the interaction of both factors.

Table 3. The effect of rumensin, garlic peels and organic mineral on milk production and quality

Parameter	T0	T1	T2
Milk production (kg 4% FCM)	20.69±4.48[a]	21.37±11.87[a]	16.12±3.37[a]
Milk components (%)			
- Fat	4.81±0.80[a]	4.93±0.32[a]	4.96±0.56[a]
- Protein	3.34±0.11[a]	3.42±0.10[a]	3.46±0.17[a]
- Lactose	5.02±0.17[a]	5.13±0.15[a]	5.19±0.26[a]
- Solid non fat (SNF)	9.13±0.31[a]	10.68±3.61[a]	9.17±0.14[a]
Production (g/day)*			
- Fat	1015 ± 331[a]	1073±676[a]	814±272[a]
- Protein	1893 ± 438[a]	2227±1185[a]	1447±127[a]
-Lactose	1041 ± 241[a]	1093 ± 597[a]	831 ± 134[a]
-Solid non fat (SNF)	1893 ± 438[a]	2227 ± 1185[a]	1447 ± 127[a]

T0 : basal feed with 0.3g/head/day rumensin, T1 : T0 + 30 ppm/kg DM garlic peels and T2 : T1 + organic mineral (1.5 ppm Cr, 0.3 ppm Se and 40 ppm Zn-lisinat). Values bearing different superscripts within column are significantly different (P<0.05).

CONCLUSION

Supplementing rumensin, garlic peels and mineral organic did not significantly affect nutrient intake (DM, OM, CF and CP) and nutrient digestibility (DM, OM and CF), milk production and quality, but highly significantly affected crude protein (CP) digestibility.

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