EDINGS OF THE INTERNATIONAL WORKSHOP
Tropical Bio-resources for Sustainable Development

"Role of Innovation to Enhance German Alumni in Scientific and Professional Capacities"

Editors:
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Anuraga Jayanegara
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TROPICAL BIO-RESOURCES FOR SUSTAINABLE DEVELOPMENT

Role of Innovation to Enhance German Alumni in Scientific and Professional Capacities

13-15 August 2014
Bogor, Indonesia

Editors

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It is really honoured and very pleased to have this 6th SEAG International Workshop on Tropical Bio-resources for Sustainable Development, 13-15 August 2014, Bogor, Indonesia.

PREFACE

SEAG is an Alumni-networking group, which was established in year 2000, in countries in South-East Asia.

Since 1999, the Federal Ministry for Economic Cooperation and Development (BMZ) and the German Academic Exchange Service (DAAD) have systematically supporting alumni networks of graduates from German Universities. The University of Goettingen, Kassel and Marburg established an alumni consortium to support and maintain efficiently local and regional alumni networks in Egypt-Arab-Region (GEAR), in Latin America (ReCALL), in Iran (GIAN) and in South East Asia (SEAG).

The objectives of the alumni networks are to establish an alumni database, the exchange of scientific experiences among the alumni and their host universities in Germany, and finally to create and maintain local and regional networks. In order to achieve these goals, the consortium uses many tools, e.g., organizing symposiums, mini-workshops, international workshops, schools, etc.

In Indonesia, some Mini Workshops had been done several times and were placed in many universities in different provinces. The first mini workshop had been done in Brawijaya University, Malang, April 2003 for those alumni who work in Agriculture economy. The second one was executed in Soedirman University, Central Java on May 2004, for Agriculturist, and the third SEAG mini workshop was conducted in Taman Safari Bogor, May 2005 for Animal scientist. The fourth was in Sam Ratulangi University ~ North Sulawesi, for the society of forester, with the theme of Developing Public Awareness through Sustainable Forest Management. The fifth was conducted in USU (North Sumatera University) for area of Agricultural Technology, in November 2006. The Sixth was in Bogor Agricultural University for horticulturist, on May 2007.

As academicians or researchers who gained education, training or part of it in Germany, we should play a role as key person in our scientific society. Our partners from Germany also believe that their support can only be
Effectively provided if it is based on cooperation with key local players. Development cooperation is very essentially dependent on finding and integrating such key persons. Indeed, as German alumni, we show an effort to support for economic, technological and social transformation processes in our countries.

Some of us hold important positions in government, in the administration, business and industry and in academia. We may act as multipliers and disseminators in and within our societies. We should also introduce the specialist knowledge, provide motivation for innovation and cooperative capabilities in dealings with local and foreign partners. That is why we explore the theme of Tropical Bio-resources for Sustainable Development: The Role of Innovation to Enhance German Alumni in Scientific and Professional Capacities, for this workshop.

High appreciation is conveyed to the organizing committee from SEAG-Indonesia and CDA IPB for the effort to conduct this workshop. The very sincere thank is delivered to the German Academic Exchange Service (DAAD) for continues support financially and many other aspect give us valuable opportunities to learn from each other, to improve individual and institutional competences, and to experience a lot of things across universities.

Syarifah Iis Aisyah

SEAG INDONESIA
CDA IPB
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Influence of different supplemental niacin levels on intake, digestibility and rumen fermentation of dairy cows: a meta-analysis

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Abstract Rumen microbes can synthesis niacin but at fewer amount. Niacin is occasionally supplemented into dairy cows’ ration to improve their production performance especially during early lactation period. The present study was aimed to assess the effect of different supplemental niacin levels on intake, digestibility and rumen fermentation of dairy cows through meta-analytical study. A database was constructed from published literatures reporting niacin supplementation on dairy cows. A total of 49 studies from 46 published articles were integrated into the database. Different niacin levels at various supplemental levels were specified, i.e. 0 to 24 mg; nutrient intake and rumen fermentation parameters were integrated as well. Data were analyzed by a mixed model methodology in which different studies were treated as random effects whereas niacin levels were treated as fixed effects. The significant effect was stated when \( P < 0.05 \). When a parameter showed \( 0.05 < P < 0.1 \), then the effect was considered to have a tendency to be significant. The results showed that different levels of niacin supplementation did not significantly influence nutrient intake, digestibility and rumen fermentation of dairy cows \( (P > 0.05) \). It is concluded that supplementation of niacin has less effect in improving intake, digestibility and rumen fermentation.

Keywords meta-analysis, niacin, concentration, dairy cow

Introduction

Dairy cows require supplementation of niacin in the diet at sufficient levels because the rumen microbes can produce niacin in small amounts only. Niacin plays a role in generating energy in the Krebs cycle (ATP cycles) [1]. Energy deficiency leads to body fat mobilization of dairy cows to be used as energy and then increases beta-hidroxybutiric acid concentration; this condition stimulates ketosis, a metabolic disorder, to occur [2]. It is
that niacin supplementation can overcome the negative energy balance in dairy cows especially during early lactating period. This study was aimed to know the influence of niacin supplementation levels on intake, digestibility and rumen fermentation profiles of lactating dairy cows by a -analysis method.

Materials and Methods

Database development

A database was developed from published literatures reporting addition of various levels on nutrient intake, digestibility and rumen fermentation of lactating dairy cows. Literature search was conducted using data search generators, i.e. Google scholar and Scopus to collect articles with the keywords “niacin” and “dairy cow”. Accordingly, levels of niacin supplementation were specified in the database. After collection of a total of 49 studies from 46 published articles with the above-mentioned keywords were obtained; the articles were published from 1981 to 2013.

Statistical analysis

Obtained were subjected to a statistical meta-analysis based on a model methodology [3, 4]. The model used was linear model, with niacin supplementation levels as fixed effects and different random effects. The following model was employed:

\[ Y_{ij} = \beta_0 + \beta_1 X_{ij} + s_i + b_i X_{ij} + e_{ij} \]

where \( Y_{ij} \) = dependent variable, \( \beta_0 \) = overall intercept across all studies (fixed), \( \beta_1 \) = linear regression coefficient of \( Y \) on \( X \) (fixed effect), \( X_{ij} \) = the continuous predictor variable (niacin supplementation level), \( s_i \) = effect of study \( i \), \( b_i \) = random effect of study \( i \) on the regression of \( Y \) on \( X \) in study \( i \), and \( e_{ij} \) = the unexplained residual error.

Statistics used were P-value and Akaike information criterion (AIC). Significance of an effect was stated when P-value <0.05. Additionally, when P-value between 0.05 to 0.1, an effect was stated as a tendency to be significant. All statistical analyses were performed with SAS Software.
Results and Discussion

1. Influence of niacin supplementation on intake and digestibility of dairy cows

The effects of niacin supplementation levels on dry matter intake (DMI), dry matter digestibility (DMD), organic matter digestibility (OMD), crude protein digestibility (CPD), neutral detergent fiber digestibility (NDFD) and acid detergent fiber digestibility (ADFD) were insignificant (Table 1). In another study, supplementation of niacin at different levels increased rumen microbial population and nutrient degradation in the rumen. Niacin supplementation at 0.75 to 3.75 g/cow/d increased cattle growth by 0.7 to 10.9%; however, supplementation of niacin above 7.5 g/cow/d caused negative effects on the performance [1]. The present meta-analysis reveals that niacin supplementation does not produce consistent results. A plausible explanation is that the supplementation may effectively contribute to dairy cows only during a certain lactation period, most probably in early lactation, not the whole.

Table 1 Intake and digestibility of dairy cows on different supplemental niacin levels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>N</th>
<th>Intercept</th>
<th>SE</th>
<th>Slope</th>
<th>SE</th>
<th>P-value</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI kg/d</td>
<td>85</td>
<td></td>
<td>21.1</td>
<td>0.88</td>
<td>-0.013</td>
<td>0.014</td>
<td>0.340</td>
<td>360.8</td>
</tr>
<tr>
<td>DMD %</td>
<td>14</td>
<td></td>
<td>65.3</td>
<td>2.07</td>
<td>-0.034</td>
<td>0.063</td>
<td>0.609</td>
<td>66.0</td>
</tr>
<tr>
<td>OMD %</td>
<td>7</td>
<td></td>
<td>71.3</td>
<td>1.89</td>
<td>-0.144</td>
<td>0.093</td>
<td>0.220</td>
<td>32.5</td>
</tr>
<tr>
<td>CPD %</td>
<td>9</td>
<td></td>
<td>53.4</td>
<td>11.52</td>
<td>-0.088</td>
<td>0.072</td>
<td>0.312</td>
<td>50.9</td>
</tr>
<tr>
<td>NDFD %</td>
<td>20</td>
<td></td>
<td>43.6</td>
<td>6.69</td>
<td>-0.102</td>
<td>0.126</td>
<td>0.433</td>
<td>126.3</td>
</tr>
<tr>
<td>ADFD %</td>
<td>22</td>
<td></td>
<td>42.2</td>
<td>4.12</td>
<td>-0.065</td>
<td>0.114</td>
<td>0.582</td>
<td>133.9</td>
</tr>
</tbody>
</table>

DMI: dry matter intake; DMD, dry matter digestibility; OMD, organic matter digestibility; CPD, crude protein digestibility; NDFD, neutral detergent fiber digestibility; ADFD, acid detergent fiber digestibility; N, number of data; SE, standard error; AIC, Akaike information criterion.

2. Influence of niacin supplementation on rumen fermentation of dairy cows

Results of meta-analysis showed that niacin supplementation did not affect rumen fermentation, i.e. VFA profiles and ammonia concentration (Table 2). It appears that niacin has less effect for rumen microbes, but the effect is more obvious for the host animals. Other authors reported that niacin supplementation affected the production of total VFA and acetate and propionate, but had minimal influence on butyrate production [5]. Niacin supplementation can improve rumen microbial population and, hence, such supplementation may increase fermentation of feed in the rumen especially...
The acetate [2] and can improve the fermentation of carbohydrates, thus increasing production of total VFA [6]. It might be that different results in fermentation is due to the influence of the different treatment, different total VFA from rumen fluid and the type of feed given to dairy cows.

Influence different supplemental niacin levels on rumen fermentation of dairy cows

<table>
<thead>
<tr>
<th>Unit</th>
<th>Parameter estimates</th>
<th>Model statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
<td>Slope</td>
</tr>
<tr>
<td>mM</td>
<td>SE</td>
<td>SE</td>
</tr>
<tr>
<td>23</td>
<td>129.3</td>
<td>0.610</td>
</tr>
<tr>
<td>16</td>
<td>63.7</td>
<td>-0.017</td>
</tr>
<tr>
<td>16</td>
<td>21.3</td>
<td>0.021</td>
</tr>
<tr>
<td>16</td>
<td>3.1</td>
<td>-0.003</td>
</tr>
<tr>
<td>16</td>
<td>11.2</td>
<td>-0.002</td>
</tr>
<tr>
<td>16</td>
<td>97.9</td>
<td>-0.324</td>
</tr>
</tbody>
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VFA, volatile fatty acid; C2, acetate; C3, propionate; C2/C3, acetate to propionate ratio; NH3, ammonia concentration; N, number of data; SE, standard error; AIC, Akaike information criterion.

References


