Effect of Prebiotic Supplementation on the Growth Performance and Carcass Characteristics of Piglets

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The use of antibiotics in animal feeds has been prohibited in Europe and reduced in many of the developed nations. Consequently, it affects the export of livestock and livestock products. Hence, it is necessary to find an alternative to antibiotic growth promoters which ensure food safety to consumers and the profitability of pig farmers. One such alternative is the use of prebiotics. The mannans act as high affinity ligands for the mannose-specific type-1 fimbriae of pathogenic bacteria such as *Escherichia coli* and salmonelae (*Spring et al.*, 2000). But, there is little information available about the use of prebiotics in livestock feeding particularly in pigs. The aim of the study is to determine the effects of mannan oligo saccharides (MOS) on the growth performance of piglets.

**Materials and Methods**

A feeding trial was carried out by utilizing 48 weaned piglets at University research farm, Madhavaram Milk Colony, Chennai-600 051 for a period of 124 days, from 56th to 180th day of age. Forty eight weaned piglets (Mean body weight ± S.E : 16.51 ± 0.18 kg) randomly divided into four treatment groups each with two replicates of six animals. The animals were weighed individually, ear tagged and distributed randomly in to four different treatment groups fed on diet supplemented with 0 % (T1), 0.2% (T2), 0.3% (T3) and 0.4% (T4) of Mannan oligosaccharide (Bio-Mos) supplied by M/s Allech company, Nicholasville, Kentucky, 40356-8700, USA. The diets were prepared (isonitrogenous and isocaloric) as per NRC (1998). The ingredient and chemical composition of the different experimental diets are presented. The piglets were reared under uniform standard managerial practices and they were fed with weighed quantity of experimental diet with free access to water. Feed intake was measured daily and body weight was recorded at fortnightly intervals till the completion of experiment.

At the end of the feeding trial, six pigs from each experimental group were selected randomly and slaughtered for carcass characteristics study. The duodenal *Escherichia coli* count was determined by using serial 10-fold dilutions with 1% peptone solution onto the Mac Conkey Agar (Laboratorios Britania, Mendoza, Argentina). Total serum cholesterol was estimated by using an automatic analyzer (XL 600, Erba, India). Relative cost benefit analysis was worked out. All the data obtained in this study were subjected to statistical analysis (Sendecor and Cochran , 1989).

**Results and Discussions**

The data obtained from the trial by feeding MOS to piglets on weight gain, feed intake, feed conversion ratio (FCR), *Escherichia*...
coli count in duodenal contents, total serum cholesterol and feed cost (Rs/kg weight gain) are presented. The marketing body weight was significantly (P<0.01) higher in groups fed with MOS supplementation diets compared to the control. Taube et al. (2009) reported that supplementation of MOS promoted growth rate in commercial crossbred piglets (Duroc×Large and White×Landrace).

The weight gain was significantly (P<0.01) higher in MOS supplemented groups than the controls groups. Among the treatment groups, significantly higher weight gain (55.40 and 55.68) was recorded in groups fed with 0.3% (T₃) and 0.4% (T₄) MOS than 0.2% MOS (T₂) and control (T₁). Davis et al. (2002) reported that MOS supplementation during the nursery phase significantly (P<0.01) improves growth performance of pigs.

The feed intake was significantly (P<0.05) higher in 0.3% and 0.4% MOS supplemented groups than groups supplemented with 0.2% (T₂) and control (T₁). Similar findings also reported by Le Mieux et al. (2003) who reported that supplementation of 0.20% MOS in the diet increased average daily feed intake in the weaning piglets. On the other hand, Houdijk et al. (1999) observed that the addition of oligosaccharides decreased the feed consumption in nursery piglets.

Mean feed efficiency was significantly
better in all the MOS supplemented groups than control. However there is no significant difference among the treatments. Poeikhampha et al. (2007) noted that the feed efficiency was improved by the supplementation of mannan oligosaccharide (MOS) in pigs. The improved feed efficiency could be due to the better intestinal morphological development (increase the length and surface area of villi) and subsequent nutrients utilization.

*Escherichia coli* count (log CFU/g digesta) in duodenal contents of pigs fed with diets containing 0 %, 0.2%, 0.3% and 0.4 % of MOS was significantly (P <0.01) lower in all the MOS supplemented groups than control. However, there is no significant difference between the treatments. Castillo et al. (2008) reported that supplying MOS in the piglet diet decreased *Escherichia coli* in the digesta of distal jejunum (P <0.05) at 14 days post-weaning.

Total serum cholesterol was significantly (P<0.05) lowered by the supplementation of MOS. Among the treatment groups, the total serum cholesterol was significantly higher in 0.2% and 0.3% MOS supplemented groups than groups supplemented with 0.4% (T3) but the level was lower than the control (T1). There was no significant difference between T2 and T3. Matras et al. (2006) observed that there was no significant difference between treatments and control and also among different treatments regarding the total serum cholesterol.

Feed cost per kg weight gain was significantly (P<0.05) lowered in all MOS supplemented groups compared to control. However, there was no significant difference among the treatment groups.

Mean dressing percentage of the piglets fed with diet supplemented with 0, 0.2%, 0.3% and 0.4% of MOS was not affected. The results revealed that there was no significant difference in dressing yield between the treatment groups and control and also among the treatment groups. The organs weight, trimmings percentage, skin thickness and back fat thickness between the treatment groups and control did not differ significantly (P>0.05). Similarly, there was no significant difference among the treatment groups. The results were in agreement with the findings of Anna rekiel et al. (2007) who reported that the slaughter performance traits were not statistically affected by the different level of MOS supplementation in fattening pigs.

Table II. Effect of prebiotic (MOS) supplementation on the performance of piglets (Mean±SE)

<table>
<thead>
<tr>
<th>Parameter studied</th>
<th>T1 (0% MOS Control)</th>
<th>T2 (0.2% MOS)</th>
<th>T3 (0.3% MOS)</th>
<th>T4 (0.4% MOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight (kg) at weaning kgs (56th day) initial weightNS</td>
<td>16.68±0.66</td>
<td>16.92±0.76</td>
<td>16.10±1.05</td>
<td>16.33±0.86</td>
</tr>
<tr>
<td>Marketing body weight in kg (180th day)**(Final weight after 124 days of experiment)</td>
<td>66.83±2.52</td>
<td>69.25±2.56</td>
<td>71.50±1.17</td>
<td>72.00±0.87</td>
</tr>
<tr>
<td>Body weight gain (kg)**</td>
<td>50.15±1.06</td>
<td>52.33±0.91</td>
<td>55.40±0.84</td>
<td>55.68±0.76</td>
</tr>
<tr>
<td>Feed intake (kg)*</td>
<td>189.83±0.29</td>
<td>187.67±0.55</td>
<td>190.85±0.33</td>
<td>190.7±0.1</td>
</tr>
<tr>
<td>Feed efficiency**</td>
<td>3.79±0.13</td>
<td>3.59±0.14</td>
<td>3.44±0.17</td>
<td>3.42±0.15</td>
</tr>
<tr>
<td><em>Escherichia coli</em> count in duodenal contents* (log CFU/g digesta)</td>
<td>8.84±0.11</td>
<td>7.50±0.09</td>
<td>7.30±0.05</td>
<td>7.10±0.07</td>
</tr>
<tr>
<td>Total serum cholesterol mg/dl*</td>
<td>117.28±2.11</td>
<td>110.70±3.14</td>
<td>104.43±2.35</td>
<td>91.38±2.12</td>
</tr>
<tr>
<td>Feed cost in Rs/kg weight gain (Rs)*</td>
<td>52.99±0.91</td>
<td>50.21±0.81</td>
<td>48.23±0.89</td>
<td>47.95±0.94</td>
</tr>
</tbody>
</table>

Means with at least one common superscript in a column do not differ significantly *(P<0.05), **(P<0.01); NS – No significant difference.
Hence, it was concluded that the supplementation of MOS had beneficial effects on the growth performance of weaned piglets. At the same time, it did not affect the carcass characteristics. Hence, it can be used as an alternative to antibiotics growth promoter in weaned piglets.

Summary

Supplementation of mannoligosaccharide significantly improved weight gain at 0.3% and 0.4% level. The feed intake was significantly (P<0.05) higher in 0.3% and 0.4% MOS supplemented groups than control. Feed efficiency was significantly (P<0.01) better in all the MOS supplemented groups. Feed cost (Rs/kg weight gain) was lower in all MOS supplemented groups when compared to control. The supplementation of MOS did not affect the carcass characteristics of pigs significantly. It is inferred that supplementation of MOS had beneficial effects on the growth performance of weaned piglets.

References

Anna rekiel, Justyna wiecek, wojciech bielecki, Julita gajewska, Marzena cichowicz, jozef kulisiewicz, martyna batorska, Tomasz roszkowski and koralina beyga (2007) Arch. Tierz., Dummerstorf 50 Special Issue, 172-180


