Abstract: The effects of dietary supplementation of a probiotic, Toxiban, Formycine and probiotic-Toxiban mixture on performance and immune response of broiler chicks were investigated. In a completely randomized design, one hundred fifty 14-days-old broiler chicks were assigned to 5 treatments with 5 replicates and 6 chicks in experimental unit. The experimental treatments were added to basal (starter and finisher) diets as follows: T (1): control group (C) that received starter and finisher diets, T (2): C plus 0.15 percent probiotic, T (3): C plus 0.1 percent Toxiban, T (4): C plus 0.1 percent Formycine and T (5): C plus mixture of 0.15 percent probiotic with 0.1 percent Toxiban. Additives except Toxiban, significantly (p<0.05) increased blood Newcastle antibody titer compared with the control group. Regarding Influenza antibody titer, there was significant differences between treatments except Formycine feeding. Only probiotic caused a significant (p<0.05) increased in blood Bronchitis antibody titer. Consumption of Formycine and probiotic+Toxiban mixture resulted in a significant decrease in blood Gambio antibody titer (p<0.05). Chicks fed diets supplemented with Toxiban significantly (p<0.01) had higher body weight and better Feed Conversion Ratio (FCR) than other treatments. Results indicated that, consumption of Toxiban had the most positive effect on performance and probiotic alone or combination of probiotic and Toxiban had the best effect on blood antibody titers of broiler chicks.

Key words: Probiotic, Toxiban, Formycine, broilers, immune response

Introduction
Probiotics are as a source of live micro-organisms that includes bacteria, fungi and yeasts (Fox, 1988; Miles and Bootwalla, 1991). Lactic acid bacteria such as Lactobacilli streptococci and Bifidobacteria are the most common organisms used in probiotics preparations. The mechanism of action of probiotics has not been fully explained although there are several hypothesis (Ahmad, 2006). Its inhibitory action against pathogens may be mediated by competition for receptors on the gut mucosa, competition for nutrients, the production of antibacterial substances and the stimulation of immunity (Piard and Desmazeaud, 1991; Perdigon and Alvares, 1992; Bal et al., 2004).

As feed additive, probiotics has a good impact on the poultry performance (Stavic and Kornegay, 1995). These live organisms after residing intestinal tract and their metabolities can act as immunomodulatory agent by activating specific and non-specific host immune responses in chicks, which in turn help in prevention and control of various infectious diseases (Fuller, 1992; Koenen et al., 2004).

The most important advantage of probiotic is that doesn't have any residues in animal production and in contrast to antibiotics which could have serous consequences such as drug resistance and harmful alternation of bacterial population in the intestine (Abe et al., 1995), probiotics are not made any resistance by consumption. Therefore, some researchers have replaced antibiotics with probiotics as therapeutic and growth promoting agent (Donovan et al., 2002; Martins et al., 2005).

The dietary supplementation of probiotic benefit the host animal by stimulating appetite (Nahashon et al., 1992), stimulate the immune system (Toms and Powwie, 2001; Koenen et al., 2004), improve microbial balance (Fuller, 1989), produce the digestive enzymes (Saarela et al., 2000), stimulate lactic acid (Bailey, 1987), decrease pH and release bacteriocins (Rolfe, 2000), synthesize vitamins (Coates and Fuller, 1977), improve egg production, egg weight and egg size in layers and turkey (Thayer et al., 1978; Nahashon et al., 1992; Jin et al., 1998), feed consumption in layers and broilers (Nahashon et al., 1994; Kim et al., 2003), lower serum and egg and yolk cholesterol levels in hens (Mohan et al., 1995; Jin et al., 1998; Haddadin et al., 2001; Kim et al., 2003; Kurtoglu et al., 2004; Hajjaj et al., 2005) improve feed conversion ratio of the host (Raymane, 2000; Cavit, 2003), lower motility rate in broiler (Samanta and Biswas, 1995) and have beneficial effect on the health of the host (Soomro et al., 2002). The strain of selected microorganisms in probiotics, method of preparation, the dosage and condition of animals could be partially responsible for such description (Huang et al., 2004).

This study was conducted to investigate the effects of dietary supplementation of a probiotic and other additives available in Iran market on performance and immune response of broiler chicks.
Table 1: Composition (%) of basal diets

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Starter (14-28d)</th>
<th>Finisher (28-42d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>55.97</td>
<td>61.52</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>35.71</td>
<td>31.52</td>
</tr>
<tr>
<td>Sunflower oil</td>
<td>4.49</td>
<td>3.46</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>1.33</td>
<td>1.10</td>
</tr>
<tr>
<td>Oyster shell</td>
<td>1.43</td>
<td>1.47</td>
</tr>
<tr>
<td>DL methionine</td>
<td>0.17</td>
<td>0.08</td>
</tr>
<tr>
<td>Salt</td>
<td>0.40</td>
<td>0.35</td>
</tr>
<tr>
<td>Vitamin and mineral perimix*</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Nutrient content

| ME (Kcal/Kg)          | 3053.00          | 3058.00          |
| Crude protein         | 20.47            | 19.10            |
| Methionine +Cysteine  | 0.82             | 0.70             |
| Calcium               | 0.95             | 0.90             |
| Phosphorus (available)| 0.40             | 0.35             |
| Sodium                | 0.17             | 0.15             |

*Vitamin and mineral provided per kilogram of diet: Vitamin A, 3600000 IU; Vitamin B1, 720 mg; Vitamin B2, 2640 mg; Pantothenic acid, 4000 mg; Nicotinic acid, 12000 mg; Vitamin B6, 1200 mg; Folic acid, 400 mg; Vitamin B12, 6 mg; Vitamin D3, 80000 IU; Vitamin E, 7200 IU; Vitamin K3, 800 mg; Biotin, 40 mg; Antioxidant, 100000 mg; Choline chloride, 5000 mg; Manganese, 40000 mg; Zinc, 33880 mg; Iron, 20000 mg; Copper, 4000 mg; Iodine, 400 mg; Selenium, 80 mg

Materials and Methods

A total of one hundred fifty 14-days-old broiler chicks (Lohman strain) were obtained from the local market and were divided into 25 groups of 6 with similar average body weight (255±10 gr). All birds were fed a standard commercial diet based on corn and soybean meal (starter diet) during the first 14 days of life and then each treatment switched to their respective experimental diets. Each experimental treatment was repeated 5 times and fed experimental diets for 28 days. Experiment was conducted as completely randomized design and five dietary treatments were utilized. The chicks were fed diets based on soybean meal and corn (without added antibiotics, coccidiostats or growth promoter). The composition of starter and finisher diets is shown in Table 1. The basal diets (starter and finisher) were formulated to meet or exceed National Research Council (1994) nutrient requirements of broiler chicks and were fed from days 14-42. The treatments were:

T (1): control groups (C) that received starter and finisher diets,
T (2): C plus 0.1 percent of a commercial probiotic (Bactocillin, Pakgostar Parand, Tehran, Iran),
T (3): C plus 0.1 percent Toxiban,
T (4): C plus 0.1 percent Formycine,
T (5): C plus mixture of 0.15 percent probiotoc with 0.1 percent Toxiban.

These levels of suppletion were selected based on optimum recommended levels in some researches. Strict sanitation practices were maintained in the house before and during the course of experiment. The probiotic contained *Pediococcus acidilactici* (MA185M) with a minimum of 1×10^10 CFU/1 gr of the product. Formycine (a mixture of formaldehyde, propionic acid, sodium bentonite and ammonia) and Toxiban (a mixture of aluminosilicate and ammonium propionate), are two commercial feed additives available in Iran marketed by IQF, Spain.

The body weight gain was affected by treatments, except treatment 4 (Formycine). As compared with the control diet, probiotic, Toxiban and probiotic+Toxiban increased

All serum samples were tested using HI test (Newcastle) according to Xu et al. (1997) and indirect antibody enzyme-linked immunosorbent assay (ELISA) kit (Influenza, Bronchitis and Gamboro) according to the manufacturer's (Svanova Biotech, Uppsala, Sweden) instruction (Lorraine and Clarke, 1982).

Analysis of variance was performed on the data using the General Linear Model of SAS software (2002). Means were compared using Duncan’s multiple range test. Level of significance used in all results was 0.05.

Results and Discussion

The main effect of treatments on broiler performance and antibody titers are presented in Table 2. Only treatment 4 (Formycine, commercial product 2) decreased (p<0.01) feed consumption by 7.1 percent as compared with the control diet. This product (Formycine) contained formaldehyde acid which coagulate cytoplasmic proteins of pathogenic bacteria through releasing aldehyde and increasing the population of unpathogenic microflora in the gut (Rosser, 2006; Krlik et al., 2004). Also this product could maintain acidic condition in the gut and lower the population of saprophytic bacteria. Treatment 5 (probiotic+Toxiban) resulted in non-significantly lower feed consumption, which indicate the beneficial effects of probiotic, formaldehyde acid and zeolites on feed consumption (Bailey et al., 1998). Probiotic alone had no significant on feed consumption which is in agreement with findings of Miazzo et al. (2000), Ledoux et al. (1999) and Mutus et al. (2006) but not in the line of the findings of Jernigan et al. (1985) and Yeo and Kim (1997) who reported that the use of probiotic in broiler chicks diets significantly improved the daily body weight gain, feed intake and feed efficiency. The reason of variable effect of biological additives may be confounded by variations in gut flora and environmental conditions (Mahdavi et al., 2005).

The body weight gain was affected by treatments, except treatment 4 (Formycine). As compared with the control diet, probiotic, Toxiban and probiotic+Toxiban increased.
Table 2: The main effects of treatments on performance and titer of antibodies of boilers

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatments</th>
<th>SEM</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed consumption (g/hen/d)</td>
<td>133.48</td>
<td>1.01</td>
<td>3.92</td>
</tr>
<tr>
<td>Body weight gain (g)</td>
<td>1464.64</td>
<td>3.34</td>
<td>3.54</td>
</tr>
<tr>
<td>Feed conversion ratio (g/g)</td>
<td>2.49</td>
<td>0.06</td>
<td>0.92</td>
</tr>
<tr>
<td>Antibody titers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newcastle</td>
<td>1.154</td>
<td>0.47</td>
<td>6.07</td>
</tr>
<tr>
<td>Bronchitis</td>
<td>1.166</td>
<td>0.55</td>
<td>11.12</td>
</tr>
<tr>
<td>Influenza</td>
<td>1.313</td>
<td>0.49</td>
<td>7.11</td>
</tr>
<tr>
<td>Gambro</td>
<td>1.166</td>
<td>0.45</td>
<td>4.97</td>
</tr>
</tbody>
</table>

SEM = Standard Error of the mean, CV = coefficient of variability, * = Significant at p<0.05, ** = Significant at p<0.01

...Microorganisms in probiotics, method of preparation, the dosage and condition of birds could be reasons for any observed discrepancies of the effect of probiotics (Huang et al., 2004).

Based on the results of the current study, feeding Toxiban (a mixture of aluminosilicate and ammonium propionate) had the most positive effects on performance parameters and probiotic alone or probiotic+Toxiban supplementations had the best effect on immunity response of broiler chicks.

References


Rowghani et al.: Dietary Supplementation of a Probiotic and Other Additives Available in Iran


